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WHAT WILL BE THE IMPACT OF AUTOMATED VEHICLE LOCATORS (AVL) AND AVL TECHNOLOGY ON THE MANAGEMENT OF PATROL SERVICES IN A LARGE LAW ENFORCEMENT AGENCY BY THE YEAR 2001?

BY

JEFFREY W. GIBSON

MAY, 1995

INDEPENDENT STUDY PROJECT

POST COMMAND COLLEGE

CLASS 20

20-0407

This Command College Independent Study 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 futures study points the way.

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Abstract

The study examines emerging Automated Vehicle Locator (AVL) technology and focuses on the management issues related to this technology. The existing status of this technology is examined and future trends and events are identified using a Modified Delphi process. The research and future forecasting are used to develop scenarios, a strategic plan and a transition management plan designed to create a process that allows for successful implementation of Automated Vehicle Locator systems. The study recommends maximization of employee involvement to reduce employee fear and sabotage, tight security to prevent unlawful access for criminal purposes, and ongoing training. Managers must guard against over dependance on the available information and must not replace the first line supervisor with a computer. The document contains future forecasting data, tables, illustrations, references and bibliography.

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JOURNAL ARTICLE

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INTRODUCTION

2001: *A Space Odyssey* --Conversation with a computer --

Dave: Hello HAL, do you read me? Do you read me HAL?

HAL: Affirmative Dave, I read you.

Dave: Open the pod bay doors HAL.

HAL: I'm sorry Dave, I'm afraid I can't do that.

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HAL: I know you and Frank were planning to disconnect me, and I'm afraid that's something I can not allow to happen.[1]

When the Stanley Kubrick film, *2001: A Space Odyssey*, was released in 1968, the concept of intelligent machines replacing man as the decision maker was science fiction. But even the science fiction writers saw the management dilemmas posed by these machines. As mankind nears the Twenty-First Century the concept of artificial intelligence is a scientific fact. Great strides in computer technology and the information processing capabilities of current hardware have made the use of expert systems available to every field of endeavor.

An expert system is a computer program designed to emulate the human thought process. An expert system of the future, for

patrol deployment might possess many of the following components. Computer Aided Dispatch with a Unit Recommendation function tied into an Automatic Vehicle Location system to identify the closest unit. The system could be integrated with a Scheduling Program and a Crime Analysis Program to ensure proper deployment of units. The system would automatically dispatch the closest unit and provide computer generated voice commands, suspect descriptions, and other necessary information.

Law enforcement hardware and software vendors are expending major portions of their research dollars developing high-tech solutions to management and deployment problems. Nowhere is this more evident than in the area of Automated Vehicle Location systems and their integration with Computer Aided Dispatch. During the 1992 annual Association of Public-safety Communications Officers (APCO) National Conference, leading system developers predicted that emerging technology would place real time vehicle location displays in field supervisor vehicles in five years. During the 1993 APCO National conference, consumer ready systems were displayed.

These high-tech solutions collide with the high-touch desires of management, employees and the public. Increased reliance on computerization, the resultant increased monitoring and the computerization of the bureaucratic system will have a dramatic effect on law enforcement organizations. Employees may view portions of the systems as "big brother" and tailoring decision making to unique situations may be more difficult.

Significant changes in the nature of the job will effect employee satisfaction and have an impact on employee retention. The mere fact that there is dramatic change will affect the culture of the organization. These changes are not preordained to be negative. The positive and negative aspects of change are largely dictated by management's ability to create a vision of the future and manage change.

FUTURES STUDY

In order to maximize the usefulness of expert systems in the deployment of patrol resources it is necessary to manage the expert systems. The focus of this futures oriented research is on the management of patrol deployment expert systems. The following issue statement helps define the scope of the study:

> What will be the impact of Automated Vehicle Locators (AVL) and AVL technology on the management of patrol services in a large law enforcement agency by the year 2001?

ENVIRONMENTAL SCAN

In 1991, Mark Weiser wrote "More than 50 million personal computers have been sold, and the computer nonetheless remains largely in a world of its own."[2] His article suggests that computers will not be fully utilized until they are woven into the every day fabric of American life. Although, in the intervening three years, the use of computers has increased dramatically the public is still fearful of technology. The term Cyberphobia has been coined to describe the fear of technology.

A 1994 Gallup survey commissioned by MCI Telecommunications revealed that:

> Nearly a third (32%) of 605 white-collar workers surveyed confessed to being cyberphobic. Women (39%) are somewhat more fearful than men (27%).[3]

Even though a significant portion of the population is Cyberphobic, the criminal element is catching on. The print media headlines abound with computer crime stories. The following is just a small sample:

Time, May 2, 1994

> Your Chips or Your Life![4]

Sacramento Bee, July 1, 1994

> Con artist invading cyberspace[5]

Sacramento Bee, July 12, 1994

> Pornography lurks in lab computer[6]

The implementation of technology is also causing concern for managers of large organizations. According to an internal State of California report, "Department of Motor Vehicles managers who spent $44.3 million on a computer system that doesn't work' succumbed too readily to industry hype' and couldn't supervise the technocrats on their staff."[7] The rapid advance of computer technology is changing the role of the modern manager.

LITERATURE REVIEW

"Technology and technological development create pervasive pressures for change."[8] The creation of reliable expert systems to facilitate patrol deployment have created the market that law

enforcement feels obligated to procure. Although literature abounds on the newest technological breakthroughs, there is a void in the literature governing the management of this technology. Dr. Malcolm K. Sparrow is one of the few contemporary writers who vigorously argues the need to manage these systems properly. In 1991 he wrote:

> Properly managed, information systems can serve as a powerful tool in the hands of progressive police executives: they can help to redefine the work, emphasize new values and facilitate the development of new partnerships. But if badly managed, they can frustrate the managerial purposes, enshrine old values, focus attention on outdated and inappropriate performance measures, give power to the wrong people, cast in concrete old ways of doing business, create false or misleading public expectations, destroy partnerships and impose crippling restrictions on new styles of operation--quite apart from their propensity to consume millions and millions of tax dollars.[9]

The implementation of new technology solves problems, but on occasion has a way of creating larger, more systemic, problems. The Houston Police Department purchased a state of the art Computer Aided Dispatch system in the mid 1980's. The system was designed around traditional forms of policing with reduced response time as a major goal. When Chief Lee Brown lead the way in the department's move to neighborhood oriented policing it was found that the system did not allow for the proactive work this strategy required. The expert system proved to be a road block in developing a new policing style.[10]

Systems created for the benefit of the employees are not always perceived as beneficial. The Kalamazoo County Marshal said, "Some police unions object to the idea of it, because of

it's the big brother thing, invasion of privacy."[11] Whereas Mr. Simons of Trimble Navigation said, "Officers were initially concerned about the potential for 'Big Brother' abuse of the system. The reality is that officers realize the system gives them greater safety and helps the whole force service the community more effectively."[12] During a California Highway Patrol test in Ventura the officers found the Global Positioning System (GPS) to be an, "...intrusion into their normally independent working style and took to parking under freeway overpasses in order to block the signal from the GPS transponder, making them disappear from the screen."[13] The officers named the program "Sergeant Hiding In Trunk" and commonly used the acronym. Leadership is necessary to ensure that expert systems produce the desired goals. According to Shoshana Zuboff, *In the Age of the Smart Machine:*

> The current technological transformation creates a new context for these centuries-old [leadership] dilemmas. To the extent that technology is used only to intensify the automaticity of work, it can reduce skill levels and dampen the urge towards more participatory and decentralized forms of management. In contrast, an approach to technology deployment that emphasizes its informating capacity uses technology to do far more than routinize, fragment, or eliminate jobs. It uses the new technology to increase the intellectual content of work at virtually every organizational level.[14]

MODIFIED DELPHI

In order to develop a vision of the future and a strategic plan to drive the organization toward that vision a Modified Delphi process was used. This process developed ten major trends

and ten potential events that were used to develop future scenarios. The modified Delphi process produced the following trends and events:

TRENDS

1. Public expectation will affect the use of technology.
2. Technology will allow for smaller, dependable applications and automated locators will become viable.
3. Level of integration between various governmental entities.
4. Training requirements change as use of technology increases.
5. Importance placed on confidentiality and system security.
6. Regionalization of technological systems will affect costs.
7. Changes in employee profile, aptitude, and abilities.
8. Use of technology as first line supervisor.
9. Level of cooperation between labor and management.
10. Level of dependence, by management, on automated, real time analysis.

EVENTS

1. Major automobile manufacture makes AVL standard equipment.
2. Organized crime uses AVL to avoid police.
3. Law enforcement begins to use Automated Person Locators on parolees.
4. Hackers break security code and plant virus in AVL system.
5. Union wins law suit that limits the use of AVL to safety issues only.
6. Mandatory industrial standards adopted for all computers used in communications and drive down costs.

7. New cellular telephone allows for location identification on 911 calls.

8. New frequency band authorized for government use gives unlimited data transmission availability.

9. 911 calls routed directly to closest police unit.

10. Fire shuts down public safety dispatch center.

The identified trends and events were then used to construct alternative future scenarios using the *SIGMA* Scenario Generator. The following scenario was selected as the basis for strategic planning:

SCENARIO (Most Desired)

> Although the last eight years have been very busy, truthfully they have been somewhat uneventful and predictable. The Sacramento Police Department embarked on a major expansion of the Computer Aided Dispatch system that included integration of an Automated Vehicle Location system to aid in the deployment of patrol resources. This was driven, in part, by a perception on the part of the public that computerization would lead to improved efficiency and provide for a safer community (Trend 1). An extensive planing process was conducted in order to develop a strategic plan for the implementation of this system. The process involved identifying stakeholders and the major issues that would affect the project.
>
> The new system became operational on January 20, 1996. Due to the extensive and effective planning process this occurred without any significant problems. On May 16, 1997 the first noteworthy incident occurred when the Communications Center was shut down by a major fire (E 10). Effective planning again saved the day. The communications function was transferred to the Office of Emergency Services dispatch center based on a cooperative agreement between the State and the City of Sacramento. The trend of integrating public services (Trend 3) once again proved to be effective.
>
> During the fall of 1997 the Communications Center reopened. This was just in time for the implementation of the new parole system. The *Three Strikes And Your Out* initiative was bankrupting the California Prison system. Under the revised system, those prisoners who

were eligible for parole were released and wore an Automated Person Locator (Event 3). As a result of the new system and new technology, arrest rates skyrocketed.

In February 1998 the federal government authorized new frequencies for government use (Event 9). The dependance on computers and data transmission had overloaded the existing system. Additionally, room had to be made for the new cellular telephone system. AVL technology had became smaller and more dependable (Trend 2) and the newest generation cellular telephones were capable of providing their location (Event 7). This data was integrated with the existing 911 system and reduced the burden of transferring calls that were misdirected.

During July 2000 the major automobile manufactures announced that AVL systems would be standard in all automobiles(Event 1). This created a boon to auto theft investigations and auto theft soon became nonexistent for new automobiles. The information overload and incompatible systems resulted in a drastic need to standardize computer systems to handle the communications needs. In November 2000 APCO issued standards for computers used in communications (Event 6). The net result was a lowering of costs and an acceleration in the use of AVL technology.

This technological revolution created a need for a new employee (Trend 7) with different skills and attitudes towards computers. Procedures were implemented in February 2001 that allowed for 911 calls to be routed directly to the field officers. This interaction resulted in an improved level of service to the public.

STRATEGIC PLAN

As law enforcement approaches the next millennium two forces pull the profession in different directions. There is the desire to rely on technology to drive down the cost of providing services. At the same time there is an acknowledgement that the tactics used in the seventies and eighties have not worked and the new salvation is Community Oriented Policing.

The Sacramento Police Department has developed a ten year strategic plan that includes the maximization of technology. Automated Vehicle Locator systems and related technology is a major component in this strategy. In order to implement AVL technology a refinement or augmentation of this strategic plan is necessary. The spirit of the strategic plan is codified in the mission statement.

MISSION STATEMENT

By the year 2001 the Sacramento Police Department will implement an Automated Vehicle Locator system integrated with Computer Aided Dispatch to aid in the delivery of patrol services and provide for increased officer safety.

This expert system will meet the public demand for both increased efficiency and an enhancement of the Community Oriented Policing program. Internal demands for proper training and adequate security will be foremost in the system design.

Management will work closely with employee representatives to ensure the expert system enhances the ability of every employee to realize their individual and organizational goals.

In order to develop a strategic plan designed to implement and manage technology an in depth analysis of the environment and organization is critical. This process leads to the identification of stakeholders and the issues that must be addressed in order to acquire their cooperation.

ENVIRONMENTAL ANALYSIS

The specter of Big Brother affects any new use of technology and computer systems to monitor and direct the activities of people. Resistance to this technology can be expected on the part of the public as well as the employees. At the same time the work force and the public at large is becoming computer literate. The use of computers is increasing at a dramatic rate at work and at home causing the profile of future employees to change. Newer employees who grew up with video games will not be as frightened by this technology and may view this type of expert system as a real life video game.

Automated Vehicle Locator technology has a history of being unreliable and susceptible to sabotage. Organized crime is also becoming familiar with computers and computer crime is one of the fastest growing classifications nation wide. Anti-virus programs and security systems safeguard programs and data there by creating a great degree of safety.

The Sacramento economy has been depressed and revenues to local government are substantiality down. When revenues increase, there will be many deserving programs competing for

renewed funding. The increased efficiency offered by an Automated Vehicle Locator system coupled with Computer Aided Dispatch may well pay for itself by reducing response times and using existing resources more effectively. The implementation of an Automated Vehicle Locator system will raise many political issues that will ultimately reach the City Council.

ORGANIZATIONAL ANALYSIS

Tension between the City of Sacramento and the various unions representing the employees of the Sacramento Police Department is high. The employee groups have not had a pay raise in two years and it is doubtful that adequate pay raises will be obtained soon. This strained relation will surely foster an attitude that any new revenue should go toward pay increases and not new technology. The City Council is very supportive of innovation and new technology. This has been demonstrated by a willingness to fund major technological programs such a new 800 Mz trunked radio system.

The Sacramento Police Department possesses many strengths that will support the implementation of a sophisticated Automated Vehicle Locator system integrated with Computer Aided Dispatch. The department has operated a Computer Aided Dispatch system for over ten years and MDT's have been in the patrol cars for over five years. The work force is highly educated, computer literate and understands the benefits of computerization. Management has used progressively sophisticated computer programs for over ten

years to develop patrol deployment plans for the Office Of Operations. This experience has created a realization of the capabilities and limitations of computers.

Morale is low and there is a feeling that the department is moving too fast. Relations with management are strained and there is a strong tendency to view any change in the worst light. Efforts to computerize the workload will be viewed with suspicion.

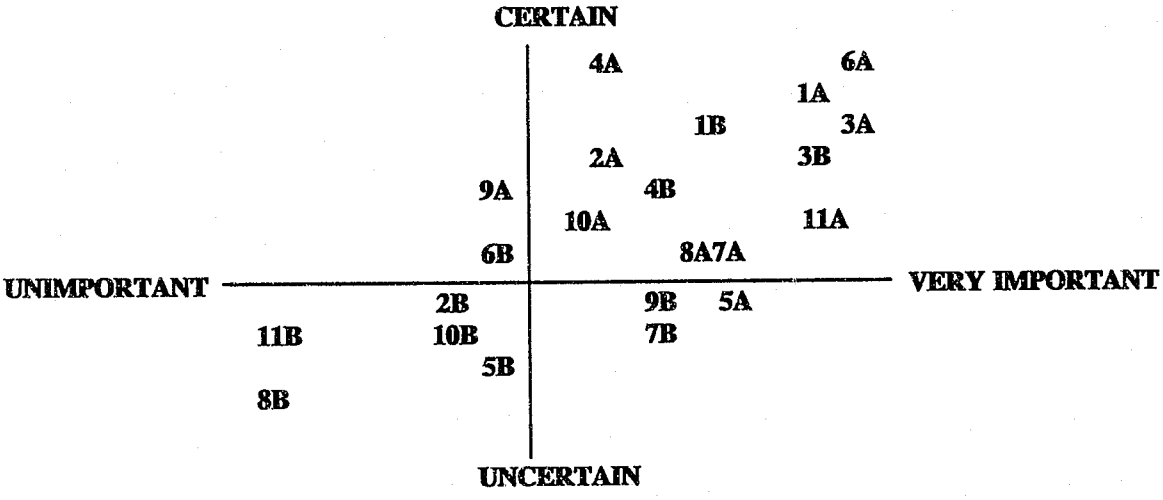
STAKEHOLDER ANALYSIS

As with all major change there are a number of competing goals and desires held by the various stakeholders. It is an absolute necessity to identify and address the needs of each stakeholder. During the strategic analysis phase eleven stakeholders were identified:

1. Sacramento Police Officers Association
2. Sacramento Mayor and City Council
3. Patrol Division Officers
4. Patrol Division Managers
5. Communications Division Dispatchers
6. Chief of Police
7. Police Department Data Services
8. City Information and Communications Services
9. Sacramento Fire Department
10. Community
11. City Managers Office

The assumption mapping chart identifies the positions of the various stakeholders related to the implementation. The issues and degree of support were obtained through individual interviews of the stakeholders and provides great insight into the issues that a strategic plan must address.

ASSUMPTION MAPPING



Stakeholder No. 1 SPOA
- A Supports Officer safety aspects
- B Does not support monitoring

Stakeholder No. 2 Council
- A Supports tech driven efficiency
- B Will bend to pressure groups

Stakeholder No. 3 Patrol Officers
- A Support Officer safety aspects
- B Does not support monitoring

Stakeholder No. 4 Patrol Managers
- A Support monitoring
- B Support Officer safety aspects

Stakeholder No. 5 Dispatchers
- A Will make job easier
- B Resist supervising police officers

Stakeholder No. 6 Chief
- A Support Officer safety aspects
- B Support increased efficiency

Stakeholder No. 7 Data Services
- A Supports use of technology
- B Requires increased resources

Stakeholder No. 8 ICS
- A supports use of technology
- B Attempt to consolidate system

Stakeholder No. 9 Fire Department
- A Supports police efforts
- B Desires to use end product

Stakeholder No. 10 Community
- A Supports efficiency
- B Supports use of NPO's

Stakeholder No. 11 Manager
- A Supports use of technology
- B Funding via CIP

DEVELOPING ALTERNATIVE STRATEGIES

The Strategic Planning Panel was comprised of selected members of the initial NGT panel and met to develop alternative strategies to implement the Automated Vehicle Locator system. A Modified Delphi process was used to identify strategies to accomplish the stated goals. A total of six alternative strategies were developed by the panel. The strategies are:

1. Assign project to existing Patrol Planning Committee
2. Purchase existing vendor package with hardware
3. Implement direction of Chief of Police
4. Create AVL implementation group with existing resources
5. Assign to Communication Division staff
6. Create AVL implementation group with outside consultant

The panel then evaluated the strategies and reduced the list to three alternatives and then selected the preferred strategy.

SELECTED STRATEGY

The selected strategy places the responsibility of system design and implementation with a newly created committee. The organization has two tiers. The first is the policy review committee, comprised of representatives from the Managers Office, Budget Office, ICS, and Executive Management of the Police Department, Sacramento Police Officer's Association, and a consultant with successful experience in marketing new programs. The second tier is the working or implementation committee comprised of representatives from each of the stakeholder groups. The policy group is responsible for funding and broad policy

guidelines. The working committee is charged with the details of implementation. This committee would be responsible for system design, marketing, training and system implementation.

In support of this structure is a highly educated and motivated work force that has expressed a desire to exercise control over their future. A policy committee headed by the Chief of Police and actively involved in the process would garner support from within and outside the department.

Employee groups may view the committee in a favorable light if aggressive marketing is conducted. City management excluding the Police Department would view this format as open and responsive to their input. The Chief of Police would have direct positive input when critical issues were decided.

IMPLEMENTATION PLAN

The implementation of new technological programs that dramatically change the way organizations conduct business are always met with resistance. The degree of resistance is a function of the planning process and the soundness of the program. The selected strategy was chosen by the Strategic Planning Panel after extensive discussion regarding the issue of feedback. Those members who initially did not support the use of a consultant repositioned themselves in light of the departments historical inability to provide feedback. Strained relations between the city and employee groups over contract issues and severe cuts in positions elevated the feedback requirements from important to critical.

The following timetable was developed for the implementation of an Automated Vehicle Locator System integrated with the existing Computer Aided Dispatch system:

STRATEGY FORMULATION

Month one through month six. During the first six months the Chief of Police convenes the Policy Review Committee comprised of representatives from the City Managers Office, Police Data Service Section, Information and Communications Systems Department, and The Sacramento Police Officers Association.

The Policy review Committee refines the Mission Statement, sets objectives and formulates the strategies necessary to implement the program. The issues of funding methods are researched and the consultant is retained.

Month seven through month twelve. During the second six months the working committee is formed and assignments made. The working committee refines the strategies and finalizes the budget. The working committee is divided into four subcommittees with significant crossover on committee assignments. The committees are responsible for the following areas:

1. Employee input, feedback and training
2. Finance
3. System design and Request for Proposals
4. Policy considerations

At the end of the first year the working committee begins to write the Request for Proposals, accepts bids and selects the successful bid.

STRATEGY IMPLEMENTATION

Month thirteen through month twenty-four. Upon selection of the successful bid the committee will complete specific policies based on the system design and capabilities. The operating budget is completed as are specific operational procedures. The training program is completed and an evaluation process is formalized. As the implementation date nears, feedback becomes more important as the frequencies of rumors regarding the system will increase.

EVALUATION AND CONTROL

Implementation of the program is not the final step. Continual evaluation of the training, system and output are necessary to ensure that the program operates properly and the desired goals are achieved. This task is assigned to the employee input, feedback and training sub-committee.

SUMMARY

Increased use of technology by law enforcement agencies is expected to accelerate in order to meet the demand for quality service and safe streets. This Independent Study Project examines the use of technology and more specifically the use of Automated Vehicle Locators in conjunction with Computer Aided Dispatch. The focus of the study was not on hardware or

software, but on the management of this technology. The initial literature search indicated that although there was a wealth of information on the technological aspects of AVL the was little information on the management of this technology.

The Sacramento Police Department's selection for the Strategic Plan was based on the authors familiarity with the department and the knowledge that the department would soon move in this direction. This decision and the initial research lead to the question:

> What will be the impact of Automated Vehicle Locators (AVL) and AVL technology on the management of patrol services in a large law enforcement agency by the year 2001?

The Sub-Issues were identified as:

1. What will be the integrity of system security?
2. What will be the impact on the police management decision making process?
3. What will be the acceptance by law enforcement employees?

The impact of Automated Vehicle Locators and related technology will have a dramatic effect on the management of patrol resources. The decision to implement technological solutions will be driven in large part by forces outside law enforcement. The perception that efficiency equates to safety in combination with a need to reduce employee expenditures will make automated systems very attractive to the public and elected officials. Whether the effect is positive or negative depends on

system design, a strategic plan defining the desirable future and a transition plan that causes change and at the same time meets the needs of the various stakeholders. In order to create a system that is beneficial to the organization the following issues must be addressed.

System security will be foremost in system design and will address two separate areas. The first will be design and policy considerations to prevent unlawful access and criminal misuse of the system. The second will be design and policy considerations to prevent employees from degrading the usefulness of the system based on their fear of the big brother aspects of technology.

The police management decision making process must also change in light of technological innovation. It is clear that properly designed systems aid in the management of patrol operations however managers must not become overly dependant on the capabilities of the systems. Managers must also resist the lure of replacing the monitoring capabilities of computerization with the proper functions of the first line supervisor. Police management must also open the decision making process as it relates to system design and policy considerations. The technocrats are incapable of designing a system that cannot be degraded by the base line employees. The solution to this problem is employee involvement, reasonable rules and feedback. A well designed system will have a high degree of employee acceptance and therefore a low level of employee sabotage.

The acceptance level of AVL technology by employees is the final hurdle to be cleared. Considering the number of employees that are cyberphobic and serious concerns regarding the monitoring capabilities of AVL technology these issues must be addressed. Openness and training are the keystone to developing an existing workforce that is comfortable with technology. This will foster labor-management cooperation and pave the way for trouble free implementation. In the future employees who grew up on computer games will be the norm and steps should be taken to identify the profile for future employees now.

ENDNOTES

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LIST OF ILLUSTRATIONS

LIST OF TABLES

Dedicated in memory of my son

Craig Zachary Gibson

December 20, 1974 October 24, 1993

I will miss you for the rest of my life.

INTRODUCTION

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When the Stanley Kubrick film, *2001: A Space Odyssey*, was released in 1968, the concept of intelligent machines replacing man as the decision maker was science fiction. But even the science fiction writers saw the management dilemmas posed by these machines. As mankind nears the Twenty-First Century the concept of artificial intelligence is a scientific fact. Great strides in computer technology and the information processing capabilities of current hardware have made the use of expert systems available to every field of endeavor.

MYCIN, an expert system, is currently being used in the medical field to speed diagnoses of infections by applying 450 rules and 1000 facts to determine the cause and treatment.[2] Automobile mechanics access stored information on malfunctions and operating conditions in order to use expert systems to trouble shoot engine problems.[3] One of the best law enforcement expert systems, Cal ID, is able to search all California fingerprints in a few minutes and make a comparison.[4]

An expert system is a computer program designed to emulate the human thought process. Computing power, allows large quantities of data to be analyzed and decisions to be made quickly. Although there is some argument in the field,

> ...most agree that expert systems share certain common characteristics:
>
> They codify expert human knowledge in a way that allows the system to make decisions similar to those the expert would make in like circumstances.
>
> They are limited to one specific area of expertise.
>
> They can not only make decisions, but also describe how that decision was reached as well. In other words, they are self auditing.[5]

An expert system of the future, for patrol deployment might possess many of the following components. Computer Aided Dispatch with a Unit Recommendation function tied into an Automatic Vehicle Location system to identify the closest unit.

The system could be integrated with a Scheduling Program and a Crime Analysis Program to ensure proper deployment of units. The system would automatically dispatch the closest unit and provide computer generated voice commands, suspect descriptions, and other necessary information.

Law and Order reported that in 1986 the Irvine California Police Department installed a Loran based Vehicle Locator System. The article states that the system "has dramatically increased the Dispatcher's ability to provide prompt and appropriate operational control".[6] The system is able to precisely locate vehicle positions and has resulted in decreased response times. A monitor was installed in the Watch Commanders office and during crimes in progress the "Watch Commander just looks at the screen and gives them an assignment."[7]

Law enforcement hardware and software vendors are expending major portions of their research dollars developing high-tech solutions to management and deployment problems. Nowhere is this more evident than in the area of Automated Vehicle Location systems and their integration with Computer Aided Dispatch. During the 1992 annual Association of Public-safety Communications Officers (APCO) National Conference, leading system developers predicted that emerging technology would place real time vehicle location displays in field supervisor vehicles in five years. During the 1993 APCO National conference, consumer ready systems were displayed.

These high-tech solutions collide with the high-touch desires of management, employees and the public. Increased reliance on computerization, the resultant increased monitoring and the computerization of the bureaucratic system will have a dramatic effect on law enforcement organizations. Employees may view portions of the systems as "big brother" and tailoring decision making to unique situations may be more difficult. Significant changes in the nature of the job will effect employee satisfaction and have an impact on employee retention. The mere fact that there is dramatic change will affect the culture of the organization. These changes are not preordained to be negative. The positive and negative aspects of change are largely dictated by management's ability to create a vision of the future and manage change.

FUTURES STUDY

In order to maximize the usefulness of expert systems in the deployment of patrol resources it is necessary to manage the expert systems. The focus of this futures oriented research paper is on the management of patrol deployment expert systems. The following issue help define the scope of the study:

> What will be the impact of Automated Vehicle Locators (AVL) and AVL technology on the management of patrol services in a large law enforcement agency by the year 2001?

The following sub-issues further define the scope of the paper:

1. What will be the integrity of system security?
2. What will be the impact on the police management decision making process?
3. What will be the acceptance level by law enforcement employees?

The current wisdom in Futures Study is that there is no one predictable future, but rather a infinite number of possible futures. The future cannot be predicted with any degree of certainty but a number of possible futures can be identified based on a close examination of current trends and capabilities. The methodology used in this paper was developed to create plausible scenarios of the future.

The purpose of developing futures scenarios is at the heart of the second principle of Futures Study. The future is based on individual choice. Within the scope of possible futures

individuals make a series of choices that determines which future becomes reality. Scenario development provides a vision of what could be, in order to provide information that allows individuals to make a choice regarding what should be. When that choice is made the individual or manager can then develop a plan to create that future.

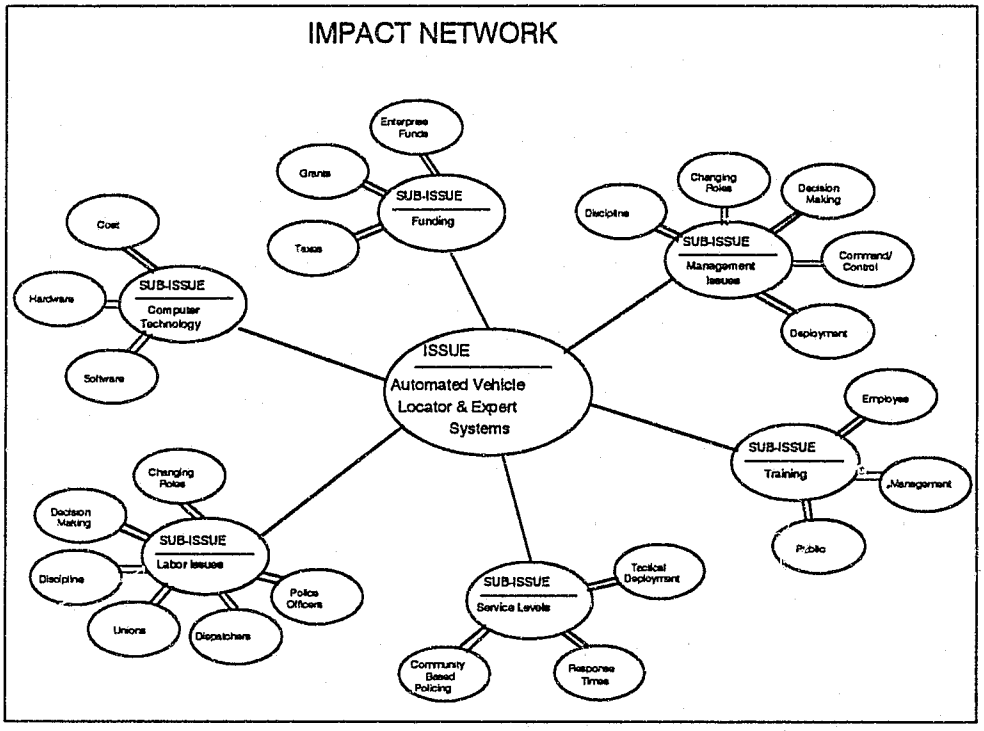
METHODOLOGY

The methodology used in this research paper began with a literature search of contemporary writers in the area of managing technology and computer systems. The literature search quickly expanded into works directed toward the private sector. It is clear that the private sector is several years ahead of law enforcement in the use of computers and high technology in the manufacturing process.

The Association of Public-Safety Communications Officers (APCO) annual National Conferences was attended three times to gain a sense of what was possible in the technological arena in order to provide the background information necessary to discuss the management issues involved in the implementation of technological solutions. The area of Automated Vehicle Locator technology is expanding rapidly and recent technological advancements have opened up the area to commercial applications. The focus of the study is the management of AVL technology and not the hardware and software.

Discussions with law enforcement managers were used to develop the impact network that framed the area of study. The impact network is shown in Figure 1. The information used to create the impact network was then distilled to form the issue and sub-issues.

Figure 1



A Nominal Group Technique panel was formed to identify trends and events that would affect the future of managing AVL technology in a large law enforcement agency. Although a large

number of trends and events were identified, the panel identified the ten most important trends and events. Events were further evaluated against each other using cross impact analysis.

In order to develop scenarios the events were run in *SIGMA*, a scenario generator. The data provided by *SIGMA* was analyzed and grouped into general categories. These categories were used to write three futures scenarios. These scenarios provide a vision of possible futures. Based on these visions an individual can choose the desired future and begin to make choices that will make that scenario a reality.

ENVIRONMENTAL SCAN

In a 1991, Mark Weiser wrote "More than 50 million personal computers have been sold, and the computer nonetheless remains largely in a world of its own."[8] His article suggests that computers will not be fully utilized until they are woven into the every day fabric of American life. Although, in the intervening three years, the use of computers has increased dramatically the public is still fearful of technology. The term Cyberphobia has been coined to describe the fear of technology. A 1994 Gallup survey commissioned by MCI Telecommunications revealed that:

> Nearly a third (32%) of 605 white-collar workers surveyed confessed to being cyberphobic. Women (39%) are somewhat more fearful than men (27%).

59% will only try technology after it has been proven.

56% of all respondents are afraid the proliferation of computers will threaten their privacy.

58% haven't heard about the Internet, the web of computer networks that lets users tap databases.[9]

Even though a significant portion of the population is Cyberphobic, the criminal element is catching on. The print media abounds with computer crime stories. The following is just a small sample:

Time, May 2, 1994

...in Fremont, California burglars disarmed a security system and made off with more than $1.8 million of chips and computer equipment in a January warehouse heist.[10]

Sacramento Bee, June 1, 1994

...has been charged with breaking Michigan's anti-stalking law for continuing to send computer messages". ..."This letter is the LEAST of the many things I could do to annoy you, he wrote on April 24.[11]

Sacramento Bee, July 1, 1994

Our concern is with swindlers and other sharp operators who exploit cyberspace.[12]

Sacramento Bee, July 12, 1994

Dramatically illustrating the security problems posed by the rapid growth of the Internet computer network, one of the nation's three nuclear weapons labs

> confirmed Monday that computer hackers were using its computers to store and distribute hard-core pornography.[13]

The implementation of technology is also causing concern for managers of large organizations. According to an internal State of California report, "Department of Motor Vehicles managers who spent $44.3 million on a computer system that doesn't work 'succumbed too readily to industry hype' and couldn't supervise the technocrats on their staff."[14] The rapid advance of computer technology is changing the role of the modern manager.

LITERATURE REVIEW

"Technology and technological development create pervasive pressures for change."[15] The creation of reliable expert systems to facilitate patrol deployment have created a market that law enforcement feels obligated to procure. Although literature abounds on the newest technological breakthroughs, there is a void in the literature governing the management of this technology. Dr. Malcolm K. Sparrow is one of the few contemporary writers who vigorously argues the need to manage these systems properly. In 1991 he wrote:

> Properly managed, information systems can serve as a powerful tool in the hands of progressive police executives: they can help to redefine the work, emphasize new values and facilitate the development of

new partnerships. But if badly managed, they can frustrate the managerial purposes, enshrine old values, focus attention on outdated and inappropriate performance measures, give power to the wrong people, cast in concrete old ways of doing business, create false or misleading public expectations, destroy partnerships and impose crippling restrictions on new styles of operation--quite apart from their propensity to consume millions and millions of tax dollars.[16]

The implementation of new technology solves problems, but on occasion has a way of creating larger, more systemic, problems. The Houston Police Department purchased a state of the art CAD system in the mid 1980's. The system was designed around traditional forms of policing with reduced response time as a major goal. When Chief Lee Brown lead the way in the department's move to neighborhood oriented policing it was found that the system did not allow for the proactive work this strategy required. The expert system proved to be a road block in developing a new policing style.[17]

Systems created for the benefit of the employees are not always perceived as beneficial. An early automated vehicle location system test occurred in St. Louis during 1974. A dead reckoning system, named FLAIR, was implemented in one district. Although the stated goals were reduced response time and improved officer safety, 58.2% of the patrol officers feared that the system would be used for disciplinary purposes. At the end of

the test period only 25.6% of the officers felt that FLAIR would have an effect on disciplinary actions. This reduction was based on the perceived failure of the system and the inability to track the officers.[18]

In the twenty years that has elapsed not much has changed. The Kalamazoo County Marshal said, "Some police unions object to the idea of it, because of it's the big brother thing, invasion of privacy."[19] Whereas Mr. Simons of Trimble Navigation said, "Officers were initially concerned about the potential for 'Big Brother' abuse of the system. The reality is that officers realize the system gives them greater safety and helps the whole force service the community more effectively."[20] During a California Highway Patrol test in Ventura the officers found the Global Positioning System (GPS) to be an, "...intrusion into their normally independent working style and took to parking under freeway overpasses in order to block the signal from the GPS transponder, making them disappear from the screen."[21] The officers named the program Sergeant Hiding In Trunk and commonly used the acronym.

Leadership is necessary to ensure that expert systems produce the desired goals. According to Shoshana Zuboff, *In the Age of the Smart Machine:*

> The current technological transformation creates a new context for these centuries-old [leadership] dilemmas. To the extent that technology is used only to intensify the automaticity of work, it can reduce skill levels

and dampen the urge toward more participatory and decentralized forms of management. In contrast, an approach to technology deployment that emphasizes its informating capacity uses technology to do far more than routinize, fragment, or eliminate jobs. It uses the new technology to increase the intellectual content of work at virtually every organizational level.[22]

FORECASTING

NOMINAL GROUP TECHNIQUE

The Nominal Group Technique (NGT) was one method used to generate and identify potential events and existing trends in order to develop future scenarios. A Nominal Group, is a small group of knowledgeable individuals or experts who meet to answer a single question that was developed by the researcher. Consensus is reached through individual work, group discussion and voting.

The eleven nominal group panel members selected for this question were identified based on a perceived need to represent diverse interests. Panel members were selected to represent labor, police management, communications, technological support, and vendors from the private sector. A detailed list of the panel members, process and forms may be found in Appendix A.

In response to the study question, the panel identified thirty-seven trends. A complete list of the identified trends may be found in Appendix B. During the NGT process these were narrowed to the following ten trends:

T-1. Public expectation will affect the use of technology.

T-2. Technology will allow for smaller, dependable applications and automated locators will become viable.

T-3. Level of integration between various governmental entities.

T-4. Training requirements change as use of technology increases.

T-5. Importance placed on confidentiality and system security.

T-6. Regionalization of technological systems will affect costs.

T-7. Changes in employee profile, aptitude, skills, training and abilities.

T-8. Use of technology as first line supervisor.

T-9. Level of cooperation between labor and management.

T-10. Level of dependence, by management, on automated, real time analysis.

In response to the study question, the panel identified thirty-three events. A complete list of the events may be found in Appendix C. During the NGT process these events were narrowed to the following ten events:

E-1. Major automobile manufacture makes AVL standard equipment.

E-2. Organized crime uses AVL to avoid police.

E-3. Law enforcement begins to use Automated Person Locators on parolees.

E-4. Hackers break security code and plant virus in AVL system.

E-5. Union wins law suit that limits the use of AVL to safety issues only.

E-6. Mandatory industrial standards adopted for all computers used in communications and drive down costs.

E-7. New cellular telephone allows for location identification on 911 calls.

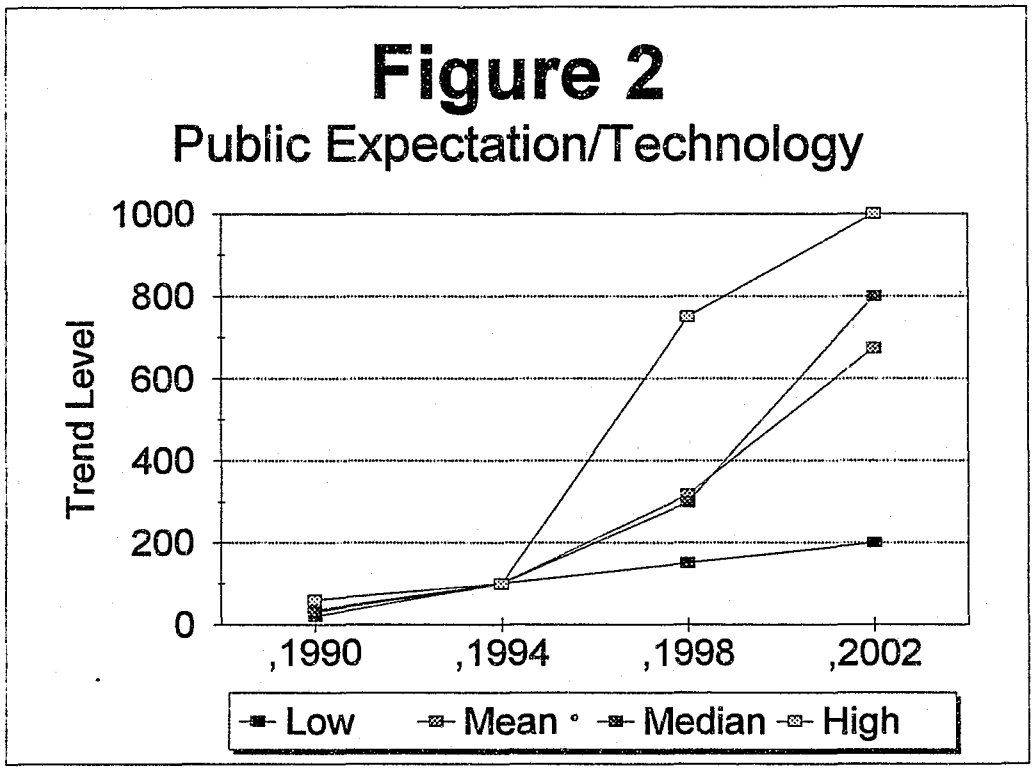
E-8. New frequency band authorized for government use gives unlimited data transmission availability.

E-9. 911 calls routed directly to closest police unit.

E-10. Fire shuts down public safety dispatch center.

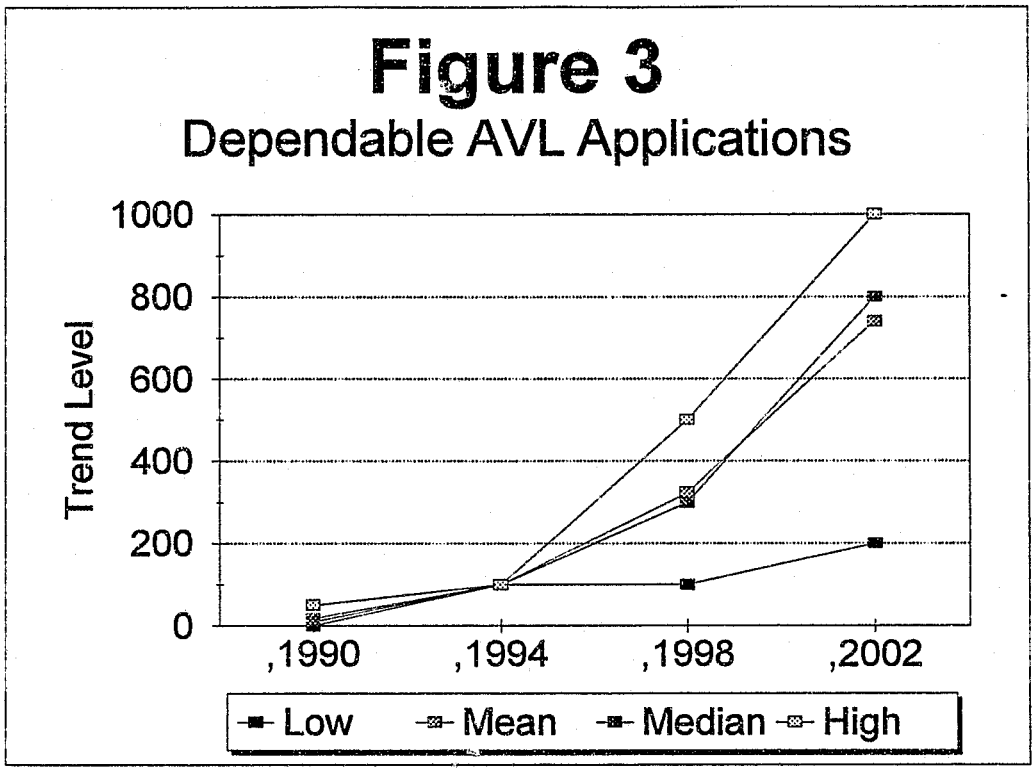
TRENDS

After identifying the ten most significant trends, the panel was asked to forecast the future of each trend for the upcoming eight years. This was accomplished by assigning forced values in a Trend Forecasting Form. This future forecast was based on the opinion of each of the diverse panel members. A surprising degree of consistency occurred for each of the ten selected trends. Graphical representations of the trends are displayed in figures 2 through 11.



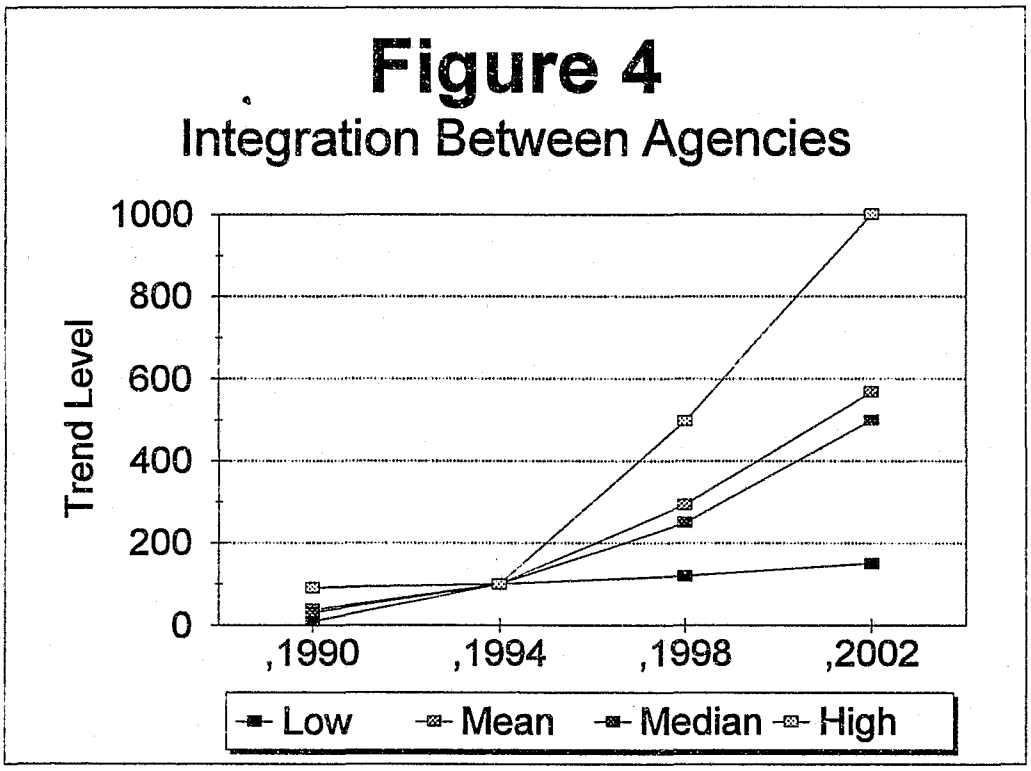
Trend 1 Public expectation will affect use of technology.

The panel felt that the public holds a belief that the use of technology will provide for more efficient law enforcement and therefore increased use of technology will provide for safer communities. Currently, the fear of crime is the number one issue on the minds of Californians and anything that is perceived to provide for public safety will receive support from the public and elected officials. Human resources is the greatest expenditure for local law enforcement. Increased use of systems such as AVL to increase efficiency and effectiveness are highly desirable. As the public becomes aware of the capabilities of AVL technology, this awareness will drive the desire to implement the technology. The panel forecast that this trend level would increase three fold during each of the four year time increments.



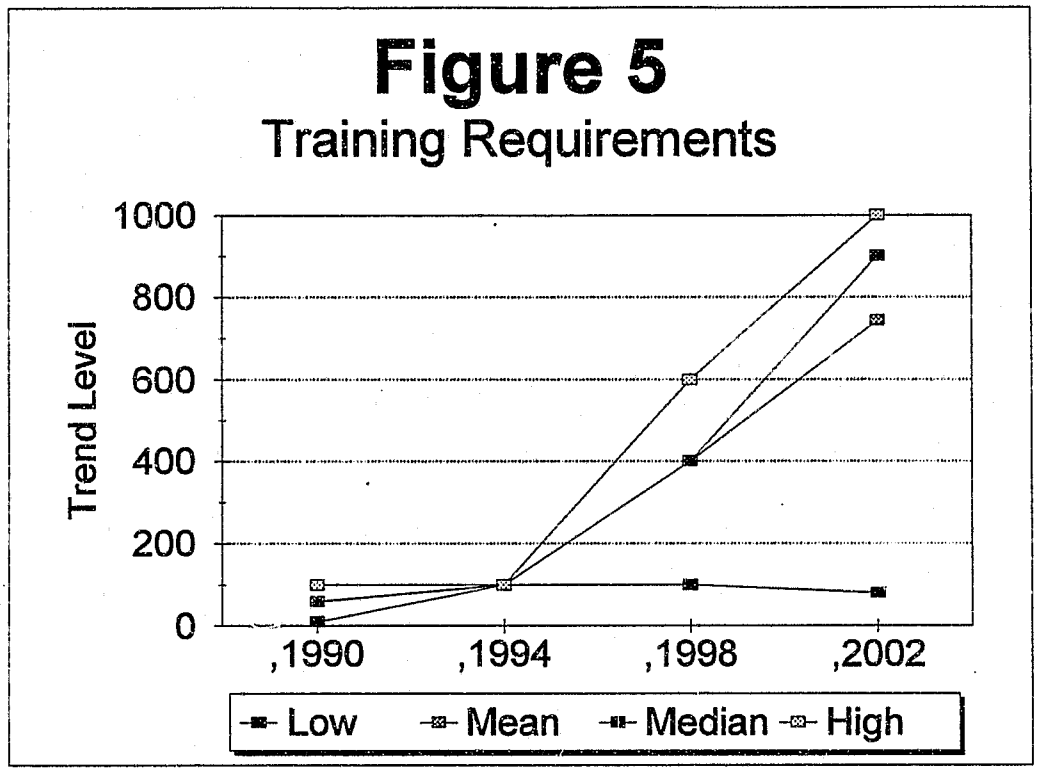
Trend 2 Technology will allow for smaller, dependable applications and AVL systems will become viable.

History indicates that the use of AVL systems have been retarded by technological and dependability problems. The panel members felt that major breakthroughs in Computer Aided Dispatching, data transmission, microprocessors, and land based or satellite based data transmission have set the stage for broad use of AVL technology. The panel forecast that the dependability and reliability would increase three fold during each of the next four year increments. This forecast mirrored that forecast of the public's expectation.



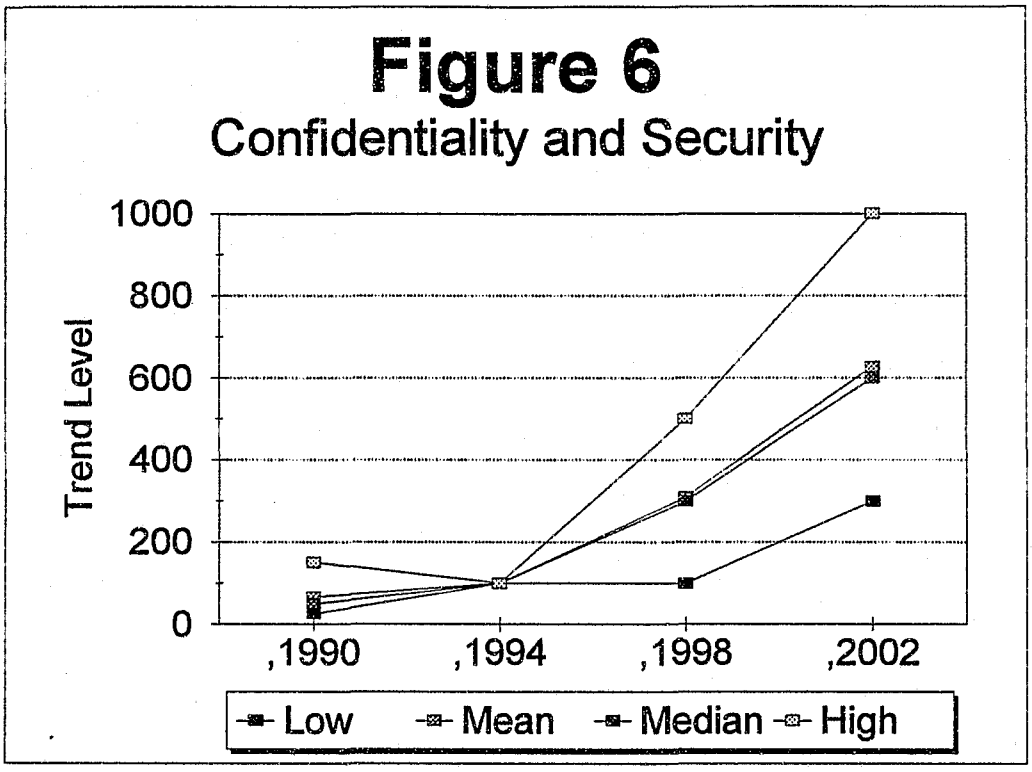
Trend 3 Level of integration between various governmental agencies.

The panel felt that there was a strong trend for a collaborative approach to problem solving. This trend does not include consolidation of governmental bodies, but rather working together on joint problems. The increased use of Joint Powers Agreements, contracting for services, and comprehensive regional planning will increase the funds available for large capital improvement programs necessary to develop technological solutions to problems. The panel forecast that this trend level would double during each of the next four year increments.



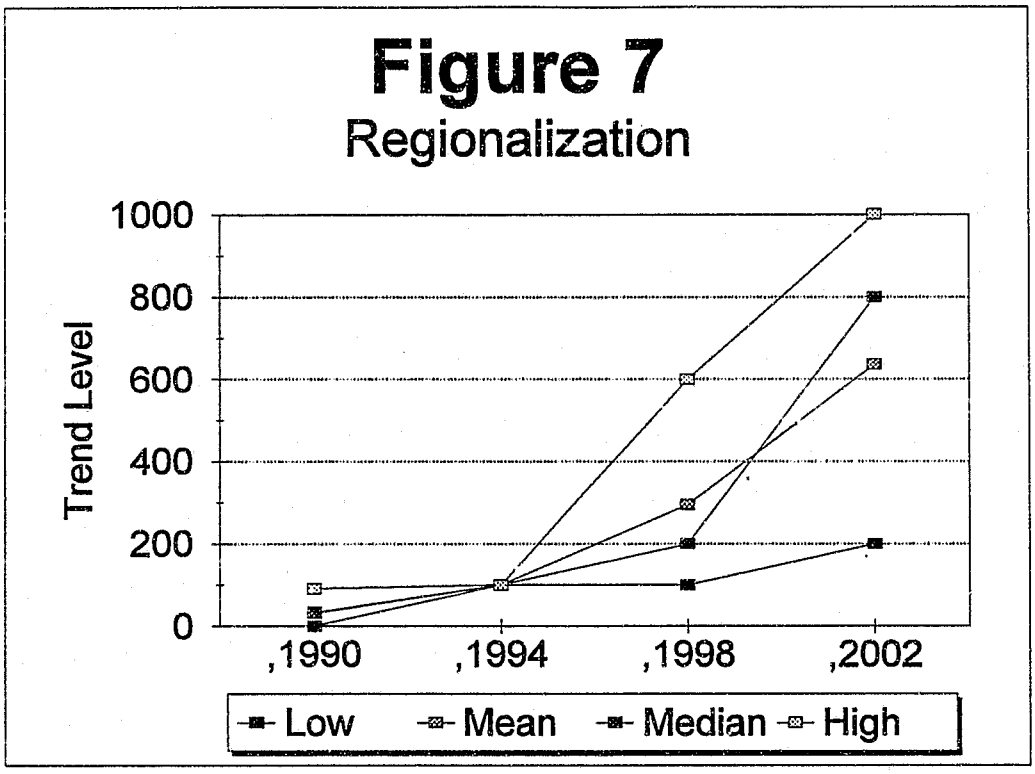
Trend 4 Training requirements change as the use of technology increases.

Law enforcement is on the ground floor in its computerization of service delivery. To date, the majority of data services applications has revolved around the storage and retrieval of data obtained by field officers and batch processed. The introduction of AVL technology and the expert systems associated with these new methods of operations will require a renewed training effort that begin with the base line employee and extends to executive management. The panel forecast that trend level will double during each of the next two four year increments.



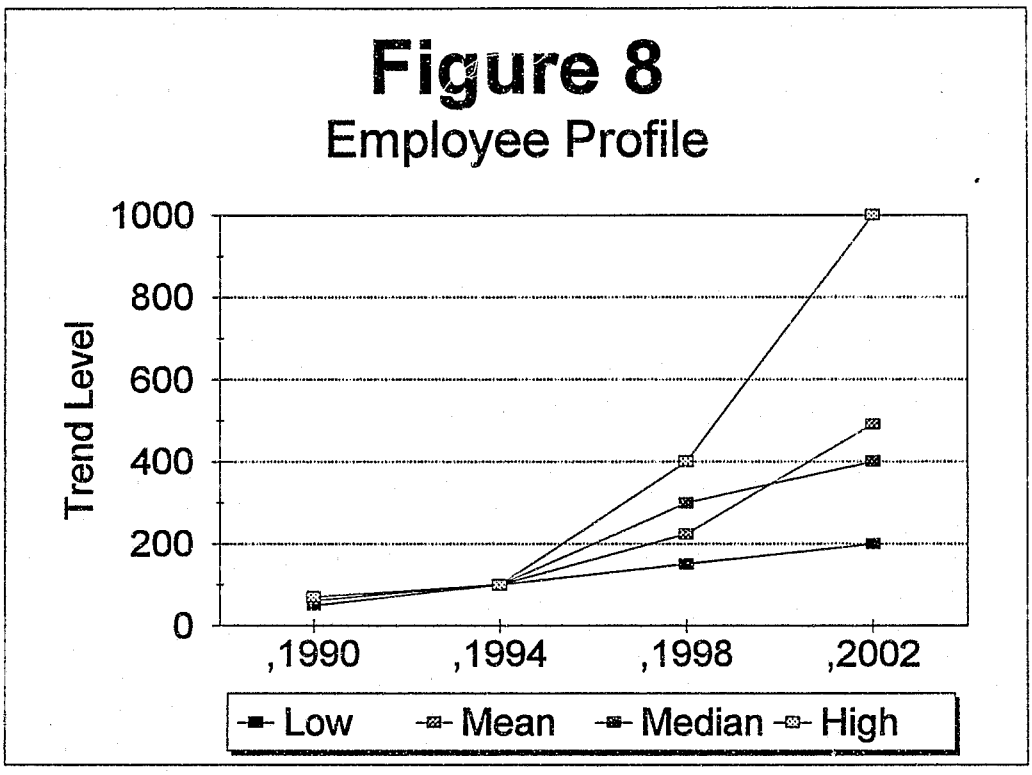
Trend 5 Importance placed on confidentiality and security.

AVL systems will provide a wealth of information to employees and managers regarding the operation of the patrol function. Security of this information and the processes will become important as others develop methods to intercept the data for criminal purposes. Computerized information regarding the location and status of field units would be of greater value to criminals than managers. As managers and users become more dependant on the systems the value of sabotage increases. The panel forecast that the trend level would increase three fold during each of the next four year increments.



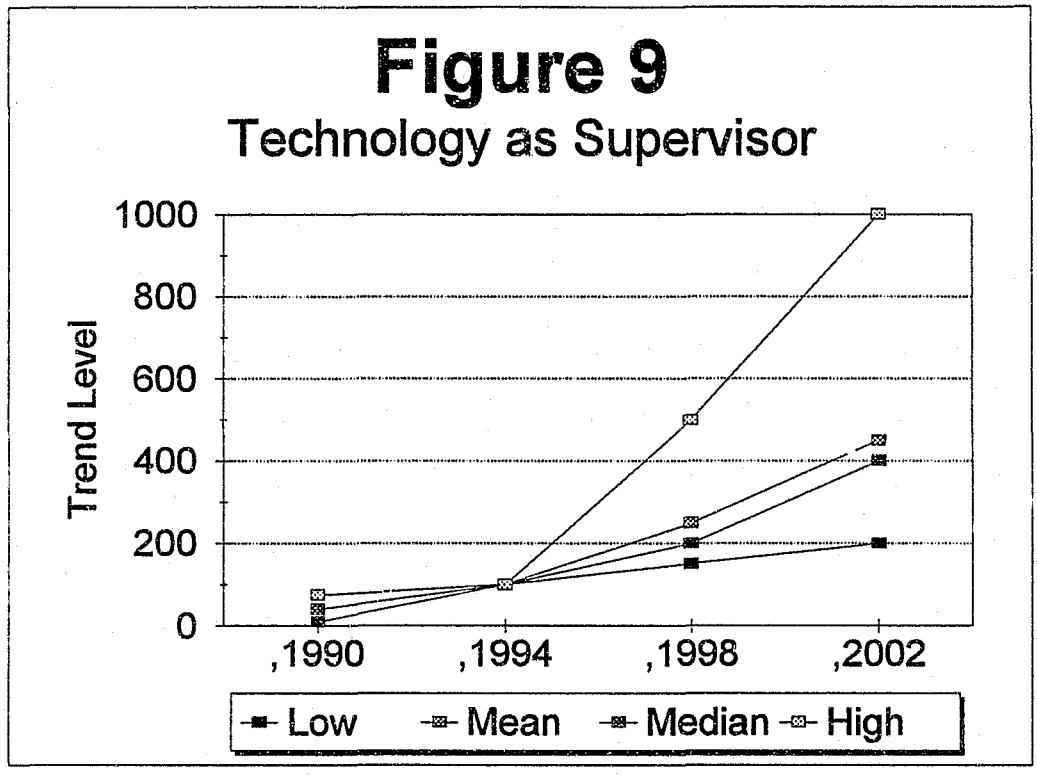
Trend 6 Regionalization of technological systems to effect costs.

Technologically intense systems require expensive backbones in order to become operational. Whether the system is land based or Global Positioning Satellite, hardware costs must be disbursed over a large number of operational units in order for the system to be financially feasible. This methodology has been used with increasing frequency and success in other technological systems such as 800 Mhz trunked radio systems. The panel forecast this trend level doubling during the next four years and then increasing at a more dramatic rate. The success of the large trunked radio systems would lead to other joint ventures.



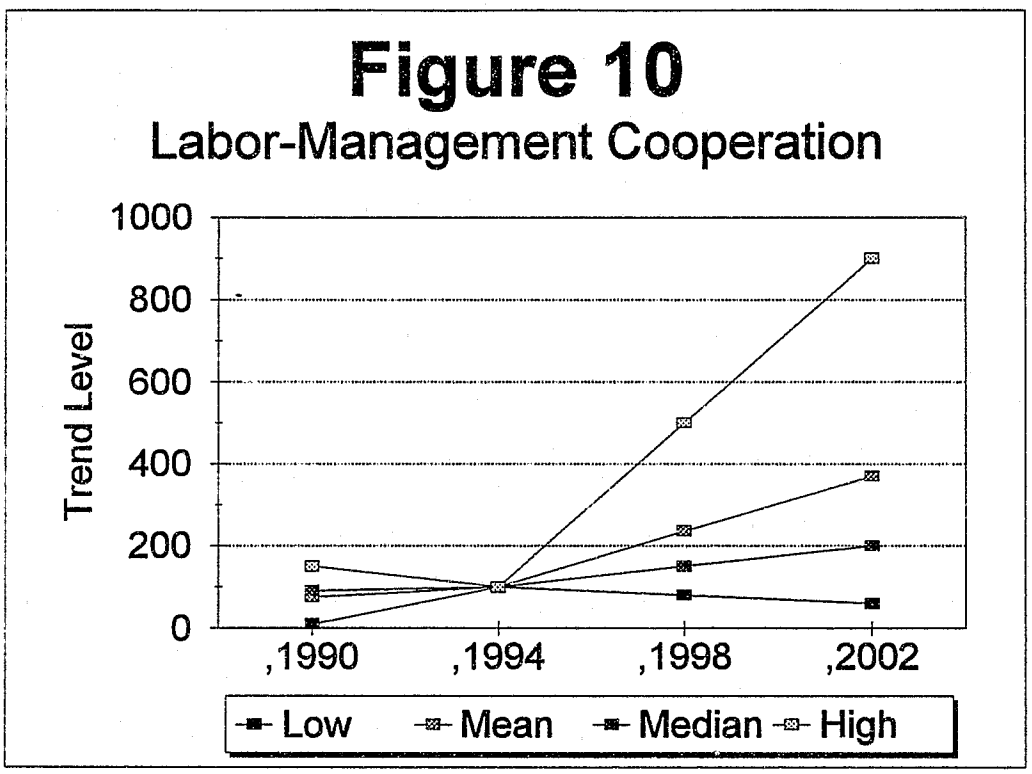
Trend 7 Changes in employee profile, aptitude, skills, training, and abilities.

New job requirements are created with the implementation of new technology. Changes in the job requirements and operational procedures will drive a need for a new employee profile. The panel felt that it would become increasingly important to identify and hire employees that are comfortable interacting with complex computer programs. This clearly applies to field officers, communications personnel and managers. The panel forecast that there would be a constant and moderate rise in this trend level during the next eight years.



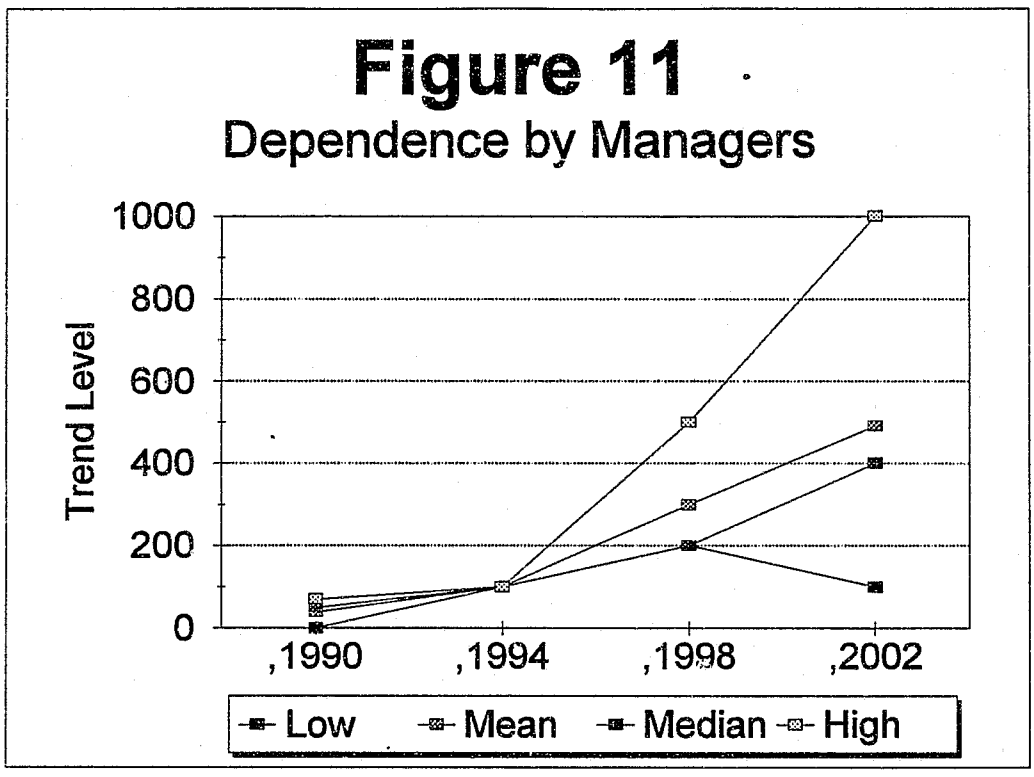
Trend 8 Use of technology as first line supervisor.

The panel identified a trend of supervisors and managers using the monitoring capability of computers as the first line supervisor. The implementation of an AVL system and the telemetry that will surly be integrated with even early generation AVL systems will make this option very attractive. For the weak supervisor it may be easer to identify poor performance in terms of computer printouts and management reports. Exception reports could be developed to report excessive speed, failure to patrol, wandering from a beat or slow response to calls for service. The temptation to create these reports may be great, however their implementation may be counter productive. The panel forecast a moderate increase in this trend with a doubling in the trend level during each of the next four year increments.



Trend 9 Level of cooperation between labor and management.

The panel felt that friction between labor and management will increase with the implementation of expert systems. The use of AVL technology will surly be viewed by many of the operations employees as "Big Brother" and lead to resentment. Decisions regarding the use of the systems will have a great effect on the employees perceptions regarding the usefulness of the systems. Historically, there has been great resistance by unions to this type of technology and this resistance has led to the failure of the systems. The panel forecast that the trend level would double during each of the next four year increments. There was a large degree of consistency in the panel members opinion and the high response was not shared by other members.

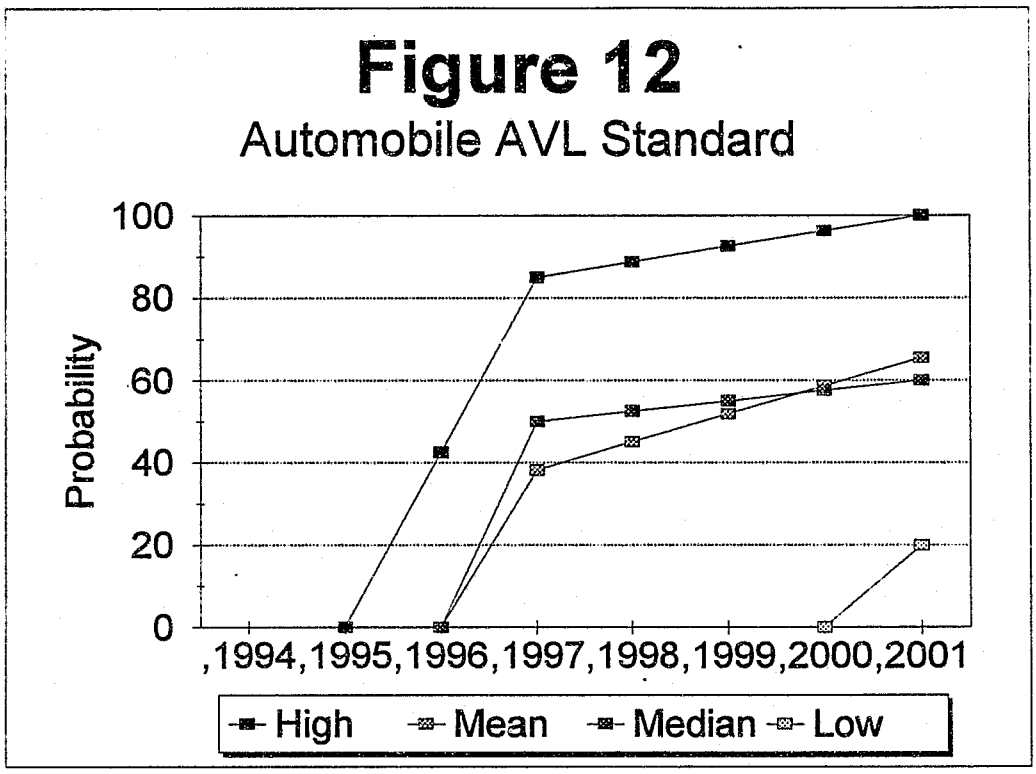


Trend 10 Level of dependence, by management, on automated real time analysis.

The panel felt that as managers begin to use expert systems and AVL technology they will find the information valuable to the decision making process. The more the information is used the more managers will rely on the data and loose the ability to interpret other external information in order to determine what is occurring in their areas of responsibilities. Blind reliance on AVL data may create a system where managers stop thinking and follow computer recommendations that do not make sense in the real world. The panel forecast that the level of dependence would double during each of the four years.

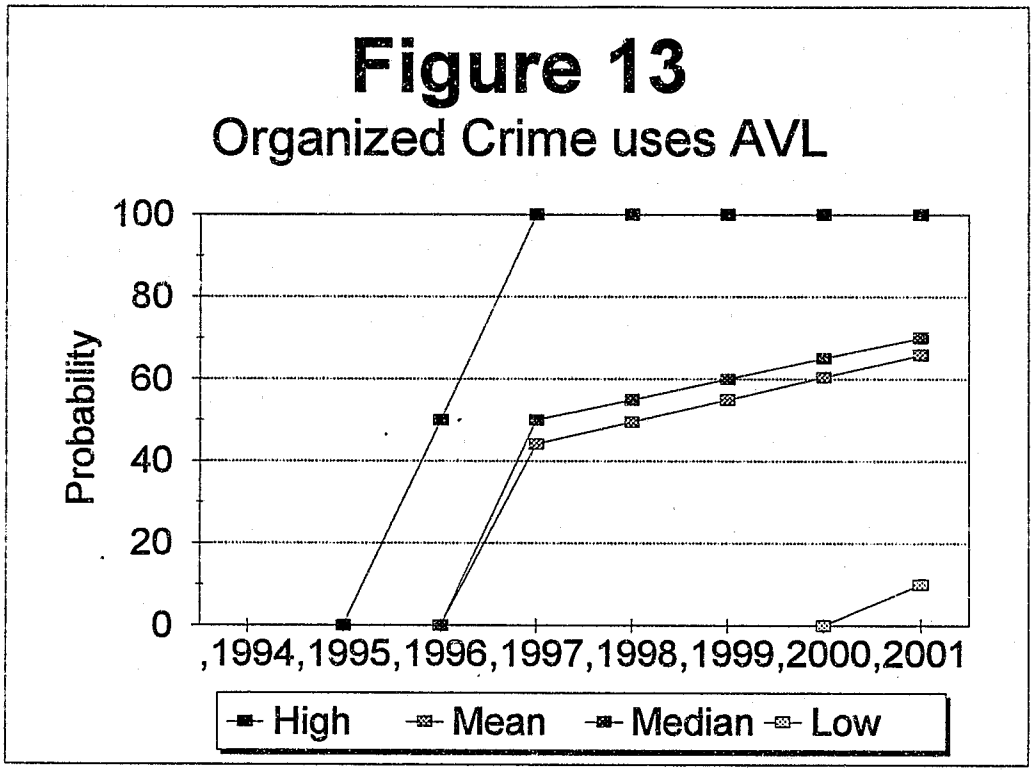
EVENTS

After identifying the ten most significant events, the panel was asked to forecast the probability of occurrence for each event during the next eight years. This future forecast was based on the opinion of each of the diverse panel members. Panel members assigned probabilities based on their opinion as to the date the event could first occur, the probability at four years and the probability at eight years. A surprising degree of consistency exists for the forecasting of each event. Graphical representations of each event and its probability of occurrence are displayed in figures 12 through 21.



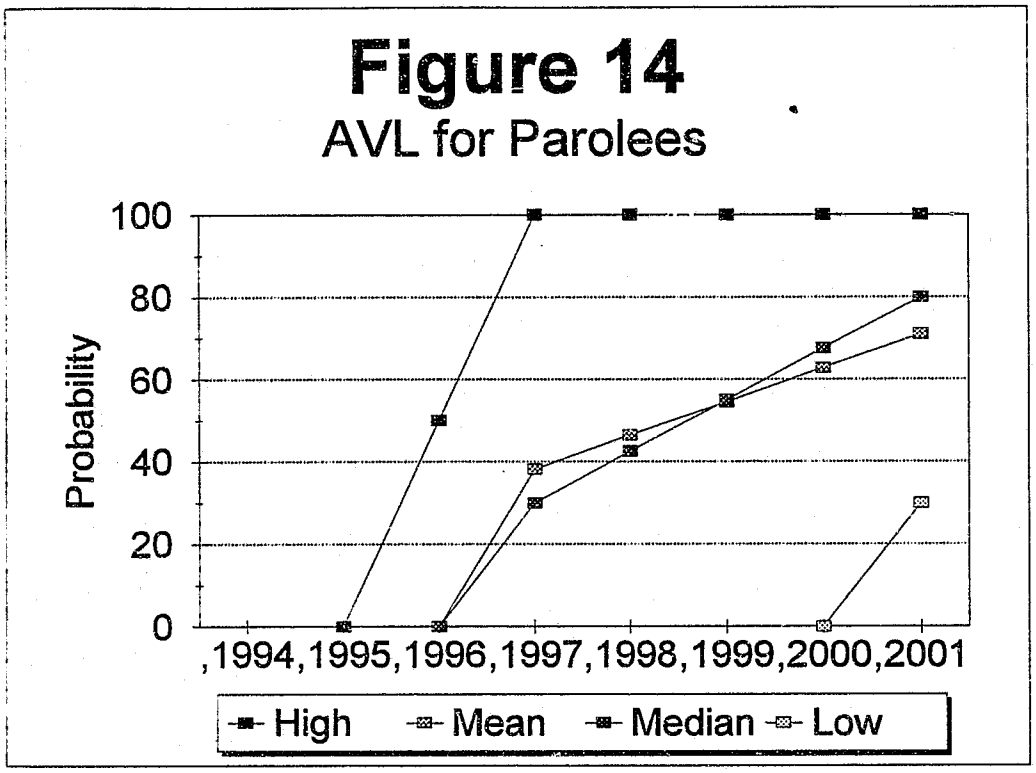
Event 1 Major automobile manufacture makes AVL standard equipment.

The panel forecasted that the mean probability of this occurring within eight years was 65.5%. As the country's manufactures saw and developed the retail value of AVL, the technology will become available for a wide variety of applications. This event will have the effect of lowering costs and increasing dependability. The general public will gain a greater understanding and acceptance of this technology that would open up unthought of applications. Although a majority of these applications would be positive, there will be those individuals that will abuse this technology to victimize others.



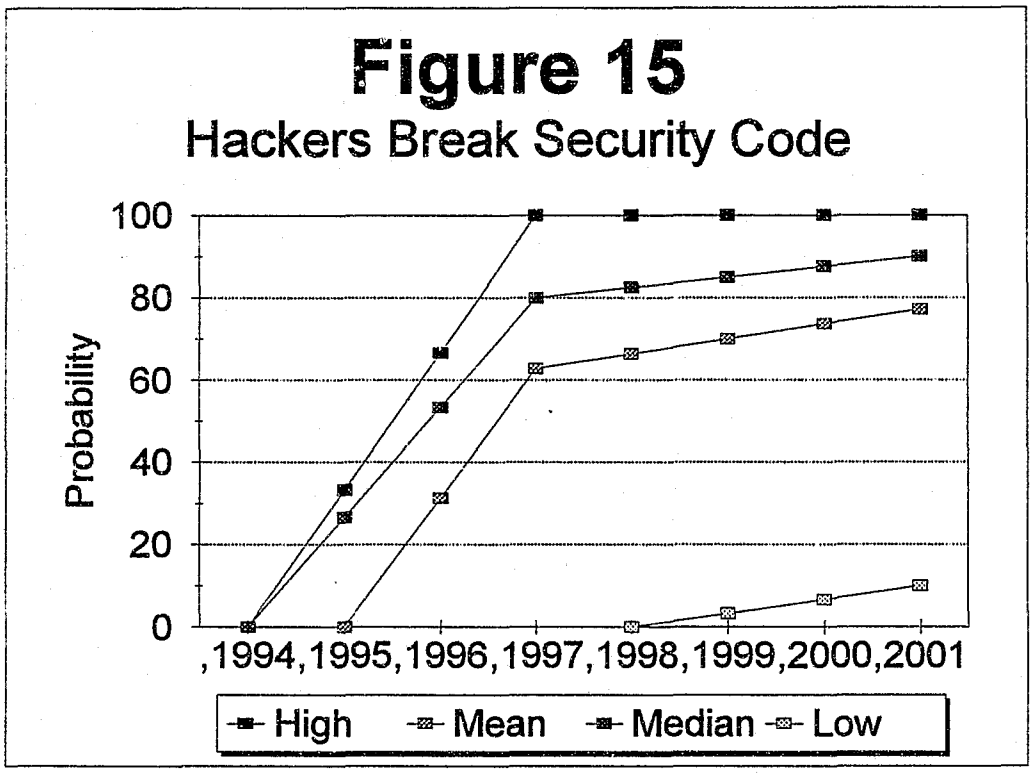
Event 2 Organized crime uses AVL to avoid police.

The panel forecast that organized crime would tap into the data base of a Computer Aided Dispatch system and use the tracking capabilities of AVL to monitor the location of law enforcement equipment and personnel in order to commit a crime undetected. The panel forecast that the mean probability of this occurring within eight years was 65.9%. Accurate information on the location of law enforcement would greatly enhance the ability to avoid detection when committing crimes such as robbery, high-jacking and narcotics transactions. Reducing the risk of arrest would surely increase the incidents of these crimes occurring and have a dramatic negative effect on law enforcement.



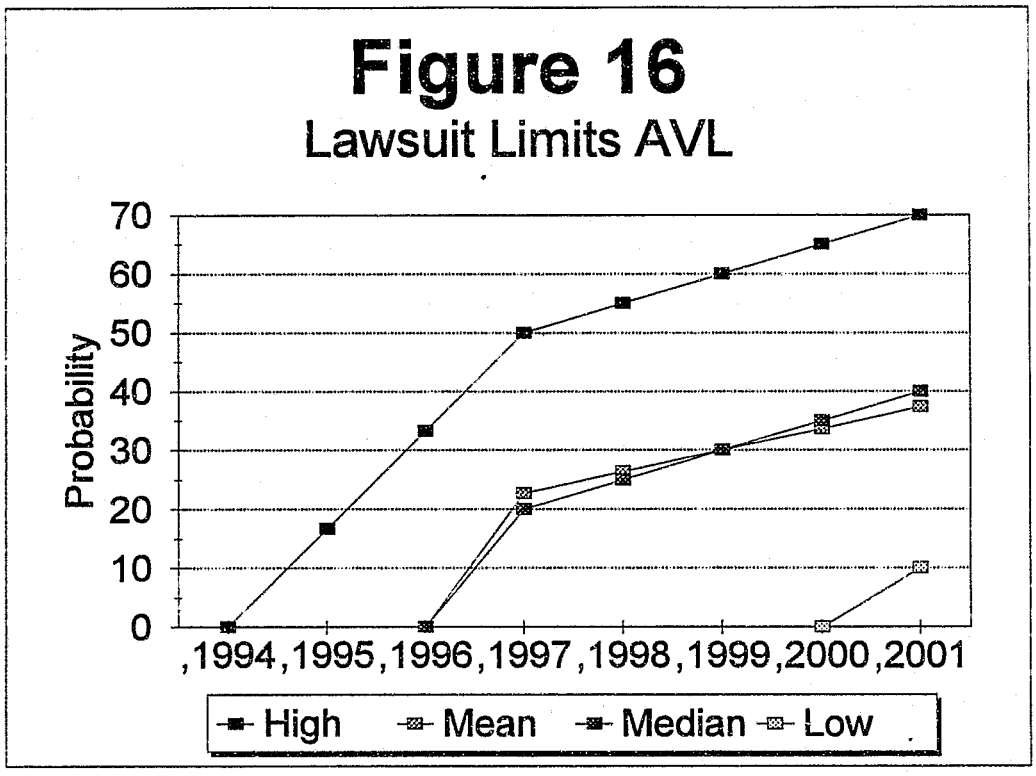
Event 3 Law enforcement begins to use AVL technology on parolees.

The panel forecast that law enforcement would use AVL technology to monitor the location of parolees and probationers. This technology would be integrated into dispatch data bases in order to allow police officers to identify convicted criminals in the area of a crime that just occurred or determine the location of individuals that had re-offended and were arrestable. The forecast gave a 70.9% mean probability of this occurring at eight years. This technology will change the responsibility for monitoring individuals on probation and parole to field units. These field units may be probation officers or local law enforcement.



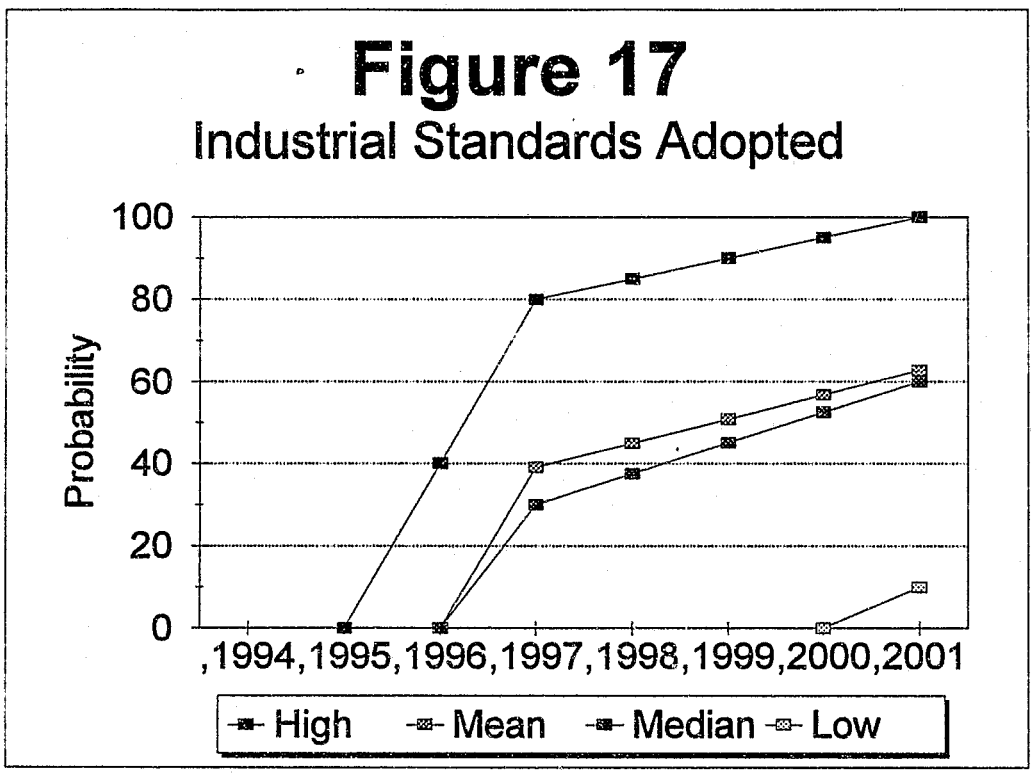
Event 4 Hackers break security code and plant virus in AVL system.

The panel forecast that there was an 77.2% mean probability that unauthorized individuals would enter the Computer Aided Dispatch-Automated Vehicle Locator system and cause damage to data or application programs within the next eight years. Current experience validates the event and reveals that intrusion into the application programs can cause major long term problems. Although the event was worded to limit the action to individuals outside law enforcement, during the discussion the panel clearly indicated that this could be accomplished by a variety of internal and external users as well.



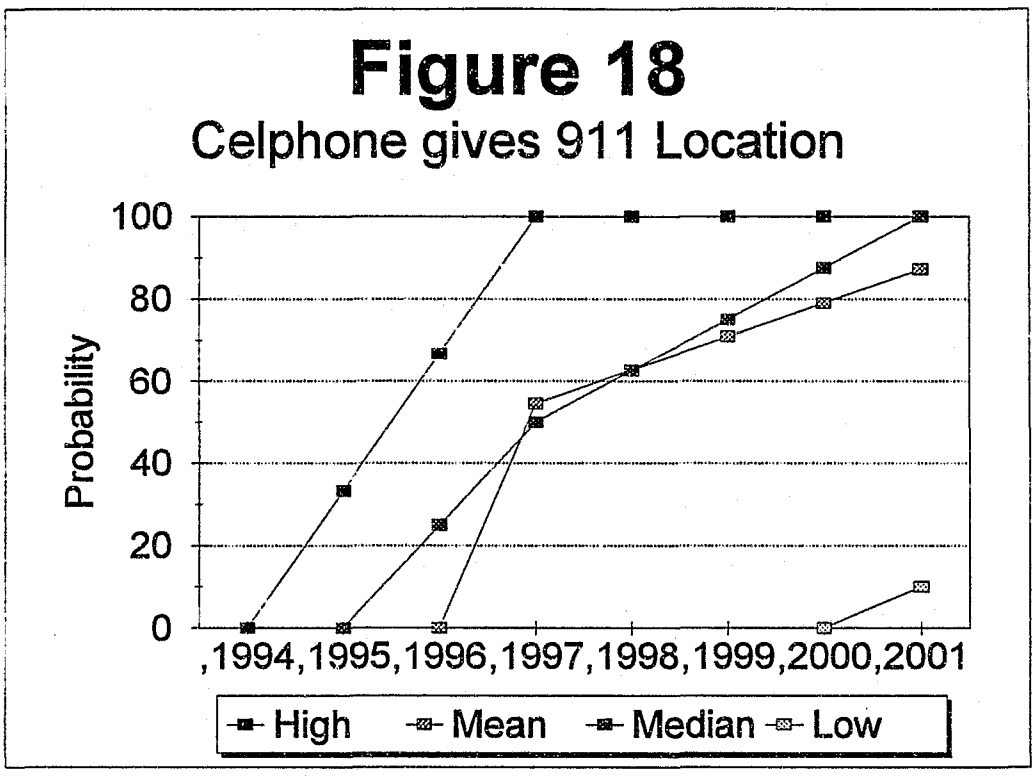
Event 5 Union wins lawsuit that limits the use of AVL technology to safety issues only.

The panel forecast that the implementation of an AVL system would result in a 37.3% mean probability of a successful law suit within eight years. A successful law suit was defined as a court order that limited the use of one major aspect of the AVL system's capabilities. The panel felt that there was an inherent distrust on the part of employee groups of the "Big Brother' aspects of an AVL system. History indicates that individual employees have consistently developed methods to render the system inoperative. A law suit is a collective method to reach this goal. Success of the suit will depend on the management practices of the agency.



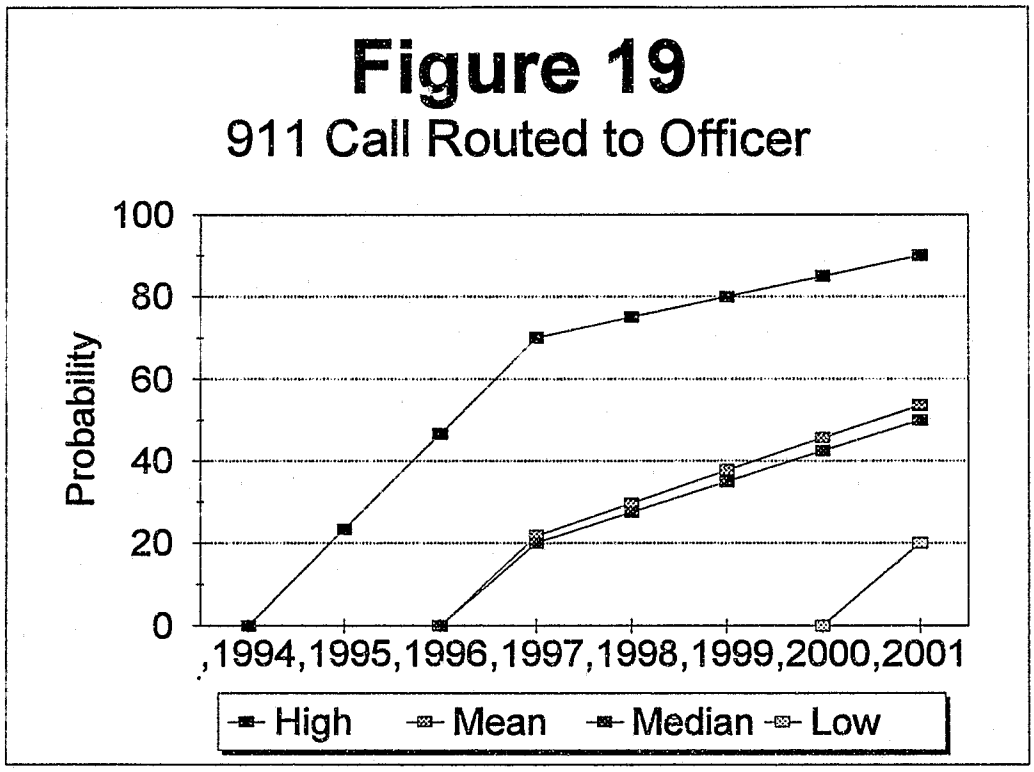
Event 6 Mandatory industrial standards adopted for all computers used in communications drive down costs.

The use of computers to drive communications systems is relatively new. Hardware is being replaced with software driven appliances that allows for greater flexibility and integration. The panel felt that the standardization of computers and program language used to operate new communications systems will drive down the costs. The panel forecast that there was a 62.7% mean probability of this standardization occurring in eight years. This event will support the trends identified by the panel and the other events that will define our future.



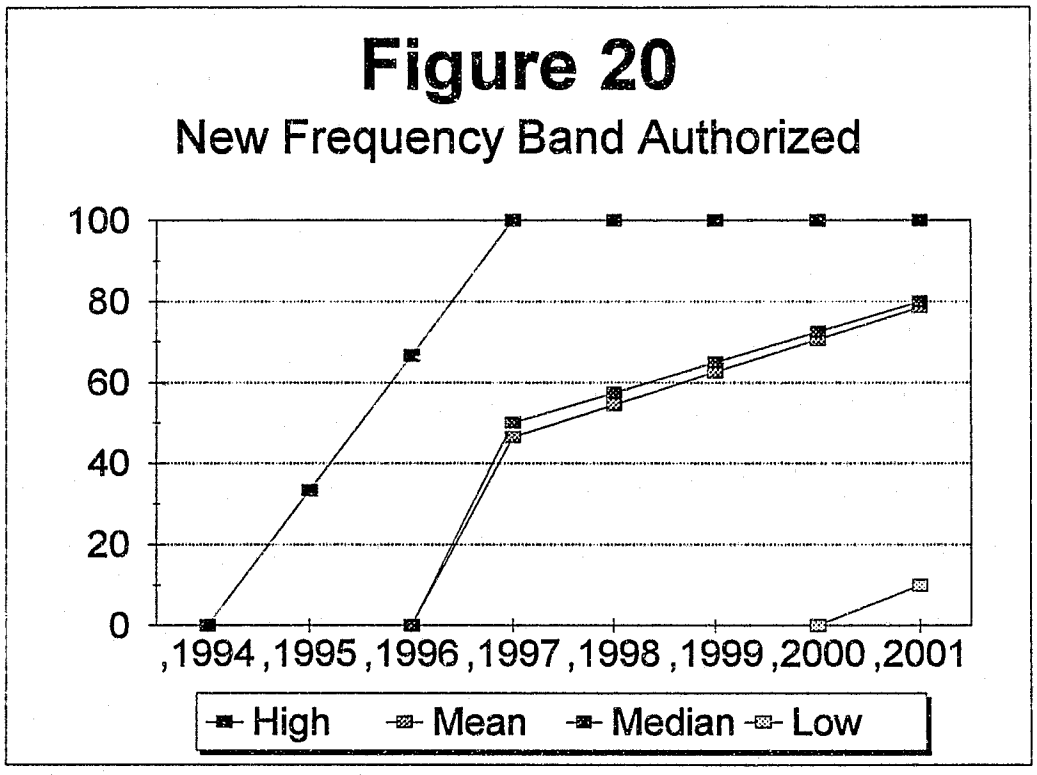
Event 7 Cellular telephone system allows for location identification on 911 calls.

The use of cellular telephones is skyrocketing and with new satellite based systems on the horizon the trend level will surely increase. The panel felt that the need to determine the location of cellular telephones in order to provide proper 911 response will be met. The panel forecast a 87.3% mean probability of this occurring in eight years. The current use of cellular telephones has created a major problem for 911 centers. The increased use of the devices will surely break the back of these centers if a technological solution is not developed.



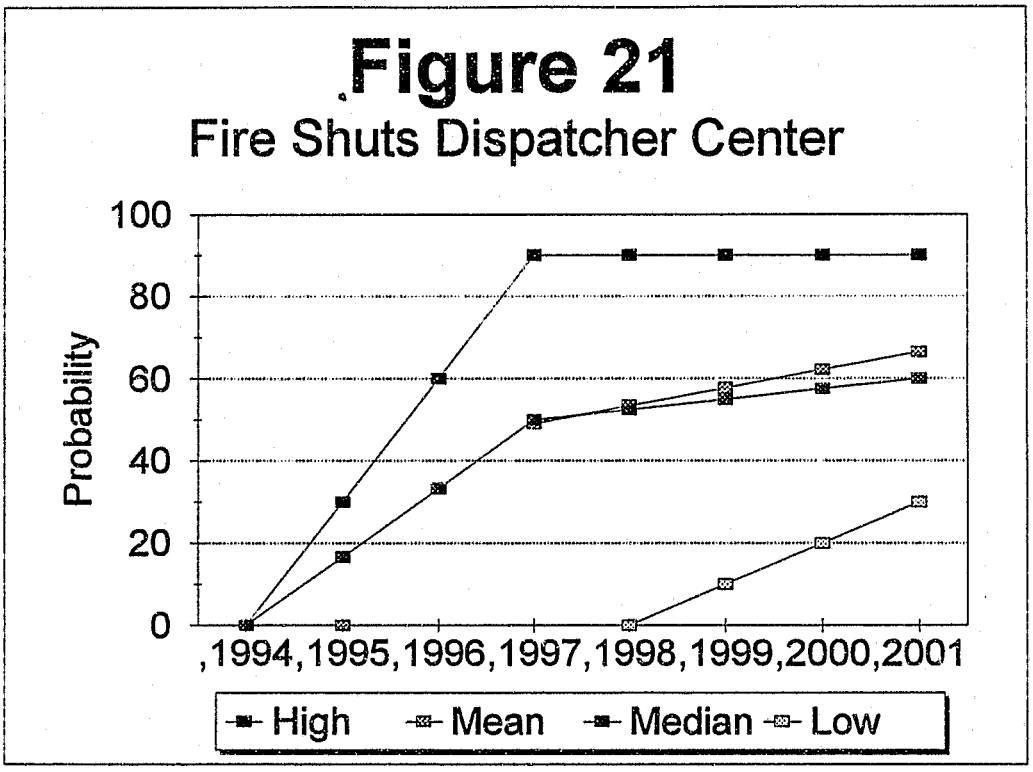
Event 8 911 calls routed directly to closest police units.

The panel forecast a 53.6% mean probability that 911 calls would be transferred to the responding police units within four years. Technology exists to effect this transfer today, however the costs associated with processing the hugh amount of data makes the systems cost prohibitive. Availability of equipment and cost are the primary roadblocks in providing this information to responding units. The panel did not give this event an extremely high probability as they felt that other methods of transferring would prove more cost effective.



Event 9 New frequency band authorized for government use allows for unlimited data transmission.

A major limiting factor with the implementation of AVL technology and other telemetry is the ability to broadcast data using the available radio frequencies. The transmission of digital data has and will enhance our ability to transmit data. However, the panel felt that the limits of this technology would be reached. The panel forecast a 78.6% mean probability that new radio frequencies would be authorized for government use in eight years. Although the panel felt there was a high probability of new frequencies becoming available, the panel realized that unlimited data transmission would never occur.



Event 10 Fire shuts down public safety dispatcher center.

The panel forecast a 66.4% mean probability of fire or some other natural disaster shutting down the Public Safety Communications Center within the next eight years. Although the initial response was fire, the panel expanded this event to include a wide variety of incidents that would shut down this operation for a significant period of time and affect the public safety. The variety of man made and natural disasters available to impact and close the Public Safety Dispatch Center is endless. Planning can mitigate these problems but they will always exist and plans to relocate the operation must also be developed.

CROSS IMPACT ANALYSIS

In order to determine the effect of one event on the other events identified by the panel and refine the probability of each event's occurrence, cross impact analysis was used. In cross impact analysis, each event is compared in sequence with each of the other events and a delta, or degree of change, is assigned. After all nine comparisons are completed a final probability is mathematically computed.

The delta was determined by reaching consensus with two of the initial Nominal Group members. Computations were then completed using the mean probability as a starting point. The following description of each event demonstrates how the events interacted based on the opinion of the members. A matrix of the cross impact analysis may be found in Table 1.

Table 1
Event Matrix

	65.5 E1	65.9 E2	70.9 E3	77.2 E4	37.3 E5	62.7 E6	87.3 E7	53.6 E8	78.6 E9	66.4 E10	
65.5 E1		Δ=0 P=65.5	Δ=0 P=65.5	Δ=0 P=65.5	Δ=0 P=65.5	Δ=+20 +12.5 P=78	Δ=+10 +8.7 P=86.7	Δ=0 P=86.7	Δ=0 P=86.7	Δ=0 P=86.7	P=86.7%
65.9 E2	Δ=0 P=65.9		Δ=+10 +7.1 P=73	Δ=+20 +15.4 P=88.4	Δ=0 P=88.4	Δ=+10 +6.3 P=94.7	Δ=0 P=94.7	Δ=0 P=94.7	Δ=-20 -15.7 P=79	Δ=0 P=79	P=79%
70.9 E3	Δ=0 P=70.9	Δ=-10 -6.6 P=64.3		Δ=-10 -7.7 P=56.6	Δ=0 P=56.6	Δ=+10 +6.3 P=62.9	Δ=0 P=62.9	Δ=0 P=62.9	Δ=+10 +7.6 P=70.5	Δ=0 P=70.5	P=70.5%
77.2 E4	Δ=0 P=77.2	Δ=+5 +3.3 P=80.5	Δ=0 P=80.5		Δ=0 P=80.5	Δ=-10 -6.3 P=74.2	Δ=0 P=74.2	Δ=0 P=74.2	Δ=-5 -3.8 P=70.4	Δ0 P=70.4	P=70.4%
37.3 E5	Δ=0 P=37.3	Δ=0 P=37.3	Δ=0 P=37.3	Δ=-10 -7.7 P=29.6		Δ=+5 +3.2 P=32.8	Δ=0 P=32.8	Δ=0 P=32.8	Δ=+5 +3.8 P=36.6	Δ=0 P=36.6	P=36.6%
62.7 E6	Δ=+10 +6.6- P=69.3	Δ=0 P=69.3	Δ=+5 +3.5 P=72.8	Δ=-5 -3.7 P=69.1	Δ=0 P=69.1		Δ=0 P=69.1	Δ=0 P=69.1	Δ=+10 +7.9 P=77	Δ=0 P=77	P=77%
87.3 E7	Δ=0 P=87.3	Δ=0 P=87.3	Δ=0 P=87.3	Δ=-10 -7.7 P=79.6	Δ=0 P=79.6	Δ=+10 +6.3 P=85.9		Δ=0 P=85.9	Δ=+10 +7.9 P=93.8	Δ=0 P=93.8	P=93.8%
53.6 E8	Δ=0 P=53.6	Δ=0 P=53.6	Δ=0 +71 P=53.6	Δ=-5 -3.7 P=49.9	Δ=0 P=49.9	Δ=+10 +6.3 P=56.2	Δ=+20 +17.5 P=73.7		Δ=+10 +7.9 P=81.6	Δ=0 P=81.3	P=81.6%
78.6 E9	Δ=0 P=78.6	Δ=0 P=78.6	Δ=+10 +7.1 P=85.7	Δ=-5 -3.7 P=82	Δ=0 P=82	Δ=+10 +6.3 P=88.3	Δ=0 P=88.3	Δ=0 P=88.3		Δ=0 P=88.3	P=88.3%
66.4 E10	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4	Δ=0 P=66.4		P=66.4%

E-1, Automobile manufacturers makes AVL standard equipment, was influenced strongly by E-6 and E-7 (industry standards and

cellular phones). Standardization of communications computers and improvements in satellite positioning technology would enhance the ability and desirability of making AVL standard equipment. The final mean probability was 86.7%.

E-2, Organized crime uses AVL to avoid police, was affected by E-4 (hackers). The ability of hackers or Department employees to provide information on the AVL system and gain access to the information influenced this event upwards. The final mean probability was 79%.

E-3, Law enforcement uses Automated Person Locators (AVL) on parolees, was not significantly changed. Although E-2 and E-4 (organized crime and hackers) had a negative effect this was offset by similar positive effects caused by E-6 and E-9 (standardization and new frequencies). The final mean probability was 70.5%.

E-4, Hackers brake security code and plant virus, experiences a significant reduction. The effects of E-6 and E-9 (industrial standards and new frequencies) combined to reduce the likelihood of this event occurring. The final mean probability was 70.4%.

E-5, Union wins law suits that limits use of AVL to safety issues, remained constant. A slight reduction caused by E-4

(hackers) was mitigated by a similar combined increase caused by E-6 and E-9 (industrial standards and new frequencies). The final mean probability was 36.6%.

E-6, Mandatory industrial standards adopted for all computers used in communications, experienced a 15% increase. This was caused by the effect of E-1 and E-9 (Auto AVL standard and new frequencies). The involvement of the private sector and new data frequency availability combined to drive this probability upwards. The final mean probability was 77%.

E-7, New cellular telephone allows for location identification on 911 calls, experienced an increase. The combined effects of E-6 and E-9 (industry standards and new frequencies) overpowered the negative effect of E-4 (hackers) and a 10% increase occurred. The final mean probability was 93.8%.

E-8, 911 calls routed directly to police unit, experienced the most dramatic increase with the probability going up 28%. This was caused by a strong influence by E-6, E-7 and E-9 (industry standards, cellular telephones and new frequencies). All three combined to increase the probability of this event occurring. The final mean probability was 81.6%.

E-9, New frequency band authorized for government allow for unlimited data transmission, had a increase. The increase was

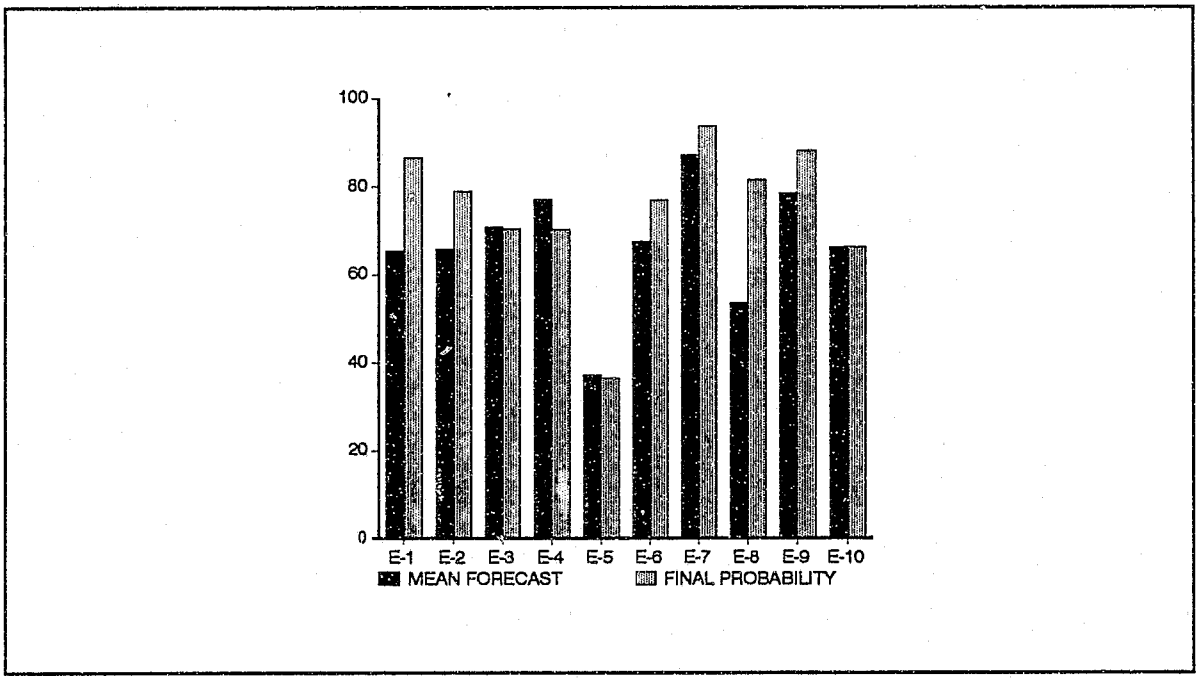
driven by the effects of E-6 (industry standards). The final mean probability was 88.3%.

E-10, Fire shuts down public safety dispatch center, experienced no change. The final mean probability was 66.4%.

The initial probability and the final probability, after cross impact analysis, are depicted in Figure 22.

Figure 22

Cross Impact Analysis-Event to Event



E-1=AUTOMOBILE AVL
E-2=ORGANIZED CRIME/AVL
E-3=PAROLEE AVL
E-4=HACKERS PLANT VIRUS
E-5=LAWSUIT LIMITS AVL
E-6=MANDATORY INDUSTRIAL STANDARDS
E-7=CELLULAR TELEPHONE LOCATOR
E-8=911 CALL TO OFFICER
E-9=NEW FREQUENCY AUTHORIZED
E-10=FIRE SHUTS DISPATCH CENTER

SCENARIOS

In order to develop a plan for the future, it is necessary to develop a vision of the future. One method frequently employed to develop this vision is the creation of future scenarios. These scenarios give us a picture of various possible futures. An analysis of these possible futures allows the astute manager to develop plans to create the most desirable future.

The basis of the following scenarios is a probability program, *SIGMA*, provided courtesy of the *Policy Analysis Company*. The data derived from the cross impact analysis of the ten selected events was entered into the *SIGMA* program. The program compared the final probabilities to randomly generated numbers and created possible scenarios. This program was run fifty times and generated fifty separate scenarios. These scenarios were then analyzed and grouped together by similarities. The final analysis resulted in three groupings. One grouping included a high number of negative events, the second grouping included a majority or all of the events and the last grouping included a high number of positive events. Copies of selected, representative, SIGMA printouts may be found in Appendix D.

One scenario was selected from each group and combined with the trends identified by the Nominal Group to create the three following scenarios:

SCENARIO 1 (Most feared)

As the first year of the new millennium comes to an end its time to reflect on the events of the past eight years. The Sacramento Police Department, like many large law enforcement agencies, engaged in an aggressive, technologically complex, program to deliver patrol services in 1994. The backbone of this system was the implementation of an Automated Vehicle Location system integrated with Computer Aided Dispatch. The question to be answered is why, after eight years of planning, work, and millions of dollars, doesn't the Department have an operational AVL system?

As is typical with most complex systems the start up process was slow, but the initial system was placed in operation in January 1996. The public announcement of the new technology received great support from the public, who saw technology as a way to make their communities safer (Trend 1). In February 1996 APCO issued the new industry standards of communications computers and major cost savings was forecast (Event 6). Unfortunately, the cost savings were not realized by the Department.

Police Management viewed the monitoring capabilities of the AVL systems the perfect supervisor (Trend 8) and were promptly sued by the Sacramento Police officers Association in May 1996 (Event 5). Only four months of operation and the first major operational problem was identified. The union quickly won the law suit and as a result of the court order the AVL system could

only be used for safety related issues. The lack of cooperation and understanding between labor and management continued to escalate (Trend 9) and agreement on the use of AVL could not be reached. For the ensuing two years a non-system was in operation as all attempts to use the system were taken to court.

During late March, 1998 all the problems associated with the old AVL system were solved when a fire completely destroyed the Public Safety Communications Center (Event 10). After a short planning process a new regional Communications Center was constructed with a completely new AVL system (Trend 6). The various unions were included in the planning process and as a result of this interaction some agreements between labor and management were reached. Although the system could not be used to spy on the field officers many management reports were developed to aid the Watch Commanders in their day to day operations (Trend 10). Although the managers became dependant on this information flow they failed to pay proper attention to system security (Trend 5) and in August 1999 hackers entered the system and planted a virus. The virus remained dormant for two months and then destroyed all of the data files on incident histories for five years. Through great effort many of the files were reconstructed, only to be destroyed two months later as the vendors files had been contaminated by the virus.

On August 1, 2000 one of the most pressing problems facing law enforcement was solved. For the past five years Motorola's satellite-based personal communications system has thrown the 911

system into disarray due to the proliferation of cellular telephones who's location and jurisdiction could not be determined. A system to identify the location of every cellular telephone was instituted on August 1, 2000 and was completed by the end of the year (event 7). A spinoff of this technology was the placement of cellular telephones into every police vehicle and the routing of 911 calls directly to the closest police unit (Event 8).

By August 2001, automobile manufacturers made AVL standard in a majority of their fleets (Event 1). This familiarity with the technology and a continued lack of system security (Trend 5) provided a opportunity for organized crime to access the system and track police vehicles in order to commit crimes (Event 2). The net result of this grand experiment is an AVL system that has been turned off because the criminal element received more benefit from the system than did law enforcement.

SCENARIO 2 (Most Likely)

The past eight years has been very difficult and yet very rewarding for the management staff of the Sacramento Police Department. Based on a public expectation that the use of technology would make their communities safer (Trend 1), the residents of Sacramento creates a special assessment district to upgrade the existing Computer Aided Dispatch system and implement an Automated Vehicle Locator system to more efficiently dispatch police officers to emergencies. The system was tested in late 1995 and became operational on January 1, 1996.

As is the case with a solution to a problem, new problems become possible. On August 13, 1996 an intensive internal investigation was started when it was determined that organized crime was using the departments AVL system to track field units and avoid arrest while committing truck high jackings. Warnings regarding the security of the system (Trend 5) had not been properly addressed and a criminal enterprise has compromised the system. Undaunted, the department corrected the problems and moved forward. In late October 1996 the system was enhanced and 911 calls were routed directly to officers responding to emergency calls (Event 8). This was done in an effort to support the department's Community Oriented Policing.

In July 1997 APCO developed standards for communications computers (Event 6) with the desired effect of driving down costs. Fortune struck the department as the existing equipment

complied with these standards and made future upgrades more affordable.

By early 1998 a vexing trend toward using the monitoring capabilities of the computer as a first line supervisor (Trend 8) reached a crisis. On February 2, 1998 the Sacramento police Department Association filed a suit to prevent this activity. The law suit was settled in March and intensive negotiations followed. Agreement was reached and the offensive practices were discontinued without an interruption to the day to day patrol operations. February proved to be a difficult month. On February 22, 1998 a virus was detected in the AVL system. Due to tightened security the virus was found quickly, before any damage was done.

When the 1998 model cars were released in early October, AVL technology became standard equipment (Event 1). This was driven by an increased public demand and smaller, more dependable technology (Trend 2).

On January 13, 1999 -a Friday- the Sacramento Police Department Communication Center was destroyed by a major electrical fire (Event 10). For many large departments this may have been a major disaster, but due to the insightful planning by the Communication Division Manager this event was classified as a major inconvenience. The trend toward regionalization had continued (Trend 6) but the department had kept various centers decentralized and provided necessary backup systems. Telephone answering and police dispatch were moved to the Sacramento Fire

Department Dispatch Center and emergency calls for service continued to be processed promptly.

The trend of integration of governmental services continued (Trend 3) and in September 1999 the Department of Corrections began placing Automated Person Locators on parolees. Officers responding to a crime in progress were able to check the area for parolees prior to arrival. This alone dramatically increased field clearance rates.

On October 27, 2000 Cellular telephones underwent a major transformation. All new cellular telephones are designed to provide their location in order to be properly routed (Event 7). Hard wired telephones had become old fashioned and everyone carried their cellular phone. This destroyed the 911 system as at least 50% of all 911 calls had to be transferred to the proper jurisdiction. This information overload taxed the existing data channels and in November 2001, under increasing pressure additional frequencies were authorized for governmental use.

SCENARIO 3 (Most Desired)

Although the last eight years have been very busy, truthfully they have been somewhat uneventful and predictable. The Sacramento Police Department embarked on a major expansion of the Computer Aided Dispatch system that included integration of an Automated Vehicle Location system to aid in the deployment of patrol resources. This was driven, in part, by a perception on the part of the public that computerization would lead to improved efficiency and provide for a safer community (Trend 1). An extensive planing process was conducted in order to develop a strategic plan for the implementation of this system. The process involved identifying stakeholders and the major issues that would affect the project.

The new system became operational on January 20, 1996. Due to the extensive and effective planning process this occurred without any significant problems. On May 16, 1997 the first noteworthy incident occurred when the Communications Center was shut down by a major fire (E 10). Effective planning again saved the day. The communications function was transferred to the Office of Emergency Services dispatch center based on a cooperative agreement between the State and the City of Sacramento. The trend of integrating public services (Trend 3) once again proved to be effective.

During the fall of 1997 the Communications Center reopened. this was just in time for the implementation of the new parole system. The *Three Strikes And Your Out* initiative was

bankrupting the California Prison system. Under the revised system, those prisoners who were eligible for parole were released and wore an Automated Person Locator (Event 3). As a result of the new system and new technology, arrest rates skyrocketed.

In February 1998 the federal government authorized new frequencies for government use (Event 9). The dependance on computers and data transmission had overloaded the existing system. Additionally, room had to be made for the new cellular telephone system. AVL technology had became smaller and more dependable (Trend 2) and the newest generation cellular telephones were capable of providing their location (Event 7). This data was integrated with the existing 911 system and reduced the burden of transferring calls that were misdirected.

During July 2000 the major automobile manufactures announced that AVL systems would be standard in all automobiles(Event 1). This created a boon to auto theft investigation and auto theft soon became nonexistent for new automobiles. The information overload and incompatible systems resulted in a drastic need to standardize computer systems to handle the communications needs. In November 2000 APCO issued standards for computers used in communications (Event 6). The net result was a lowering of costs and an acceleration in the use of AVL technology.

This technological revolution created a need for a new employee (Trend 7) with different skills and attitudes toward computers. Procedures were implemented in February 2001 that

allowed for 911 calls to be routed directly to the field officers. This interaction resulted in an improved level of service to the public.

CONCLUSIONS

What will be the impact of automated vehicle locators and AVL technology on the management of patrol services in a large law enforcement agency by the year 2001?

Although it is impossible to predict the future, responsible managers must investigate the interesting future and identify trends and events that will have significant positive or negative impacts on their organizations. By conducting a literature search, interviewing incumbents in associated fields and using a modified delphi it is possible to identify possible futures with a high degree of accuracy.

This paper investigates those issues that will affect a large law enforcement agency that attempts to use AVL systems to manage patrol services in the near future. Sound technology is commercially available and within the ensuing eight years these systems will surely be common place.

The trends and events identified in this paper show a high of congruence and identify several major themes that must be addressed. It is clear that the implementation of highly computerized systems will change the nature of the work force. Labor relations will be strained and there will be a feeling of

Big Brother watching. Great pains must be taken to ensure the computers do not replace first line supervisors.

As information is gathered and stored, managers must become more vigilant to ensure that this information is safeguarded. The rewards for misusing this information will be great and the ability to conduct electronic vandalism will be greater.

The capabilities and complexity of the emerging technology will provide many opportunities to improve patrol services and at the same time create new, unthought of problems. The role of the modern manager is to think of these problems and provide solutions before the problems materialize.

The desired future for the Sacramento Police Department is described in Scenario 3. In order to realize this scenario a strategic plan that considers certain broad policies identified in the futures study must be addressed. Those general policies are:

1. System security will be considered in the planning and implementation phases.
2. System design will included input from a broad cross section of the agency's employees.
3. Continual training and feedback will be provided.

STRATEGIC PLAN

As law enforcement approaches the next millennium two forces pull the profession in different directions. There is the desire, driven by funding levels, to rely on technology to drive down the cost of providing services. At the same time there is an acknowledgement that the tactics used in the seventies and eighties have not worked and the new salvation is Community Oriented Policing. The search for high-tech solutions collide with the high touch desires of management, employees and the public.

One high-tech solution that has advanced rapidly during the past five years is the use of expert systems to aid law enforcement in endeavors that were time consuming or impossible. Several private vendors are now marketing Automated Vehicle Locator systems to aid in the delivery of patrol services.

The Sacramento Police Department has developed a strategic plan that includes the maximization of technology as one of the major strategies. In order to implement AVL technology a refinement or augmentation of this strategic plan is necessary. In order to develop this strategic plan the following techniques were used analyze the Sacramento Police Department:

1. Environmental Analysis using the STEEP model.
2. WOTS UP Analysis of organizational strengths and weakness
3. Stakeholder identification and analysis.

MISSION STATEMENT

The mission statement was developed by a small group of Sacramento Police Department Managers deeply involved in the delivery of patrol services and the proper deployment of the existing resources. The Strategic Planning Panel members, who were also members of the initial NGT panel, were Deputy Chief Albert Najera, Captain Rick Braziel, Communications Manager Dee Gibson and the author. Each member used their personal experience, input from their staff and input from the NGT process to aid in the development of the mission statement and strategies.

MISSION STATEMENT

By the year 2001 the Sacramento Police Department will implement an Automated Vehicle Locator system integrated with Computer Aided Dispatch to aid in the delivery of patrol services and provide for increased officer safety.

This expert system will meet the public demand for both increased efficiency and an enhancement of the Community Oriented Policing program. Internal demands for proper training and adequate security will be foremost in the system design.

Management will work closely with employee representatives to ensure the expert system enhances the ability of every employee to realize their individual and organizational goals.

ENVIRONMENTAL ANALYSIS

In order to develop a strategic plan designed to allow the Sacramento Police Department to implement an Automated Vehicle Locator expert system and obtain a desirable future it is necessary to analyze the threats and opportunities that will affect the out come. The method selected is to follow the STEEP model and analyze the threats and opportunities associated with each of the five elements. The elements are Social, Technology, Economic, Environmental, and Political. International and even national trends are usually beyond the control of local governments. Although it may not be possible to change the course of these trends, understanding will enable local governments to be successful in endeavors they do have control over.

Social

Threats: The specter of Big Brother affects any new use of technology and computer systems to monitor and direct the activities of people. Resistance to this technology can be expected on the part of the public as well as the employees. Recent history indicates that this will be true in this case. When the enhanced 911 systems were implemented in the mid eighties law enforcement was able to capture the address and telephone number of the person calling. Special interest groups concerned with right to privacy issues gained legislation

requiring all agencies to maintain emergency lines separate from 911 to allow callers to prevent their address and telephone number from being obtained.

Opportunities: At the same time the work force and the public at large is becoming computer literate. The use of computers is increasing at a dramatic rate at work and at home. The use of computers has changed and will change the employee profile in the future. Newer employees who grew up with video games will not be as frightened by this technology and may well view this type of expert system as a real life video game.

Technology

Threats: Automated Vehicle Locator technology has a history of being unreliable. Electronic systems break down and employees must revert to manual systems. There is also a history of sabotage to monitoring systems when they are not perceived to be useful to the employees. Organized crime is also becoming familiar with computers and thefts of computer components has become very profitable. Computer crime is one of the fastest growing classifications nation wide.

Opportunities: Twenty years of experimentation and great strides in computer hardware have created new possibilities. Computer hardware has become very dependable and possesses great computing power and memory. This allows for systems that possess a great degree of flexibility. Anti-virus programs and security systems safeguard programs and data there by creating a great degree of safety.

Economic

Threats: The Sacramento economy has been depressed and revenues to local government are substantiality down. This delicate balance has been upset by the redistributing of funds in order to balance the 1993/1994 state budget. This process may occur again in order to balance the 1994/1995 state budget. The Sacramento Police Department suffered a 8.5% cut in its budget for 1993/1994 and reduced its work force by 70 sworn positions and 23 non-sworn positions. With these financial constraints, instituting new programs is difficult. When revenues increase there will be many deserving programs competing for renewed funding.

Opportunities: The increased efficiency offered by an Automated Vehicle Locator system coupled with Computer Aided Dispatch may well pay for its self by reducing response times and using existing resources more effectively. The City of Sacramento has instituted a new budget procedure that allows operating departments to keep money saved during the year. A one percent savings for the Sacramento Police Department would equal $700,000. This wind fall has been earmarked for technological investment.

Environmental

Threats: Construction of towers for land based Automated Vehicle Locator systems will have an impact on land use and will have some effect on the environment. The City of Sacramento has

experienced problems with the installation of new towers for the new 800 Mz radio system. Environmental impact reports are expensive and complex. Even when the report indicates that there is no threat some portions of the community work vigorously to stop construction.

Opportunities: Automated Vehicle Locator systems reduce response time by assigning the closest unit. A secondary effect of this process will be reduced vehicle operation and miles driven. This will reduce the amount of fuel used and automobile pollution produced.

Political

Threats: The implementation of an Automated Vehicle Locator system will raise many political issues that will ultimately reach the City Council. Labor unions will lobby for severe constraints on the use of any system. These constraints may reduce the usefulness of the system to such a point that it would not be cost effective. The exiting council is pro-labor and a majority of the incumbents have received strong labor support in the past. Community based groups, that have lost their funding during the past two years, will vigorously lobby for new revenue to be used to reinstate the funding levels.

Opportunities: The City of Sacramento has many strong neighborhood groups that effectively lobby the City Council. Their major issues are crime, traffic and zoning issues. Money spent on the police department is received well by these groups.

A system that is openly supported by the Sacramento Police Officers Association would receive support form the City Council.

ORGANIZATIONAL ANALYSIS

The ability of an agency to develop a strategic plan is based on an accurate evaluation of the agency's capabilities. WOTS UP Analysis lends itself to this type of analysis and therefore was chosen to evaluate the Sacramento Police Departments abilities to successfully implement a reliable and effective Automated Vehicle Locator system.

Organizational Threats

Tension between the City of Sacramento and the various unions representing the employees of the Sacramento Police Department is strained. The employee groups have not had a pay raise in two years and it is doubtful that a pay raise will be given within the next year. Even as the economy improves, catch-up will take several years. This strained relation will surely foster an attitude that any new revenue should go toward pay increases and not new technology. This is demonstrated by the Sacramento Police Officers Association's refusal to support a tax initiative recently placed on the ballot. As the thirty million dollar, five year plan did not provide for pay raises the union would not support it. The plan narrowly failed to gain the necessary support in the election. Union and pay problems have spilled over into the work place.

Organizational Opportunities

Organizational opportunities outweigh the threats. The City has engaged in a new budget posture that allows operating departments to keep savings rather than return them to the general fund. With a seventy million dollar budget, the savings can be significant. These one time expenditures can be spent on technology that will produce additional savings. The City Council is very supportive of innovation and new technology. This has been demonstrated by a willingness to fund major technological programs such a new 800 Mz trunked radio system, significant enhancements to the records management and computer aided dispatch systems and improvements in other technological investigative systems.

The Sacramento Police Department has developed positive working relationships with allied agencies and other City departments. These relationships have been supportive in the departments efforts to update and increase the use of technology. Additionally, the department has engaged in a process that developed a ten year strategic plan. This planning process has focused the departments plans in the area of technological innovation and allowed the department to approach some goals in a building block method.

Organizational Strengths

The Sacramento Police Department possesses many strengths that will support the implementation of a sophisticated Automated

Vehicle Locator system integrated with Computer Aided Dispatch. The sworn work force is highly educated with 50% of the sworn employees possessing a Bachelor of Arts degree and all of the sworn employees have at least 60 college units. Educational levels among the non-sworn work force is also extremely high. The department has operated a Computer Aided Dispatch system for over ten years and MDT's have been in the patrol cars for over five years. The work force is computer literate and understands the benefits of computerization.

Management has used progressively sophisticated computer programs for over ten years to develop patrol deployment plans for the office of operations. This experience has created a realization of the capabilities and limitations of computers in the management arenas. During the past fifteen years the department has implemented a number of new computer based programs. The department employees have developed a tradition of being successful in these endeavors. One of the strongest components is the ability of the dispatchers to convert to new processes. This division has been involved in more change and technological advancement that any division in the department. The division has always performed well in this area and seems to look forward to new technology.

Organizational Weaknesses

A number of separate issues have created low morale within the Sacramento Police Department. Increased workload, budgetary

restraints, new procedures and changes in the culture of the organization have stressed the existing work force. A new Chief of Police, from the outside, was appointed in February 1993. This coincided with a large revenue shortfall that required cutting the department budget by 8.5%. This resulted in a decrease of 70 sworn and 23 non-sworn positions. At the same time the Chief of Police changed the way the department conducted business and related to the community. Major efforts were under taken to guide the department toward a true community oriented policing posture. The byword of the department became "more with less".

Morale is low and there is a feeling that the department is moving too fast. Relations with management are strained and there is a strong tendency to view any change in the worst light and oppressive. Rumors and conspiracy theories abound and managers spend a significant amount of their time repairing the damage done by the rumors.

STAKEHOLDER ANALYSIS

The final area of inquiry in the analysis process is Stakeholder Analysis. A strategic plan must identify those groups or individuals that have a vested interest in the outcome of the plan and who's assistance is critical for the plan to succeed. Groups or individuals who will not assist in obtaining the goals must be identified early in order to address issues raised by them.

With the assistance and input of the Strategic Planning Panel eleven stakeholder were identified. Assumptions for each stakeholder were then identified.

Stakeholder No. 1 Sacramento Police Officers Association

A. The union supports the officer safety aspects inherent in a Automated Vehicle Locator system.

B. The union does not support the monitoring capabilities of the system. The union wishes to be involved in the design process and will attempt to veto monitoring portions.

Stakeholder No. 2 Sacramento Mayor and City Council

A. The City Council supports the use of technology and has funded large programs when it can be demonstrated that the use of technology will reduce employee service costs.

B. The Council will respond to the concerns of highly organized special interest groups. In the past the union has had great influence with the council, however, the existing contract problems have strained the relationship.

Stakeholder No. 3 Patrol Division Officers

A. Patrol Division Officers strongly support the officer safety capabilities of an Automated Vehicle Locator system.

B. Patrol Division Officers view the use of management reports as another example of "Big Brother" and will resist efforts to use the computer as a first line supervisor.

Stakeholder No. 4 Patrol Division Managers

A. Patrol Division Managers favor the use of Automated Vehicle Locators as a management tool that will allow the manager to monitor problem employees and ensure equitable distribution of work.

B. The managers support the officer safety capabilities of these systems and view their use in tactical situations as a great step forward in officer safety.

Stakeholder No. 5 Communications Division Dispatchers

A. Dispatchers support the use of Automated Vehicle Locator systems integrated with Computer Aided Dispatch as they view these systems as tools that make their jobs easier.

B. Maintaining an accurate status of field units is one of the major problems facing dispatchers; however, dispatchers do not want to be placed in the position of supervising field units.

Stakeholder No. 6 Chief of Police

A. The Chief of Police supports the officer safety features of an Automated Vehicle locator system.

B. Any increases in efficiency will allow the Chief to direct additional resources to the departments Community Oriented Policing efforts.

Stakeholder No. 7 Police Department Data Services

A. Any increases of computer driven technology is supported by the department's Data Services Section. These individuals see all technology as positive and only question how management uses the technology.

B. The Data Services Section will resist any effort to implement this system that does not provide additional resources to support the system.

Stakeholder No. 8 Sacramento City ICS (Snail Darter)

A. The City of Sacramento Information and Communication Systems Department supports the use of technology and would support this system. Components of the system may be valuable to many city departments.

B. The City of Sacramento Information and Communication Systems Department desires to have all computer systems operate within its division. Attempts to consolidate the systems could delay this project.

Stakeholder No. 9 Sacramento Fire Department

A. The Fire Department supports the Police Departments movement in this area.

B. The Fire Department desires an Automated Vehicle Locator system for their fleet and feels that the Police Departments system would provide an infrastructure that would reduce their costs.

Stakeholder No. 10 Community Groups

A. A majority of the community supports any efforts to improve the efficiency of the Patrol Division and reduce response times. They call the police once in a life time and want a unit on scene as quickly as possible.

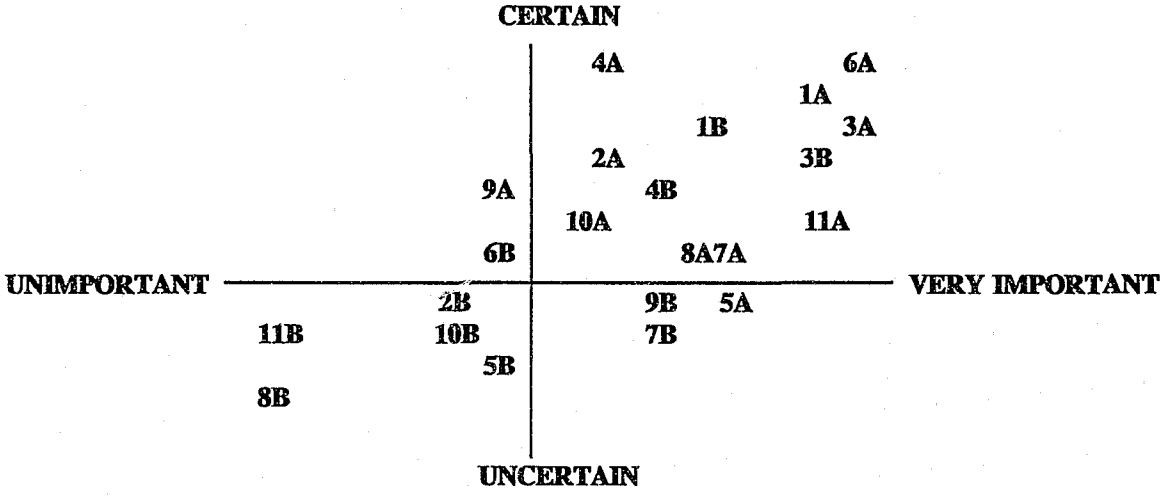
B. Neighborhoods with Neighborhood Police Officers will view too much focus on response time as harmful to their programs.

Stakeholder No. 11 City Managers Office

A. The City Managers Office supports the use of technology to provide a superior service with a decreased employee cost. Efforts toward automation have been undertaken, at the direction of the managers office, in several departments.

B. The City Managers Office will support an Automated Vehicle Locator system if it can be funded through the Capital Improvement Budget.

Figure 23
ASSUMPTION MAPPING



Stakeholder No. 1 SPOA
A Supports Officer safety aspects
B Does not support monitoring
Stakeholder No. 2 Council
A Supports tech driven efficiency
B Will bend to pressure groups
Stakeholder No. 3 Patrol Officers
A Support Officer safety aspects
B Does not support monitoring
Stakeholder No. 4 Patrol Managers
A Support monitoring
B Support Officer safety aspects
Stakeholder No. 5 Dispatchers
A Will make job easier
B Resist supervising police officers
Stakeholder No. 6 Chief
A Support Officer safety aspects
B Support increased efficiency

Stakeholder No. 7 Data Services
A Supports use of technology
B Requires increased resources
Stakeholder No. 8 ICS
A supports use of technology
B Attempt to consolidate system
Stakeholder No. 9 Fire Department
A Supports police efforts
B Desires to use end product
Stakeholder No. 10 Community
A Supports efficiency
B Supports use of NPO's
Stakeholder No. 11 Manager
A Supports use of technology
B Funding via CIP

DEVELOPING ALTERNATIVE STRATEGIES

The Strategic Planning Panel met to develop alternative strategies to implement the Automated Vehicle Locator system. A modified delphi process was used to identify strategies to accomplish the stated goals. A total of six alternative strategies were developed by the panel. The strategies are:

1. Assign project to existing Patrol Planning Committee
2. Purchase existing vendor package with hardware
3. Implement direction of Chief of Police
4. Create AVL implementation group with existing resources
5. Assign to Communication Division staff
6. Create AVL implementation group with outside consultant

The panel then evaluated the strategies and reduced the list to three alternatives. The two most desirable alternatives, those receiving the most votes, and the alternative that produced the greatest disagreement were selected. The alternative strategies are as follows:

Strategy No. 1

This strategy places the responsibility of implementing the AVL system with the existing Patrol Planning Committee. This committee works under the direction of the Deputy Chief of Operations and is comprised of members from every division within the department. There are also police officer and union representatives on the committee.

There are a number of points that support this strategy. The committee is well established and provides an existing structure. There is broad representation within the department and the members understand deployment, computers and the interaction of policy decisions. Most committee members are on the committee due to their assignment and have the ability to gather information throughout the year.

On the down side, some elements of the committee are not well suited for this project. The Deputy Chief has traditionally had minimal involvement in the process and has simply approved or vetoed recommendations made by the committee. The committee has no representation form other city departments or the community. Members of the committee have minimal information on funding issues. Employees have traditionally been suspicious of committee recommendations and the feedback loop has always been weak.

The stakeholders, comprising the employee groups would not strongly support the alternative. Although the union, patrol officers and dispatchers are represented on the committee, a feeling of distrust exists and feedback has been poor. Efforts to strengthen the feedback loop have been viewed with distrust. The Mayor and City Council, along with the Managers Office and other city departments view this alternative as a closed system where they have little input into the process. The Chief of Police views this process as filtering his input and excluding community input.

Strategy No. 4

This strategy places the responsibility of system design and implementation with a newly created committee. The organization has two tiers. The first is the policy review committee, comprised of representatives from the Managers Office, Budget Office, ICS, and Executive Management of the Police Department. The second tier is the working or implementation committee comprised of representatives from each of the stakeholder groups. The policy group is responsible for funding and broad policy guidelines. The working committee is charged with the details of implementation. This committee would be responsible for system design, marketing, training and system implementation.

In support of this structure is a highly educated and motivated work force that has expressed a desire to exercise control over their future. A policy committee headed by the Chief of Police and actively involved in the process would garner support from within and outside the department. The working committee would include new people and carry over less of the stigma of other existing committees.

On the down side, the new committee would have to form new lines of communications and many members would have to educate themselves on the issues surrounding the new system. Workloads would increase and it is unlikely that responsibilities could be transferred. The committee would still be management heavy.

Employee groups may view the committee in a favorable light if aggressive marketing is conducted. City management excluding

the Police Department would view this format as open and responsive to their input. The Chief of Police would have direct positive input when critical issues were decided. Community input is still missing.

Strategy No. 6

This strategy is very similar to Strategy No. 4 with the major addition of the use of an outside consultant and the inclusion of a union representative on the policy review committee. This was also the strategy with the greatest diversity of support. The organization has two tiers. The first is the policy review committee, comprised of representatives from the Managers Office, Budget Office, Information and Communication Systems Department, Sacramento Police Officer's Association, the consultant and Executive Management of the Police Department. The second tier is the working or implementation committee comprised of representatives from each of the stakeholder groups and the consultant. The policy group is responsible for funding and broad policy guidelines. The working committee is charged with the details of implementation. This committee would be responsible for system design, marketing, training and system implementation. The use of an outside consultant with successful experience in internal marketing of new programs was included in order to support a traditional weakness of the department.

In support of this structure is a highly educated and motivated work force that has expressed a desire to exercise

control over their future. A policy committee headed by the Chief of Police and actively involved in the process would garner support from within and outside the department. Inclusion of a union representative will prevent major problems during the implementation phase. The working committee would include new people and carry over less stigma of other existing committees. The use of a consultant would aid in gathering design information in the initial phases and internal marketing as the operational phase nears. The consultant would be responsible for certain reports and meetings thereby reducing the workload of the existing staff.

On the down side, the new committee members would have to form new lines of communications and many members would have to educate themselves on the issues surrounding the new system. This alternative does not allow for community input during the early stages.

Employee groups may view this alternative in the most favorable light. The consultant's experience in developing feedback systems will deter the spread of unfounded rumors. The consultant will also be positioned to champion issues important to employee groups. Major problems with system design from the union's point of view will be dealt with during the early phases of the project. City management will feel that the system is open and there input is delivered in the proper light and at the proper time. Police management maintains control over the project and their future.

IMPLEMENTATION PLAN

The implementation of new technological programs that dramatically change the way organizations conduct business are always met with resistance. The degree of resistance is a function of the planning process and the soundness of the program. Strategy No. 6 was selected by the Strategic Planning Panel after extensive discussion regarding the issue of feedback. Those members who initially did not support the use of a consultant repositioned themselves in light of the departments historical inability to provide feedback. Strained relations between the city and employee groups over contract issues and severe cuts in positions elevated the feedback requirements from important to critical.

The following timetable was developed for the implementation of an Automated Vehicle Locator System integrated with the existing Computer Aided Dispatch system:

Strategy Formulation

Month one through month six. During the first six months the Chief of Police convenes the Policy Review Committee comprised of representatives from the City Managers Office, Police Data Services Section, Information and Communications Systems Department, and The Sacramento Police Officers Association.

The Policy Review Committee refines the Mission Statement, sets objectives and formulates the strategies necessary to implement the program. The issues of funding methods are researched and the consultant is retained.

Month seven through month twelve. During the second six months the working committee is formed and assignments made. The working committee refines the strategies and finalizes the budget. The working committee is divided into four subcommittees with significant crossover on committee assignments. The committees are responsible for the following areas:

1. Employee input, feedback and training
2. Finance
3. System design and Request for Proposals
4. Policy considerations

At the end of the first year the working committee begins to write the Request for Proposals, accepts bids and selects the successful bid.

Strategy Implementation

Month thirteen through month twenty-four. Upon selection of the successful bid the committee will complete specific policies based on the system design and capabilities. The operating budget is completed as are specific operational procedures. The training program is completed and an evaluation process is formalized. As the implementation date nears, feedback becomes more important as the frequencies of rumors regarding the system will increase.

Evaluation and Control

Implementation of the program is not the final step. Continual evaluation of the training, system and output are necessary to ensure that the program operates properly and the desired goals are achieved. This task is assigned to the employee input, feedback and training sub-committee.

TRANSITION MANAGEMENT

The Sacramento Police Department has developed a strategic initiative to maximize the use of technology by the year 2001. One of the specific objectives is to implement an automated vehicle locator system integrated with computer aided dispatch in order to effectively and efficiently deploy patrol resources.

As with all major change there are a number of competing goals and desires held by the various stakeholders. It is an absolute necessity to identify and address the needs of each of the stakeholders. During the strategic analysis phase eleven stakeholders were identified. The stakeholders are:

1. Sacramento Police Officers Association
2. Sacramento Mayor and City Council
3. Patrol Division Officers
4. Patrol Division Managers
5. Communications Division Dispatchers
6. Chief of Police
7. Police Department Data Services
8. City Information and Communications Services
9. Sacramento Fire Department
10. Community
11. City Managers Office

The selected strategy to implement the Automated Vehicle Locator system required a two tier committee. The first tier,

Policy Review Committee, is comprised of those individuals who are critical in getting the job done. In addition the members of the Department, the committee has representatives from the Managers Office, ICS, Sacramento Police Officers Association and a consultant. The second tier, Implementation Committee, is comprised of a diagonal slice of system users. The Implementation Committee or working committee is charged with providing input and the details of implementation.

CRITICAL MASS CONCEPT

Change does not just occur over time, but is led by individuals who have a vision and lead a larger group to accept a new ways of doing things. The minimum number of people required to lead this change has been identified as the "Critical Mass" by Richard Beckhard and Reuben T. Harris. In this case, it is necessary to identify those individuals that must commit to the implementation of an Automated Vehicle Locator system to ensure it's successful operation.

During the strategic planning process the following individuals were identified as the core group that comprised the Critical Mass:

1. Arturo Venegas, Chief of Police
2. Albert Najera, Deputy Chief Operations
3. Rick Braziel, Operations Captain
4. Jim Jorgenson, President SPOA
5. Jack Crist, Deputy City Manager
6. Barbara Weaver, Director ICS

Various levels of commitment are necessary from each member of the Critical Mass. The following chart is a graphical representation of the current level of commitment of each member and what the level of commitment must be in order for the plan to succeed:

Table 2
COMMITMENT PLANNING CHART

INDIVIDUALS COMPRISING THE "CRITICAL MASS"	BLOCK CHANGE	LET CHANGE HAPPEN	HELP CHANGE HAPPEN	MAKE CHANGE HAPPEN
Chief of Police Arturo Venegas			XO	
Deputy COP Albert Najera			X	O
Program Manager Capt. Braziel			X	O
SPOA President Jim Jorgenson	X	O		
Deputy City Manager Jack Crist		X	O	
Director ICS Barbara Weaver		X	O	

"X" is the current level of commitment
"O" is the level of commitment required

The following analysis, based on interviews of each member, describes their current commitment to the plan, the level of commitment necessary for the plan to succeed and a description of the tactics that may obtain the necessary level of commitment.

ARTURO VENEGAS, CHIEF OF POLICE

CURRENT LEVEL OF COMMITMENT

Chief Venegas is currently in the help change happen category. He strongly supports the use of high technology in law enforcement as a tool to enhance performance. He has also publicly stated that he is very supporti e of the officer safety aspects of an Automated Vehicle Locator system, but has some concerns regarding how the employee groups will react to the use of this technology. Chief Venegas has clearly demonstrated that the primary goal is to move the department into a strong Community Oriented Policing posture. Anything that enhances this goal will receive his strong support and anything that detracts from that goal will be put on the back burner.

LEVEL OF COMMITMENT REQUIRED

Chief Venegas must remain in the help change happen category. The implementation of an Automated Vehicle Locator system will require the expenditure of a significant amount of resources in terms of time, money and commitment. In the short term this program will compete with Community Oriented Policing for resources and it is necessary that the Chief maintain his level of commitment in order to ensure that the project is not under capitalized.

APPROACH

The Chief of Police bases his decisions on facts, logic and long range strategic planning. A cost benefit analysis will reveal the level of improved efficiency due to automation. Increased efficiency will allow the Chief of Police to redirect resources to Community Oriented Policing efforts. The officer safety aspect will help the Chief of Police repair damages with the line officers as long as monitoring issues can be dealt with effectively.

ALBERT NAJERA, DEPUTY CHIEF-OPERATIONS

CURRENT LEVEL OF COMMITMENT

Deputy Chief Najera is in the help change happen category. He believes that police officers have become too expensive to allow large police departments to hire sufficient officers and deploy them in the traditional ways. Personnel shortages have effected the quality of life in Sacramento and crime deterring efforts as well as public service have deteriorated. The use of an Automated Vehicle Locator system is one of many methods that would allow police managers to use existing resources more effectively.

LEVEL OF COMMITMENT REQUIRED

Deputy Chief Najera must move to the make change happen category in order for the project to be successful. Although this project will effect every division within the Police Department, the vast majority of sworn officers are in the patrol

divisions. It is the patrol officers who will be affected by this program most dramatically. It is necessary that this office chief become the champion of the project and ensure that patrol management is supportive of the use of new technology.

APPROACH

Deputy Chief Najera will move to the make change happen as soon as the City's financial picture improves and there is a realistic ability to fund the project. At the current time funding is not possible considering labor issues. City employees are working on the third year without a cost of living pay raise due to the recession. Any funds available in the near term will surely be allocated to pay raises in order to prevent labor strife and to maintain a quality workforce.

RICK BRAZIEL, OPERATIONS CAPTAIN

CURRENT LEVEL OF COMMITMENT

Captain Braziel is in the help change occur category. Captain Braziel is a strong supporter of computer driven technology and information gathering processes. In the recent past he has headed the Patrol Planning Committee and worked with the companion Response Time Committee. In these committees he has worked with others to modify the patrol deployment scheme in order to make it resemble a deployment scheme compatible with an Automated Vehicle Locator/Computer Aided Dispatch system.

LEVEL OF COMMITMENT REQUIRED

Captain Braziel must move to the make change happen category. Based on assignment, knowledge and interest he is the best positioned to be the project manager.

APPROACH

Giving the assignment and allowing minor realignment of duties among the existing captains would move Captain Braziel to the make change happen category.

JIM JORGENSON, PRESIDENT SPOA

CURRENT LEVEL OF COMMITMENT

The President of the Sacramento Police Officer Association is in the block change category. He holds the opinion that the officer safety aspects of Automated Vehicle Locators are over played. He stated that he is unaware of any situation, in an urban environment, where this technology has increased officer safety. He also supports the notion that the "Big Brother" aspects of the system would be detrimental to moral and labor relations issues. He believes the efficiency issues surrounding the use of unit location to dispatch police officers to calls for service has merit. The system may be sold on that issue only.

LEVEL OF COMMITMENT REQUIRED

It is necessary to move the union leader to the let change happen category. If he remains in the current position, law suits, lobbying and job actions will block any chance of the project being successful. It would increase the potential of

success if he was moved to the help change category, but this is not an absolute necessity.

APPROACH

The approach used to move the union president would be to address the three issues raised by him and his advisors. Documentation of the benefits of the increased efficiency and effectiveness would be provided to the union leadership and membership. Additionally, information related to officer safety issues would be developed. This would include both officer in distress and tactical scenarios. The third and most important approach would be the inclusion of the president in the decision making process. Access to the development process for reasonable rules governing the use of an Automated Vehicle Locator system would defuse many of the "Big Brother" arguments.

JACK CRIST, DEPUTY CITY MANAGER

CURRENT LEVEL OF COMMITMENT

Jack Crist is currently in the let change happen category. Mr Crist is the Deputy City Manager responsible for the budget office and is assigned management responsibility for all major technological projects. His buy in is necessary to obtain adequate funding and for the coordinations of various City resources. Mr. Crist likes technological solutions to problems and sees an Automated Vehicle Locator system as a reasonable solution to increased efficiency and officer safety. Due to the tight financial constraints on local governments, the project

would have to be sold based on improved efficiency or improved capabilities. A plan to deal with labor issues is also necessary.

REQUIRED LEVEL OF COMMITMENT

Mr Crist must move to the help change happen category. His support will ensure future finding and the resources necessary to complete the project.

APPROACH

Based on his bent toward technological solutions this may be accomplished by providing factual information on the improved efficiencies and capabilities. Once rough costs and funding sources are identified his support will be forthcoming. Strategies developed to deal with labor issues will allay fears that the system will be sabotaged.

BARBARA WEAVER, DIRECTOR ICS

CURRENT LEVEL OF COMMITMENT

Barbara Weaver is the Director of the City's Information and Communications Services Department. She is currently in the let change to happen category. This department is responsible for all communication and computer systems within the City, except those located within the Police Department. All Police Department projects must be approved by the Director of ICS to ensure city wide compatibility. Ms. Weaver strongly supports Automated Vehicle Locator systems for the entire city fleet. She sees this technology as being invaluable in many areas including disaster preparedness and hazardous materials incidents.

REQUIRED LEVEL OF COMMITMENT

Due to her position Ms. Weaver must move to the help change happen category. It is necessary that she is a part of the project in order to gain the necessary support. Under no circumstances can she be allowed to move to the block change category.

APPROACH

Ms. Weaver supports the application of an Automated Vehicle Locator system to the entire City fleet. If the Police Department project is viewed as a first step or a pilot project she will support the project. Assurances that the technology will be shared are required.

MANAGEMENT STRUCTURE

Upon completion, the Automated Vehicle Locator system will be an integral part of the deployment process of the Sacramento Police Department and will not require additional staffing to manage the program or technology. This is not true for the design, implementation and shake down phases of the project. The implementation of new technology and new ways of conducting business require a great amount of effort and work. In order to find adequate funding, design a system, locate vendor, sell the system to users and install the system, requires a coordinated effort on the part of many individuals. Many of these functions are mechanical in nature and can be assigned the technical staff for completion. The project will succeed or fail on the issues of system design and the ability to sell the system to the users.

The preferred management structure is to use a two tier committee system. The first committee is the Policy Review Committee. This committee is comprised of the six individuals who were identified as the critical mass, a consultant familiar with the dynamics of computerization and its effects on organizations and other selected managers. These managers would include Dee Gibson, the Communications Division Manager and Karen Hill, the Department Data Services Administrator. Each member holds a position where they are authorized and responsible to direct work, authorize expenditures and make policy. With the exception of the consultant and the SPOA President, these are the managers the City has vested with the authority to make commitments for the City.

The second committee is the Implementation Committee. This is a much larger group that includes the members of the Policy Review Committee, staff members who will be working on the project and a cross section of affected employees. The employee group will be selected based on their expressed interest and their informal leadership skills. Although they are not union representatives, concurrence form the unions will be sought.

The function of the Implementation Committee is varied. The committee will be charged with the responsibility to provide substantial input on design issues and policy considerations. They will also be encouraged to seek input from the employees and provide feedback on the activities of the committee. Minutes of

committee meetings will be distributed and members must be prepared to answer follow up questions from interested employees.

The Implementation Committee will be broken into four working committees and assigned tasks and due dates. Job assignments will be made on both current assignments and individual interests. Managers must commit to release the individuals from normal duties to work on this project to the greatest degree possible. This will require the reassignment of work and managers will be faced with the negative aspects of the redistribution of the work load.

The working sub-committees are necessary in order to allow small groups of experts and users to identify problems and develop a range of solutions. These solutions are evaluated by the Implementation Committee and recommendations are made. The final decision to authorize funding or implement policy are made by the Policy Review Committee. This structure may appear to be some what cumbersome, however, the goal of allowing a maximum amount of input is met. Considering the great amount of suspicion surrounding the technology, openness and input is a primary consideration.

To ensure that critical tasks are completed with a minimum of confusion, a responsibility chart was constructed. The chart indicates if the actor is **R**esponsible, **A**ssists, **S**upports, of is **I**nformed. The chart is shown in Table 3.

Table 3
RESPONSIBILITY CHART

ACTORS / ACTIONS	CHAIR MEETINGS	INITIAL DESIGN	REPORT TO COUNCIL	REQUEST FOR	SELECT CONSULTANT	INSTALL HARDWARE	INSTALL PROGRAMS	TRAIN OFFICERS	TRAIN DISPATCHERS	DEVELOP POLICIES	INFORMATION	FOCUS GROUPS	ON-GOING EDUCATION
Arturo Venegas COP	S	A	A	A	S	I	I	I	I	A	S	S	S
Albert Najera DCOP	A	I	I	I	A	A	I	A	A	A	A	A	A
Rick Braziel Project Manager	R	S	I	S	R	R	S	R	S	R	R	R	R
Jim Jorgenson Union President	S	I	I	I	S	I	I	I	I	S	S	S	S
Jack Crist Deputy City Manager	I	S	A	A	I	I	I	I	I	I	I	I	I
Barbara Weaver Director ICS	I	R	R	R	A	S	S	I	I	I	I	I	I
Dee Gibson Communications	S	S	I	S	S	S	A	S	R	A	S	S	S
Karen Hill Data Services	I	I	I	S	I	S	R	S	S	S	I	I	I

R=RESPONSIBLE A=ASSIST S=SUPPORT I=INFORM

TECHNOLOGIES AND METHODS TO SUPPORT CHANGE

The design of a proper management structure does not ensure success of the project. Certain methods of operation must be developed in order to achieve the desired goals. The problems

broken into three areas. The first is obtaining reliable information regarding system design, employee fears and other unidentified issues. The second is providing feed back on the progress of the project and dispelling rumors. The third is formalized training prior to implementation.

Reliable information will allow the core group to solve major design problems and respond to unjustified fears at the earliest time possible. There is a wide variety of methods that will help obtain this information. The following methods will be employed:

Site Visits

Committee members responsible for obtaining input will conduct site visits to agencies that are operating Automated Vehicle Locator systems. A major focus of this visitation is to identify potential problems.

Attitude Survey

A written survey will be distributed to the employees who are primary users of the Automated Vehicle Locator system. The survey responses will be anonymous and only identify job classification. The survey will provide information preferred system capabilities and fears regarding the system.

Focus Groups

After information is obtained from site visits and surveys the committee will conduct focus group interviews in order to refine the information obtained. This contact with the

focus groups will allow the committee to obtain information regarding questions raised in the survey process.

During the term of the project, feedback is of primary concern and must be considered a on going effort. The following feedback methods will be employed:

Written Documentation

Written documentation will be distributed to the membership of the department. This will consist of committee meeting minutes and a news letter.

Personal Contacts

Regular personal contacts will be made with the membership of the department by leaders of the project to provide updates, answer questions and dispel rumors. The names of all committee members will be published in order to allow employees to contact them in person.

Training employees on the capabilities and use of the system is essential to the success of the project. Training must include an overview of the system, demonstration of its use and practical application. The course content will vary due to current job assignments, however, every course will provide a comprehensive overview of the system capabilities.

SUMMARY

Increased use of technology by law enforcement agencies is expected to accelerate in order to meet the demand for quality service and safe streets. This Independent Study Project examines the use of technology and more specifically the use of Automated Vehicle Locators in conjunction with Computer Aided Dispatch. The focus of the study was not on hardware or software, but on the management of this technology. The initial literature search indicated that although there was a wealth of information on the technological aspects of AVL the was little information on the management of this technology.

The Sacramento Police Department was selected for the Strategic Plan and Transition Management sections of the paper. This selection was based on the authors familiarity with the department and the knowledge that the department would soon move in this direction. This decision and the initial research lead to the question:

> What will be the impact of Automated Vehicle Locators (AVL) and AVL technology on the management of patrol services in a large law enforcement agency by the year 2001?

The Sub-Issues were identified as:

1. What will be the integrity of system security?
2. What will be the impact on the police management decision making process?
3. What will be the acceptance by law enforcement employees?

The impact of Automated Vehicle Locators and related technology will have a dramatic effect on the management of patrol resources. The decision to implement technological solutions will be driven in large part by forces outside law enforcement. The perception that efficiency equates to safety in combination with a need to reduce employee expenditures will make automated systems very attractive to the public and elected officials. Weather the effect is positive or negative depends on system design, a strategic plan defining the desirable future and a transition plan that causes change and at the same time meets the needs of the various stakeholders. In order to create a system that is beneficial to the organization the following issues must be addressed.

System security will be foremost in system design and will address two separate areas. The first will be design and policy considerations to prevent unlawful access and criminal misuse of the system. The second will be design and policy considerations to prevent employees form degrading the usefulness of the system based on their fear of the big brother aspects of technology.

The police management decision making process must also change in light of technological innovation. It is clear that properly designed systems aid in the management of patrol operations however managers must not become overly dependant on the capabilities of the systems. Managers must also resist the lure of replacing the monitoring capabilities of computerization with the proper functions of the first line supervisor. Police

management must also open the decision making process as it relates to system design and policy considerations. The technocrats are incapable of designing a system that cannot be degraded by the base line employees. The solution to this problem is employee involvement, reasonable rules and feedback. A well designed system will have a high degree of employee acceptance and therefore a low level employee sabotage.

The acceptance level of AVL technology by employees is the final hurdle to by cleared. Considering the number of employees that are cyberphobic and serious concerns regarding the monitoring capabilities of AVL technology these issues must be addressed. Openness and training are the keystone to developing an existing workforce that is comfortable with technology. This will foster labor-management cooperation and pave the way for trouble free implementation. In the future employees who grew up on computer games will be the norm and steps should be taken to identify the profile for future employees now.

Recommendations

This study is futures oriented and develops a plan designed to implement high technology in a new area. A case study of the implementation process in a large law enforcement agency or a comparative study between two law enforcement agencies with different management styles would provide useful insight into the effectiveness of the process.

APPENDIX A

NOMINAL GROUP TECHNIQUE

NOMINAL GROUP TECHNIQUE

GROUP MEMBERS

1. Dee Contreares, Labor Relations City of Sacramento
2. Rick Braziel, Captain Sacramento Police Department
3. Linda Browne Programmer/Analyst II Data Services
4. Janice Warren, Motorola Regional Sales Representative
5. Brian Starr, Dispatcher III Sacramento Police Department
6. Dee Gibson, Manager Public Safety Communications Center
7. Greg Twilling, Lieutenant Sacramento Police Department
8. Tom McHale, Board Member Sacramento Police Officers Assoc.
9. Karen Hill, Manager Police Department Data Services
10. Gaylen Workman, Software Program Manager PRC
11. Jerry Tomkins, Program Manager Motorola

METHODOLOGY

Eleven members comprised the nominal group and each was invited based on their involvement in a portion of entire process of instituting an AVL system. The nominal group was provided a copy of the introduction prior to the meeting.

The meeting was facilitated by Albert Najera, Deputy Chief of Police Sacramento Police Department. The panel was provided with written definitions of trends and events and the forecasting forms. The process was explained to the panel.

Extensive lists of trends and events were generated by the panel using a round robin method. The panel members then voted on the trends and events in order to select the top ten.

Voting was accomplished by listing the top ten choices on a 3 by 5 card. When the selected events and ties were determined the items were re-numbered and a second vote was conducted.

At the end of the trend selection process and again at the end of the event selection process, the panel members completed the Trend Forecasting Form and the Event Forecasting Form. The data compiled from these forms was used to construct the trend forecasting graphs and the event forecasting graphs. Copies of the Event and Trend Forecasting forms are included in this appendix.

TREND FORECASTING FORM

TREND STATEMENT	LEVEL OF THE TREND (TODAY = 100+ 100)			
	Five Years Ago	Today	4 Years From Now	8 Years From Now
		100		
		100		
		100		
		100		
		100		
		100		
		100		
		100		
		100		
		100		
		100		

EVENT FORECASTING FORM

EVENT STATEMENT	Years Until Probability First Exceeds Zero	PROBABILITY		IMPACT ON THE ISSUE AREA IF THE EVENT OCCURRED	
		8 Years From Now (0-100)	4 Years from Now (0-100)	Positive (0-10)	Negative (0-10)

APPENDIX B
TRENDS

TRENDS

1.) Police expectations will affect the use of technology
2.) Technology will allow for smaller, dependable applications and automated locators will become viable.
3.) Level of integration between various governmental entities.
4.) Training requirements change as the use of technology increases.
5.) Importance placed on confidentiality and system security.
6.) Regionalization of technological system will effect costs.
7.) Changes in employee profile, aptitude, skills, training and abilities.
8.) Use of technology as first line supervision.
9.) Level of cooperation between labor and management.
10.) Level of dependance, by management, on automated, real-time analysis.

OTHER TRENDS

11.) Employee dependence on available technology.
12.) Cost of equipment.
13.) The effect of technological impact on the culture of the organization.
14.) The effect of technology on employee efficiency.
15.) Computer literacy of new employees.
16.) Laptop computers effect on organization productivity.

17.) Speed of technological advances v. development of practical applications.

18.) Importance placed on planning.

19.) Reduced revenues will affect the use of technology.

20.) Reduced revenues will affect the need to become more efficient.

21.) Technology and its affect on the size of the workforce.

22.) Relationship of community with individuals in organization.

23.) Use of expert systems to analyze data on calls for service.

24.) Use of interactive systems instead of personal contacts.

25.) Multi-media incident information storage.

26.) AVL technology accessible to consumers.

27.) Computer dependance effects interaction with community.

28.) Ability of technology to continue to enhance service levels.

29.) Computer capabilities will surpass admin. capabilities.

30.) Computer systems affect on organizational team approach.

31.) Employee acceptance of AVL technology.

32.) Community acceptance of AVL technology.

33.) Controlled implementation of AVL technology.

34.) Technological problems with implementation of AVL.

35.) Requirement for intensive internal marketing.

36.) Inclusion of rank and file in planning process.

37.) Changes in response time due to the use of technology.

APPENDIX C

EVENTS

EVENTS

1.) Major automobile manufacturer makes AVL standard equipment.

2.) Organized crime uses AVL to avoid police.

3.) Law enforcement begins to use AVL on parolees.

4.) Hackers break security code and plant virus in AVL system.

5.) Union wins lawsuit that limits the use of AVL to safety issues only.

6.) Mandatory industrial standards adopted for all computers used in communications drives cost down.

7.) New cellular telephone allows for location identification on 911 calls.

8. 911 calls routed directly to closest police unit.

9.) New frequency band authorized for government use - unlimited data available.

10.) Fire shuts down public safety dispatch center.

OTHER EVENTS

11.) College student finds way to scramble GPS signal.

12.) Voice activated lapel communicator is developed and commercially available.

13.) Labor organization all join together.

14.) Information highway is reality.

15.) Statewide communications system for all law enforcement.

16.) Gated communities become the norm.

17.) Medical discovery confirms that long term computer use causes cancer.

18.) AVL puts officer on scene quickly and stops school yard massacre.

19.) 60 Minutes does expose comparing police manual system to organized crime computerized system.

20.) Psychological profile for perfect computer user employee developed.

21.) Police use non-lethal laser weapons.

22.) Gangs become political parties.

23.) War causes government to deactivate GPS.

24.) Data base delivers false information causing death.

25.) Laws change making all law enforcement information public information.

26.) Device developed to neutralize firearms.

27.) Mass walkout by police officers in protest of AVL system.

28.) Satellite malfunction disrupts AVL.

29.) Satellite arrangements allow for in-field booking and releases.

30.) Polly Klaus-type incident occurs due to lack of technology.

31.) Remote controlled ignition deactivation installed in new cars.

32.) Collaborative labor-management agreement leads to cooperation.

33.) Citizens assigned personal police officer.

APPENDIX D

SIGMA PRINTOUTS

THE POLICY ANALYSIS COMPANY, INC.

SIGMA SCENARIOS GENERATOR

SCENARIO 1

Scenario number 2 out of a FAMILY of 50 follows: SEED = 3612819
(A 7 year SCENARIO using the 'avltech' data.)

THIS IS WHAT HAPPENS !!

Run # 2 of 50

1. Feb. 1996 E- 6. Industry standards lower cost
   T = 105
2. May 1996 E- 5. Union wins law suit
   T = 99
3. Mar. 1998 E- 10. Fire shuts down dispatch center
   T = 92
4. Aug. 1999 E- 4. Hackers plant virus
   T = 84
5. Jul. 2000 E- 7. Cel telephone gives location
   T = 91
6. Nov. 2000 E- 8. 911 calls directly to officer
   T = 99
7. Aug. 2001 E- 1. Automobile AVL standard
   T = 107
8. Aug. 2001 E- 2. Organized crime uses AVL
   T = 99

The EVENTS which do NOT Happen are:

1. E- 3. Law enforcement uses AVL on parolees

2. E- 9. Frequency/increased data available

End of Scenario number 2 in a FAMILY of 50 : Seed used was 3612819

THE POLICY ANALYSIS COMPANY, INC.

SIGMA SCENARIOS GENERATOR

SCENARIO 2

Scenario number 9 out of a FAMILY of 50 follows: SEED = 3613468
(A 7 year SCENARIO using the 'avltech' data.)

THIS IS WHAT HAPPENS !!

Run # 9 of 50

1. Aug. 1996 E- 2. Organized crime uses AVL
   T = 92
2. Oct. 1996 E- 8. 911 calls directly to officer
   T = 100
3. Jul. 1997 E- 6. Industry standards lower cost
   T = 105
4. Feb. 1998 E- 5. Union wins law suit
   T = 99
5. Feb. 1998 E- 4. Hackers plant virus
   T = 91
6. Oct. 1998 E- 1. Automobile AVL standard
   T = 99
7. Jan. 1999 E- 10. Fire shuts down dispatch center
   T = 92
8. Sep. 1999 E- 3. Law enforcement uses AVL on parolees
   T = 100
9. Oct. 2000 E- 7. Cel telephone gives location
   T = 107
10. Nov. 2001 E- 9. Frequency/increased data available
   T = 115

The EVENTS which do NOT Happen are:

In this Scenario, all the Events happened -- How unusual!!

End of Scenario number 9 in a FAMILY of 50 : Seed used was 3613468

THE POLICY ANALYSIS COMPANY, INC.

SIGMA SCENARIOS GENERATOR

SCENARIO 3

Scenario number 22 out of a FAMILY of 50 follows: SEED = 3614674

(A 7 year SCENARIO using the 'avltech' data.)

THIS IS WHAT HAPPENS !!

Run # 22 of 50

1. May 1997 E- 10. Fire shuts down dispatch center
   T = 93
2. Nov. 1997 E- 3. Law enforcement uses AVL on parolees
   T = 101
3. Feb. 1998 E- 9. Frequency/increased data available
   T = 109
4. Mar. 1998 E- 7. Cel telephone gives location
   T = 116
5. Jun. 2000 E- 1. Automobile AVL standard
   T = 124
6. Nov. 2000 E- 6. Industry standards lower cost
   T = 129
7. Feb. 2001 E- 8. 911 calls directly to officer
   T = 137

The EVENTS which do NOT Happen are:

1. E- 2. Organized crime uses AVL
2. E- 4. Hackers plant virus
3. E- 5. Union wins law suit

End of Scenario number 22 in a FAMILY of 50 : Seed used was 3614674

ENDNOTES

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