National Institute of Justice Abstract

Police Management use of Automated Vehicle Tracking Devices.

By Timothy E. Martell

This document is the report of a law enforcement futures study project conducted as a final paper by the author as a student in the California Commission on Peace Officers Standards and Training (POST), Center for Executive Development, Command College. It focuses on the use of automated police vehicle tracking devises (VTD), as both a tactical and strategic tool in the management of the police function in California.

A summary of the history of the experiments with and development of the five basic systems types that have been available is presented.

A survey was conducted among a sample of 200 California police agencies not currently using VTD systems to determine the current level of knowledge of and interest in these systems. Current levels of support and possible sources of resistance to the implementation of VTD systems are identified. This survey shows that the potential use of existing VTD technology is not widely understood by police managers in the state. Lack of an "identified" need for the information available from these systems and the cost of these systems are the two main concerns.

The results of this survey are incorporated with the results of a nominal group technique process and three different scenarios forecast possible future acceptance and use of the VTD systems.

The best case scenario integrates the VTD systems with a number of other automated systems, such as records management systems, computer aided dispatch systems, automated crime analysis systems and automated telecommunications systems.

The potential for such an integrated automated computer systems that includes a VTD to provide both tactical assistance for the deployment and supervision of police resources on a day by day basis and management reports for strategic planning purposes is discussed and forecast.

The strategic and transition plan for the implementation of an integrated computer-VTD system for the City of Pleasant Hill (CA) is detailed, with suggestions for other agencies interested in the implementing the technology.

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BY THE YEAR 2000, HOW CAN AUTOMATED VEHICLE TRACKING DEVICES BE UTILIZED IN THE MANAGEMENT OF THE PLEASANT HILL POLICE DEPARTMENT?

An Independent study

BY

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This Command College Independent Study Project is a **FUTURES** study on 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.

Studying the future differs from studying 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.**

EXECUTIVE SUMMARY

This futures study focuses on the use of automated police vehicle tracking devises (VTD) in California.

A summary of the history of the experiments with and development of the five basic systems types that have been available is presented and representatives of the three California Law Enforcement agencies that currently have working vehicle tracking devices were interviewed.

A survey was conducted among a sample of 200 other California police agencies not currently using the systems to determine the current level of knowledge of and interest in these systems. This survey shows that the potential use of existing VTD technology is not widely understood by police managers in the state. Lack of an "identified" need for the information available from these systems and the cost of these systems are the two main concerns. While there is no organized opposition to the use of these systems, there has been no organized movement to encourage their use as either stand-alone systems or systems integrated into the array of other computer systems that are available or in use by the police.

The results of this survey are incorporated with the results of a nominal group technique process and three different scenarios forecast possible future acceptance and use of the VTD systems.

The best case scenario integrates the VTD systems with a number of other automated systems, such as records management systems, computer aided dispatch systems, automated crime analysis systems and automated telecommunications systems.

The potential for integrated automated computer systems that includes a VTD to provide 1) improvements in the "routine" supervision and direction of day-by-day operations, 2) tactical assistance for the deployment and direction of police resources in "critical incidents", and 3) improved information available for both short and long term strategic planning purposes is discussed and forecast. This discussion includes basic information on the basic cost vs benefit issues to point out the potential reduction in liability from the officer safety standpoint.

Special attention is paid to the ETAK, Inc. vehicle navigator system as it may interface with VTD and CAD systems.

The strategic and transition plan for the implementation of an integrated computer-vehicle navigator-VTD system, for the City of Pleasant Hill is detailed.

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I Introduction:

Today, by all accounts, we are in the midst of the "information age." The very speed of everyday business and social interaction makes the accurate, timely processing of information more essential to the efficient, effective management of police organizations than it ever has in the past. Information gathering, analysis, storage, retrieval and dissemination is critical in law enforcement intelligence systems as well as criminal and traffic investigations. Concurrently, managers must insure the accuracy and speed of their operations to protect against civil liability. As labor costs rise at an ever increasing rate and government agencies resources are restricted or actually reduced, government managers must redouble their efforts to eliminate unnecessary labor costs by turning to more non-labor intensive methods to execute their responsibilities. The application of modern computer technology to all aspects of the operation is one of the ways these things are being accomplished. Applications include the automated processing of all types of information. The most important of these are the automation of police record management systems (RMS), automated identification systems such as the automated fingerprint systems, automated crime analysis programs (CA), the automation of most police communications systems, the police computer aided dispatch systems (CAD) and the use of mobile data terminals (MDT).

One of the recent developments in automation that promises to provide assistance in the collection and analysis of this all-important management information for police managers is the use of automatic vehicle tracking devices (VTD) or locator systems for law enforcement agencies. A variety of these vehicle tracking systems have been tested in a number of experiments over the past fifteen years, yet at this time there are less than fifteen such systems in operation in the U.S. and only three in California. None of these systems is fully integrated with other police records management system, computer aided dispatch systems or crime analysis systems. Why not? Why hasn't this potentially revolutionary tool been incorporated into widespread use by local Law Enforcement? This paper will explore this issue and propose a plan to accomplish this task for the Pleasant Hill (CA) Police Department.

Definitions:

For the purposes of clarity, certain definitions are appropriate:

AVLS : Automated Vehicle Locator system

CA: Crime Analysis system

CAD: Computer Aided Dispatch system

ETAK: the ETAK corporation, Menlo Park, California.

MDT: Mobil Data Terminal

RMS: Records Management System

VTD: Vehicle Tracking Device

LORAN-C: LOng-RAnge Navigation system

II. BACKGROUND:

Currently available technology:

To date, at least five types of VTD systems have been placed in use or have been proposed. The principal features of these systems are described herein.

The sign-post system:

In a sign-post system, a series of low power transmitters are located at regular intervals along a fixed route. Each post broadcasts a pre-designated digital address. As a vehicle equipped with a receiver on that frequency passes a particular sign-post, it receives the digital address and re-transmits that information to the base station when the base station polls the vehicle. The base station computer determines the vehicle's location from an address table. This information may then be interfaced to other computer aided dispatch functions, displayed on a digital map or put to other appropriate use by the agency. Problems with this system have been the cost of installation and maintenance of the equipment. To be effective, the entire geographic area must be closely covered by transmitters. This system has not proven practical for random routes over large geographic areas such as police patrol. No law enforcement agencies in the U.S. were found to be currently using this system.

Satellite system:

The U.S. Government sponsored Navstar Global Positioning System (GPS) was scheduled for late 1988, but is now on indefinite hold

waiting for a functioning launch vehicle system after the Challenger disaster. This system uses the basic principal of trilateration. The phase differences of signals received from three or more satellites are calculated and converted into a three dimensional location fix. This location fix is then transmitted by the vehicle or other properly equipped equipment to the dispatching base station when the vehicle is polled. The base station computer then interfaces the location information into whatever computer aided dispatching functions that are appropriate to the nature of the business. There are other problems with this system, even if the satellites were in place. The Federal Government must be convinced that the use of the system by law enforcement is a high priority and be persuaded to allocate frequencies to that use. In many difficult geographic locations the line of sight to the satellites may be blocked by land features, vegetation or buildings, interfering with accurate position fixes. No local law enforcement agencies in the U.S. are currently using this system but it is potentially the system of the future, perhaps in some combination with a dead-reckoning system of on board vehicle map displays.

An older system, Navsat (or Transit system) is currently in orbit and operational, but is being replaced by the Navstar system. Navsat is still available for limited "commercial" use. At least one major trucking firm in Southern California makes use of this system to track the movements of its fleet.

Terrestrial radio trilateration:

The basic concept here is the same as with the satellite system. The system involves the use of three or more fixed transmitters on the ground to determine a vehicle's position. The vehicle with the receiver then re-transmits the location information it receives to a base station dispatching center, where the computer interfaces that information with whatever computer aided dispatching functions deemed necessary. Digital maps may be included in this operation. No local law enforcement agencies in the U.S. were located that are currently using this system.

LORAN-C system:

LORAN-C is an acronym for LOng RAnge Navigation which was designed for marine navigation and has been in use since the mid-1950's. The transmitter infra-structure is operated and maintained by the Federal Government and is now usable for use by land vehicles. At any given location, a vehicle equipped with a LORAN receiver receives transmissions from three LORAN transmitters. This information is converted into location data which in turn is transmitted via a separate radio to the vehicle's base station where it may be interfaced with any appropriate computer used for dispatching functions.
Color graphic (digital) maps may be included at this end of the operation. This system is the most widely used in the law enforcement community at this time. There are at least six manufactures of LORAN systems.[1] Between twelve and fifteen

departments in the U.S. actually use one or another of these systems at this time,[2] at least two others are in the planning stage.[3] None of these systems interface directly with local, state or national law enforcement data banks or communications systems. These systems are used for tactical response and force disbursement. There are no known pre-programed management reports being created by any of these systems and none are currently being used for crime analysis or other studies. The two largest manufactures for law enforcement use are Motorola, Inc. and II Morrow, Inc. (In some installations reception and accuracy has suffered from interference from geographical features such as mountains, canyons and buildings.)

Dead-reckoning systems:

These systems rely on the mechanical translation of vehicle movements over land to determine location. Odometer measurements and electronic compass headings in the vehicle are fed into a on board vehicle mini-computer that correlates that information with a digital map base. The digital map base provides constant re-calibration points for the computer.

This "augmented" location information is then relayed to the vehicle base station (dispatcher) where it may be simply displayed on a digital map or interfaced with other necessary dispatching information, as appropriate. The location, speed and direction of travel of each unit is relayed to the dispatcher's

computer and recorded. Coupled with some input from the vehicles operator or passenger, the vehicle's status, can be constantly recorded on the base computer. All of this information may be recorded for future playback and analysis. The most advanced dead-reckoning system on the market at this time is manufactured by the ETAK Corporation, Menlo Park, Ca.

History of VTD Experiments:

In 1967, the President's Commission on Law Enforcement,[4] stated "reducing the response time in getting field units to the scene upon request from a citizen has been shown to be related to improving the probability of making an arrest. Car locators would make it possible to select and assign the closest available car. Of equal significance, however, is the fact that car locator devices make possible more detailed control of the mobil forces. Knowing the locations of cars permits an intelligent deployment of forces as emergency situations develop, avoiding over responses and under responses and the possibility that sections of a metropolitan area may be inadvertently left without police protection."

This is clearly a recommendation for the use of VTD's by police. The report suggested that a reasonable cost to accuracy ratio of VTD's would be in the neighborhood of accuracy of 0.4 miles and a cost of between $500 and $1,000 per unit. The report goes on to state that further development was necessary in one or more of the VTD technologies to reach this level. There were no reported

development of VTD's by any U.S. police agencies for five years following the release of this study.

Montclair (CA) Police Department: [5]

In 1972, the Montclair, California, Police Department obtained a LEAA grant to study "Locates", a vehicle location and status reporting system. At that time there were no reported VTD systems in operational use by Criminal Justice Agencies in the U.S. The study was concluded in March of 1974 and a final report was written that concluded that particular system was both reliable and useful in operations. The system, however, was taken out of service after the initial study was completed and has not been used since. The cause of the disuse of the system has been reported as two fold; the first was difficulty maintaining the equipment and the second was employee resistance. No detailed police response time studies or other strategic reports were reported. It appears that the expected results were ahead of the available technology.

Huntington Beach (CA) Police Department: [6]

In 1973, the City of Huntington Beach, California, installed a Motorola "signpost" Vehicle location device. Initially the VTD and the computer aided dispatch system were planned to be integrated. The system did not include any mapping or map displays. The system was in operation for slightly over three years and was then taken out of service. The reasons quoted for

the deactivation of the system were twofold. The first was mechanical failure of equipment, and the second was employee resistance, although that was minor. No valid studies as to response time reduction were ever completed and the system did not include other strategic (management) type reports. Here again, the demands placed on the system suggest that operational requirements were ahead of the available technology.

Oakland (CA) Police Department: [7]

In 1973 The City of Oakland, (CA) installed a trial system for police vehicle location tracking, made by GTE Sylvania, Inc. This was funded through the California Council on Criminal Justice. This system depended on the field officer manually transmitting location information to the dispatchers computer. This experiment lasted about one year and was deactivated. It was reported that its demise was due to at least three reasons: officer resistance, the limited nature and extent of the experiment, and that the demands placed on the system were ahead of the degree of sophistication of the technology employed.

Automatic Vehicle Location Planning Guide: [8]

In 1976, an introductory planning guide for "The Application of Automatic Vehicle Location in Law Enforcement" was published on a LEAA grant. This makes reference to the earlier experiments and suggests how to avoid the same difficulties through detailed planning. The integration of RMS/CAD/CA/VTD systems was not addressed and the actual use of the information was not detailed.

St. Louis (MO) Police Department: [9]

In 1976 the St. Louis (MO) Police Department installed a prototype system in one district of the city. This was the FLAIR system. Flair is a trademark of the Boeing Company and stands for Fleet Location and Information Reporting. Tests were conducted for about one year. The objectives were to reduce response time and study the relationship of police vehicle locations to the occurrence of crime and the effects of directed patrol. The study was discontinued at the end of the year because of difficulty in accuracy of the reporting of locations, lack of reductions in response times and the lack of ability to playback the vehicle location information for future study. Here again, the major drawback to the system was that the expectations and demands placed on the system were more than the available technology could supply.

Initial analysis of the results of the experiment did result in a finding that by using a properly designed VTD system, police departments could reduce the patrol resources assigned to areas so covered by between six and seven per cent, or by maintaining the same level of resources, result in a six to seven per cent increase in the available service levels. This study recommended additional studies on the use of "Directed Patrol."

National Institute of Justice: [10]

In May of 1985, the National Institute of Justice, Technology Assessment Program, published it's document, "Vehicle Tracking

Devices." The stated purpose of the document was to establish performance requirements and methods for testing vehicle tracking devices and systems. This document sets standards for the transmitters and receivers used in the various systems. It does not deal at all with the potential data to be transmitted or the uses that might be made of that data.

Kern County (CA) Sheriff's Office: [11]

In 1985, the Kern County Sheriff's Office installed 14 II Morrow units in patrol cars. They intended to "give the CAD eyes" and expand the system to the entire fleet. They have a bid from a company to integrate the VTD and the CAD, but have run into budget problems. Under current conditions the dispatchers and the watch commanders can view the screen and can use it for tactical decision making during dispatch, however most of the patrol fleet is not equipped with the devices. There is no interface with other automated systems. There are no strategic (management) reports generated. They have not used the VTD for formal employee disciplinary action.

Irvine (CA) Police Department: [12]

In 1986, the City of Irvine installed a II Morrow system in 25 patrol units. The city does not have a computer aided dispatch system and the VTD does not interface with any other systems. The system is used by the dispatcher and the watch commander for tactical decision making during the police dispatch function.

The VTD information is not recorded and is not available for playback or review after it has passed. There are no strategic (management) reports generated from the system. The department reported no organized employee resistance and they have not used the system for formal employee evaluation or discipline proceedings.

Garden Grove (CA) Police Department:[13]

In 1987, the City of Garden Grove installed a II Morrow VTD system in 33 patrol units. The system is used by the dispatchers and the watch commander for assistance in tactical decision making during the police dispatch function. The system is not interfaced with any other computer aided dispatch or records systems at this time. Garden Grove reported that one important reason for the installation was to protect the city in any possible future cases of public complaint about the deployment of its forces.

Vehicle location information is recorded on a computer disk, but not currently available for playback or review, although the Department has plans to do so. There are no strategic (management) reports generated from the system. The Department reported no employee resistance and has not used the system for formal employee evaluation or discipline proceedings.

Others:

The California State Department of Justice has a small number of their vehicle's equipped with II Morrow VTD system in a task force operation in the San Francisco Bay Area. Details of this operation are classified for security reasons. There are several private businesses in California using one or the other of the VTD's for fleet and human resources management. These include ambulance companies, tow companies, sanitation companies, delivery companies, cement delivery companies and private security companies.

Over the past 10 years there have been several other experiments in local law enforcement with one or more of the VTD systems that have been described. Dallas, TX and Stamford, CT, have tried systems, but have not continued or have limited the use of the systems due to technological difficulties.[14]

Discussion:

As has been seen, there have been a number of VTD experiments and operations during the past fifteen years. Most that were installed prior to about 1985 have been taken out of service, or limited in application, basically because the then existing levels of VTD and computer technology were not up to the task. In most previous VTD system programs, researchers recommended additional studies.[15] Local law enforcement has been very slow to make these studies and take advantage of the improvements in

technology that have been made over the past fifteen years. In the few short years since the beginning of VTD systems, computer technology has advanced to the point where it's capabilities exceed most prior VTD system expectations. Computer systems (including VTD's) will continue to develop at an ever increasing rate in the near future as private companies race to incorporate such developments as Artificial Intelligence (AI), voice interactive systems, laser disks, optical disks, other improved data storage retrieval systems, improved graphics, improved networking systems, miniaturization of all systems and alternative power sources. Lap top terminals are now more advanced that many mainframe systems of fifteen or twenty years ago. Although a good number of municipal and county police agencies have implemented a great deal of the current computer technology with RMS and CAD systems, across the state, most have not.

As of January 1, 1988, both the City of Redding and the City of Arcadia reported that they have funds budgeted for VTD installations in the 1988-89 fiscal year. Arcadia intends to install a II Morrow system and Redding intends to install a Motorola system. Although funding of these programs and in particular, funds for research and development of new systems, is difficult to find in the current situation of restricted government (local) resources, additional agencies must be found that are willing to help develop future VTD systems.

Current VTD Equipment:

Motorola Tracknet system.[16]

In 1985, Motorola Communications and Electronics, Inc. introduced Smartnet II, a "trunked" radio system for public safety agencies that allowed the integration of "Tracknet", the Motorola Corporation's AVL system. This system operates on the LORAN-C network. The development of this trunking was in response to the Associated Public Safety Communications Officers, Inc. planning guide for 800 Mhz trunked communications systems. This system incorporates the most modern computerized radio channel selection and identification technology available to the civilian market. The VTD part of this system has only been installed in a very limited number of municipal law enforcement situations. It's features include digital map displays for dispatch. Printer ports are available. MDT's are available to integrate with the entire system. These systems can be integrated with RMS and or CAD systems, but to date, this has only been done with CAD. There are currently no operational systems of this type in use by the police in California. The company's AVL system is also available as an independent system without the trunked system. System costs vary widely, depending on the size of the installation as well as integration with other available systems, such as additional computer interface with (RMS/CAD/CA) programs. The VTD stand-a-lone system, with radios, could be expected to run between $3,000 and $5,000 per unit, plus base station costs.

ETAK, Inc. (Navigator):[17]

One of the VTD manufacturers, ETAK, Inc., of Menlo Park, California, has coupled the information available from a computer enhanced dead reckoning system with an on-board map display that constantly shows the operator the position of the vehicle in relation to the surrounding geographical features, such as streets, hospitals, waterways, etc. Enhancements to this system provide for a variety of digital messages (mobile data terminal) to be exchanged between the vehicle and the dispatcher. To date, over fifty of the largest metropolitan areas of the U.S. have been placed on digitalized maps for use with this system. This system is currently being tested under a "beta-test" site contract by the Pleasant Hill, California, Police Department.

Features of this system include interface with both RMS and CAD, dispatch console controls with optional remote terminals and unit status transmitter in each vehicle, including a "silent" emergency "distress" alarm. Supervisorial or management reports on all aspect of the dispatch and/or unit location operation are available on an "ad hoc" basis from the relational data base program on the host computer. Records from this system may be directly printed or stored for later retrieval and analysis in the host computer. ETAK navigator units cost between $2,200 and $2,800 per unit. There is an additional cost of about $1,000 each for a data channel radio for each unit, if necessary, in the particular installation. This does not include additional

computer integration (RMS/CAD/CA) programs.

II Morrow, Inc.:[18]

The II Morrow VTD is a LORAN-C based system. They are the most widely used VTD systems by local law enforcement in the U.S. at this time. The three VTD systems currently in use in California are II Morrows. It's features include: A unit status transmitter in each vehicle, a "silent" distress alarm with a silent remote (officer carried) transmitter for emergencies, and a digital map display at the systems console's control center; optional additional remote display terminals; printer port access or optional interface with existing CAD operations. The vehicle LORAN units are connected to a radio in the vehicle and transmit to the control station on a data channel.

System costs can be expected to average between $2,200 and $3,000 per unit, including a data channel radio. This does not include programs for interfacing with any other automated systems (RMS/CAD/CA) that an agency might have in place.

II. Forecasting the Future

The first step in futures studies is to factor and study the general issue, utilizing futures research methodologies. The outcome here is three futures scenarios. The general issue is stated as follows:

By the year 2000, how can automated police vehicle tracking devices/systems (VTD) be utilized in the management of the Pleasant Hill Police Department?

Of course, if one local agency in the state can implement such a system, it is logical to generalize that any agency in the state could do the same. Therefore, the material presented in this paper may have application throughout the state, with modification to fit the special circumstances to the individual community. A number of related issues have been identified from the past. They were:

1. Have reliable VTD systems been available in the past? If, yes, have they been able to provide sufficient officer safety and management information to make them useful and practical? How have they been used?
2. Has there been an identified need for the information potentially available from the existing VTD systems?
3. Has there been political resistance or support for the use of VTD's by the police? If yes, what has been the source of the resistance or support?
4. If systems are available, why is it that they are not in wide-spread use in California law enforcement today?

Related issues emerging in the present were identified by a survey instrument and a nominal group technique process. These issues were then subjected to a preliminary screening, as an approach to structuring the general issue for further research. The result was a list of four issues that, when considered together, essentially define the parameters of the general issue being studied:

1. Are reliable VTD systems available today for the use of local law enforcement agencies?
2. What is the nature of the officer safety and supervisory and management information, both tactical and strategic, available from the vehicle tracking device systems?
3. Is there general support or opposition to the use of VTD's by police agencies? What is the source of such support or opposition?
4. What might be the results of the wide-spread use of VTD (integrated records management, computer aided dispatch, crime analysis and VTD systems)?

Consideration was given to related issues that might emerge by the year 2000. Future issues were judged to be relevant on the basis of potential impact upon possible futures scenarios. The initial selection was:

1. What additional technological developments in VTD systems are likely to occur?
2. What heretofore untapped uses of the information potentially available from VTD systems are possible?

3. What legal or political intervention in the use of VTD systems by police management might occur?

TRENDS AND EVENTS:

The research into the background of this basic issue resulted in the identification of several general questions that needed to be answered before the basic question of how the Pleasant Hill Police Department can utilize VTD technology could be answered. First and foremost was : If the technology exists to provide basic VTD system integration with law enforcement CAD operations and management information, why is the use of these systems limited to less than one percent of the law enforcement agencies in the state? Other questions followed, such as : What features of VTD systems are important to potential users and what features are seen as not useful or impractical? What research and development programs, if any, are underway? What was the moving force behind the current installations? What are and or were the obstacles to additional installations? To answer these and other similar questions a survey/questionnaire was designed in January of 1988 to solicit information from law enforcement agencies as to the current status of the use of VTD's.
The questions asked in the survey were identified by scanning the literature, an interview with one[19] current user of a VTD system, polling other law enforcement managers and personal reflection by the author. From this process several basic questions were developed into the survey instrument. These

questions were developed into the survey instrument. These questions included material on potential stakeholder in the process. The survey was divided into three parts. This survey was mailed to over 200 law enforcement agencies of various sizes across the state. Several out-of-state agencies were also selected after they were identified by the major manufacturers of VTD's as having operational systems. Within California, the 100 largest agencies were selected as well as 100 medium to small sized police and sheriffs departments. Several State Police agencies were also selected, i.e., the California Highway Patrol,the California State Police and some units of the University and College Police system. Of the 200 questionnaires mailed out, a total of 102 were eventually returned (51%). Eighty-seven were returned by the designated deadline, at which time they were subjected to detailed statistical analysis in the Statistical Package for the Social Sciences (SPSS-V 9.0) at California State University at Hayward under the direction of Dr. H. Tombari. The results of this statistical analysis are detailed in the following parts.

Part I of the survey asked for opinion responses as to the level of ten specific trends and two potential events identified by the process detailed above. Respondents were encouraged to add any trends or events that they felt might be important to the issue. Pre-identified trends questions were:

1. What is the percentage of the community resources available

for the LE function?

2. What is the trend of the number of negligence suits against the police (for all reasons)?
3. What is the trend of the frequency of citizen complaints for/about police "coverage"?
4. What was/is/will be the status of VTD technology.
5. What is the cost of VTD technology?
6. What was/is/will be the level of increased demands for improved police response times?
7. What was/is/will be the increased demands for efficient management of the police function?
8. What was/is/will be the level of traffic accidents involving police units?
9. What was/is/will be the rate of officer injuries or deaths (for all reasons)?
10. What was/is/will be the number of citizen complaints of police misconduct?

Respondents added another thirty-three "trend" comments to the survey. Those comments are shown on Appendix 1, presented exactly as the material was written by respondents. It has not been edited. This is so that the comments will more accurately reflect the true opinions and feeling about the current status of the issue by respondents.

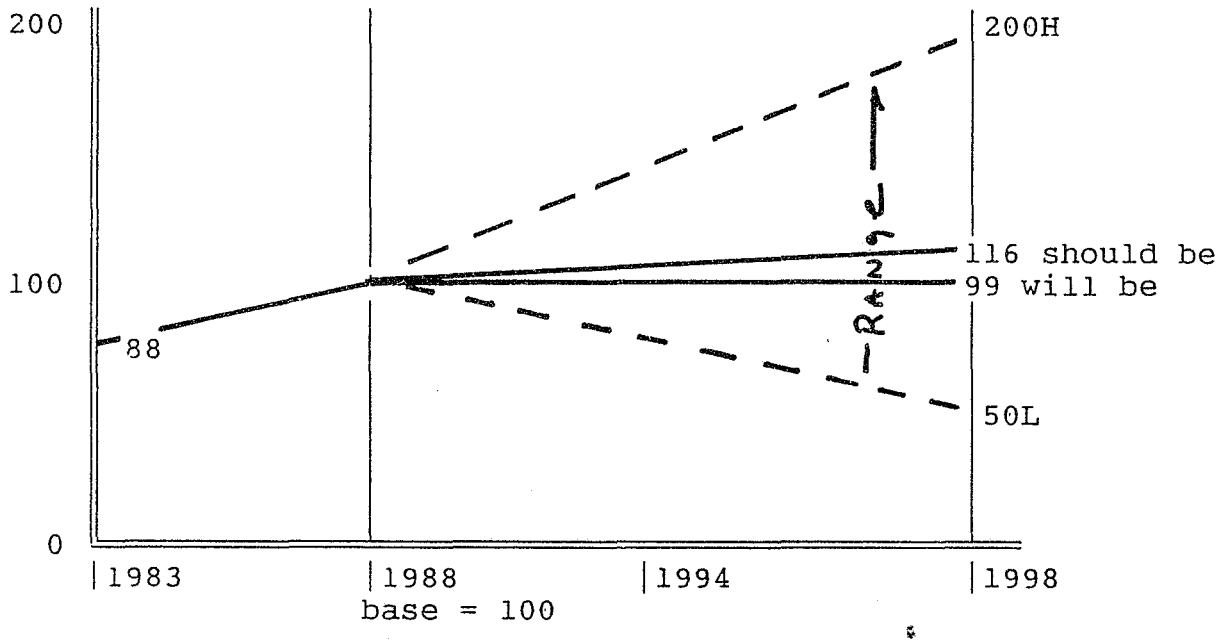
To distinguish between these trends and the trends identified by

the nominal group discussed later in this paper, the first set is titled, **SURVEY TRENDS.** The ten trends detailed on the survey are the only ones subjected to the SPSS-V 9.0 statistical program and the results are detailed on charts ST1 through ST10.

The vertical scale on each chart represents the level of the trend, from a low of 0 with the 1988 level pre-set at 100. The horizontal scale represents time: five years ago (1983), today (1988), and ten years into the future (1998). The highest and lowest forecast levels made by individuals in the S group are displayed as such and the range of these numbers is shown on the 1998 scale by a dashed line.

SURVEY TREND 1:

What is the percentage of the community resources available for the LE function?

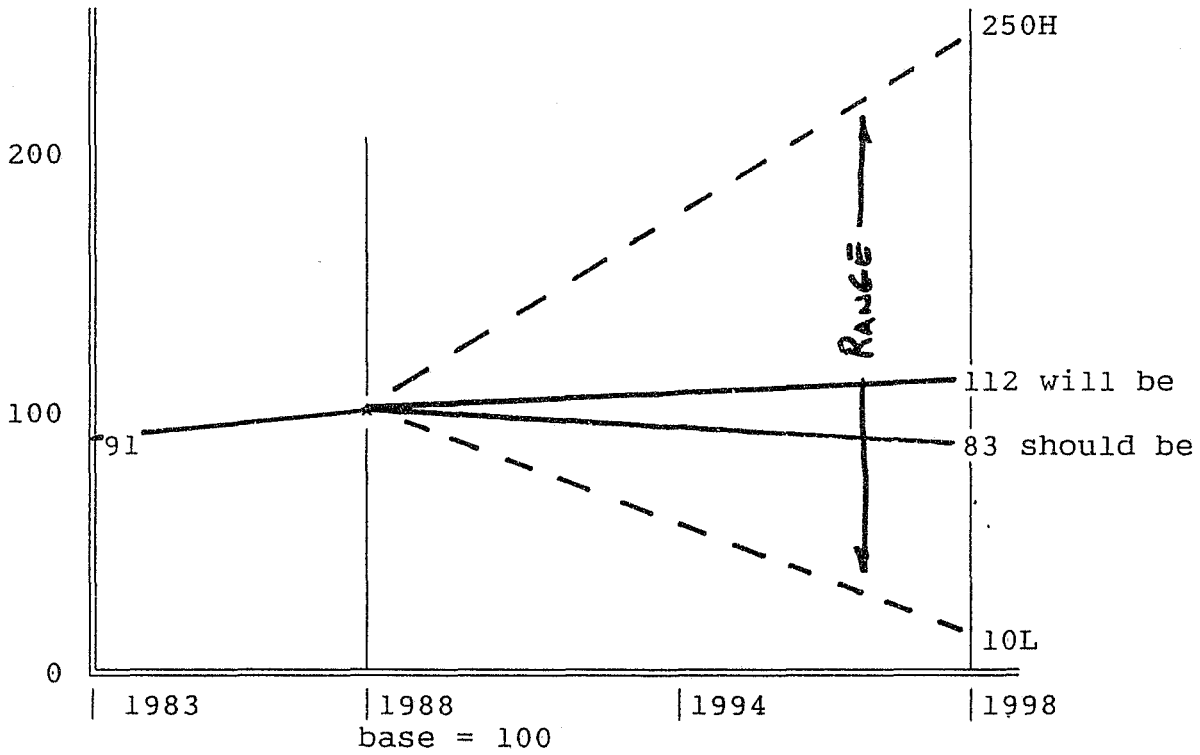


The "range" is the high and low of the S group forecast for what the percent should be in 1998. (High = 200 / Low = 50)
Mean average = 116.

The respondents report that there has been a slight increase over the past five years, from 88 to 100. They have forecast a flat situation over the next 10 years where resources do not increase. The median response of where this should be was 116, 17% over what was predicted. This indicates a need to actively work toward increasing the percentage of resources allocated to the police function.

SURVEY TREND 2:

What is the trend of the number of negligence suits against the police for all reasons?

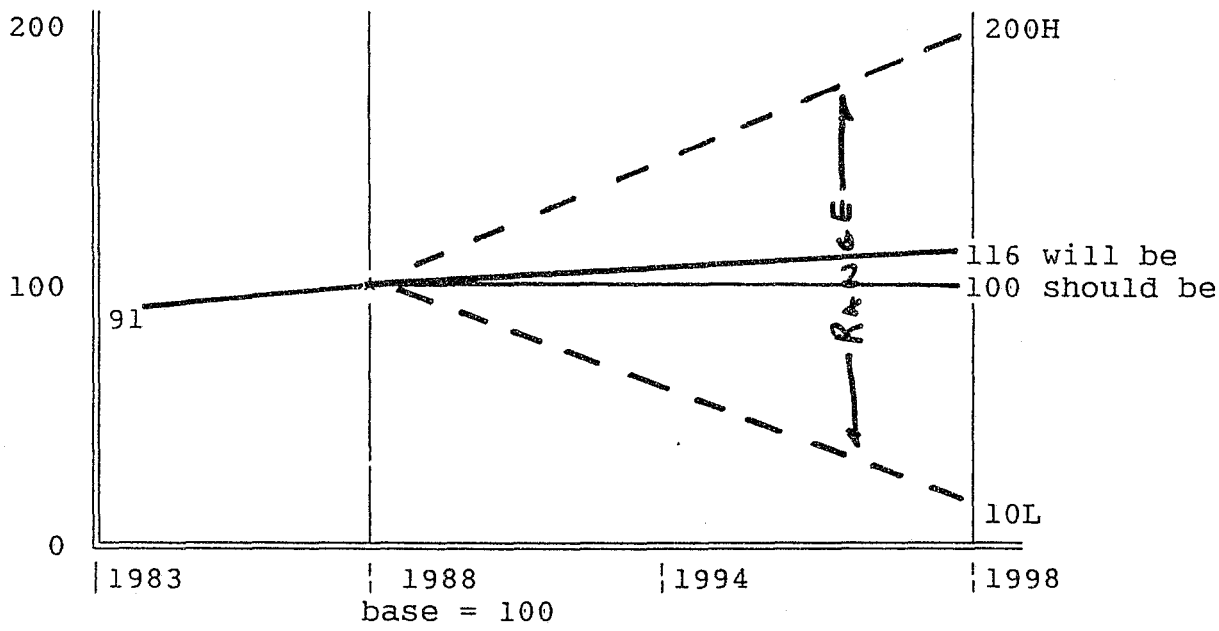


The "range" is the high and low of the S group forecast for what the number of suits should be in 1998. (High = 250 / Low = 10) Mean average = 83.

Not unsurprisingly, the respondents felt that the number of suits will increase over the next ten years (21% increase) while not surprisingly, the group felt that the number should be reduced to a level lower that estimated as current. The recent enactment of the Vehicle Code section providing protection in some police chase situations should result in a reduction in the total number of suits. This section does require that a high degree of management/supervision control be enacted as policy by the departments.

SURVEY TREND 3:

What is the trend of the number of citizen complaints about the lack of police "coverage"?

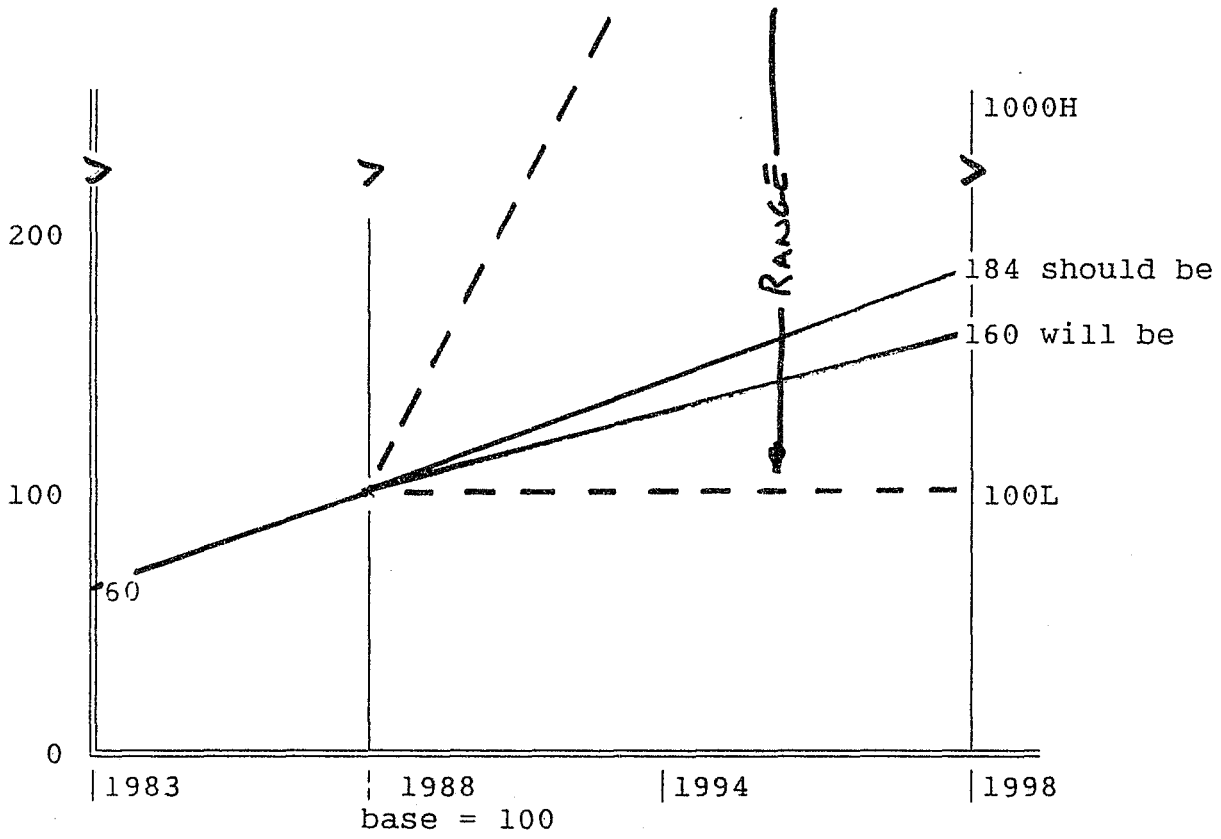


The "range" is the high and low of the S group forecast for what the number of "coverage" complaints should be in 1998. (High = 200 / Low = 10) Mean average = 100.

The respondents felt that there has been a slight increase in the level of complaints over the past five years and predicts a continued slight increase over the next ten years. The group felt that if this level could be held to what it is today, it would be an acceptable level.

SURVEY TREND 4:

What was/is/will be the status of VTD technology?

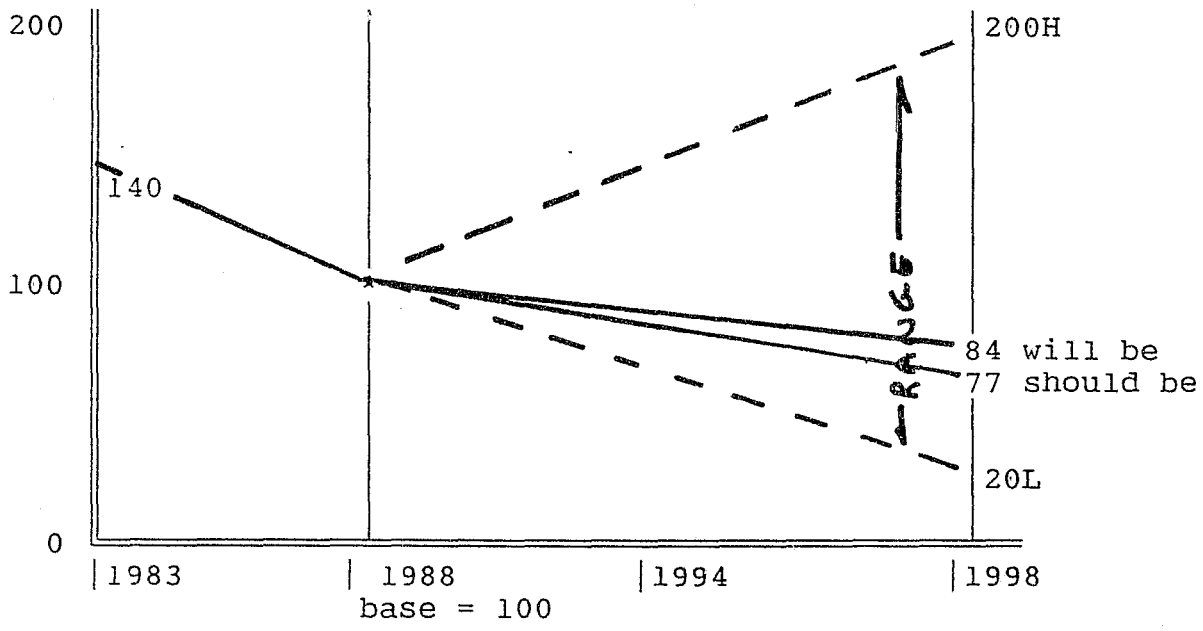


The "range" is the high and low of the S group forecast for what the level of technology should be in 1998. (High = 1000 / Low = 100) Mean average = 183.

The respondents felt that there has been almost a 100% increase in the level of technology over the past five years. The group forecasts thAT there will be an even more rapid increase over the next ten years. Interestingly, the group feels that there should be more improvements that they think will actually happen. This is an area ready for research and development by one or more police agencies, perhaps with grant assistance. The group wants and expects rapid development here.

SURVEY TREND 5:

What is the cost of VTD systems?

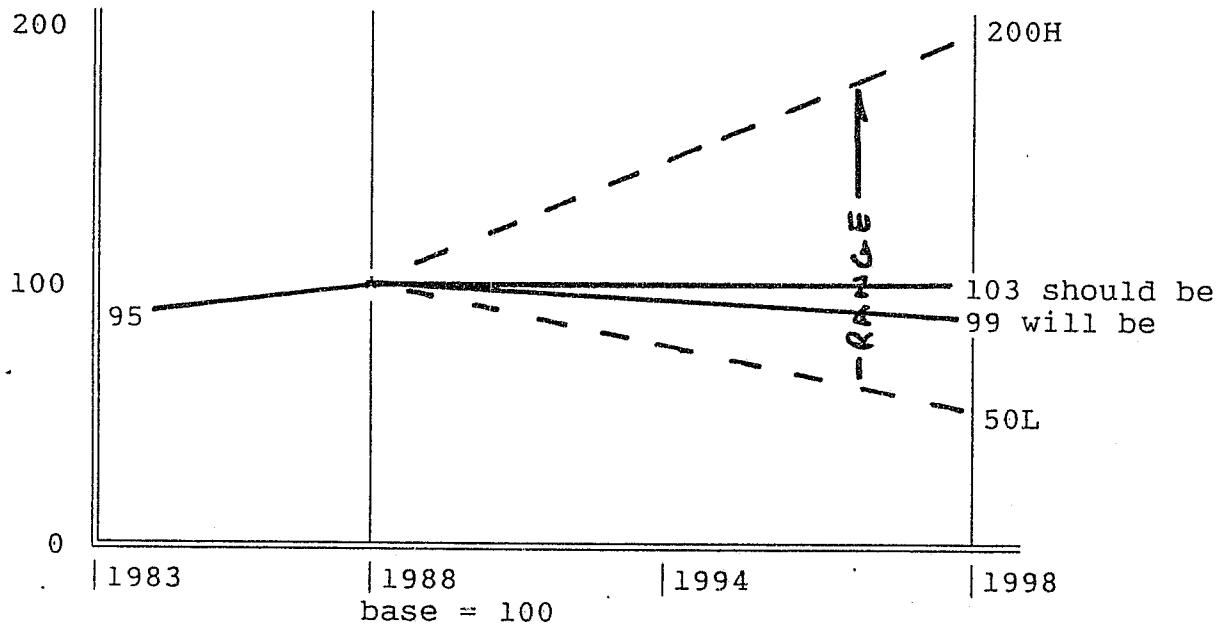


The "range" is the high and low of the S group forecast for what the cost of VTD systems should be in 1998. (High = 200 / Low = 20) Mean average = 77.

The respondents have seen the cost of VTD drop almost 30% over the past five years and expects that it will drop another 15% in the next ten years. They felt that the cost should drop 25% during the period. This is coupled with the expectation that the level of development of VTD's will improve by between 60% and 85% during the same period. In order to increase the level of interest in the use of VTD's, the cost of the system must be reduced. It is apparent that few respondents know sufficient detailed information about VTD cost to accurately respond. Their responses were apparently based, for the most part, on the cost levels of computer systems in general.

SURVEY TREND 6:

What was/is/will be the length of response times by police to emergencies?

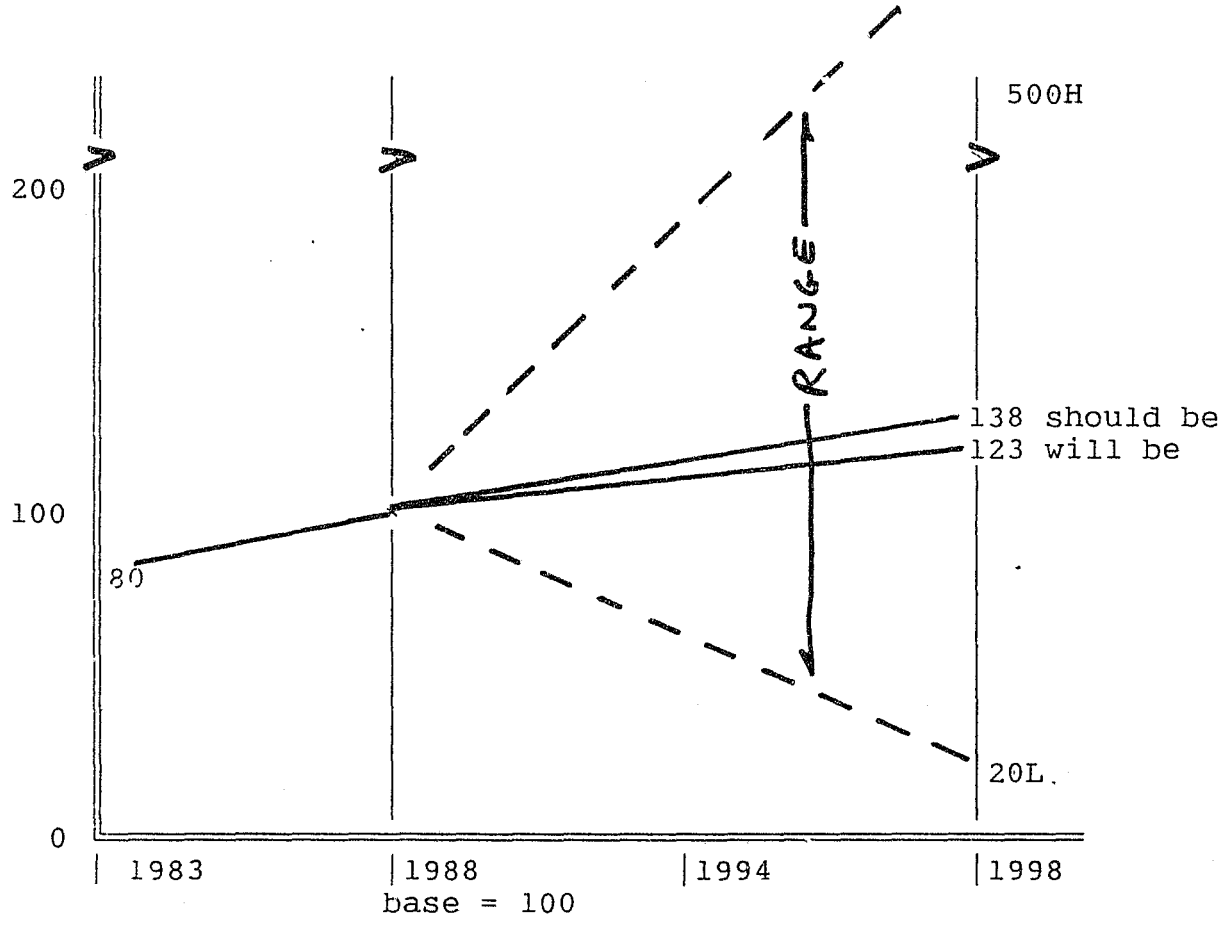


The "range" is the high and low of the S group forecast for what the average response time should be in 1998. (High = 200 / Low = 50) Mean average = 103.

The respondents report that in their opinion, response times are slightly better (5%) now than in 1983. This relates to ST1 which reflected a slight (12%) increase in the resources available. The estimate of times for 1998 is 99, or 1% slower that the current rate. This anticipates no improvement. The desired level is reported to be 103, an almost insignificant increase in times. This reflects a current satisfaction with the current level, consistent with ST3, the level of complaints about the lack of police coverage. An apparent acceptable level has been reached. There seams to be a complacency with the current levels and they are apparently not an issue.

SURVEY TREND 7:

What was/is/will be the demands for efficient police management?

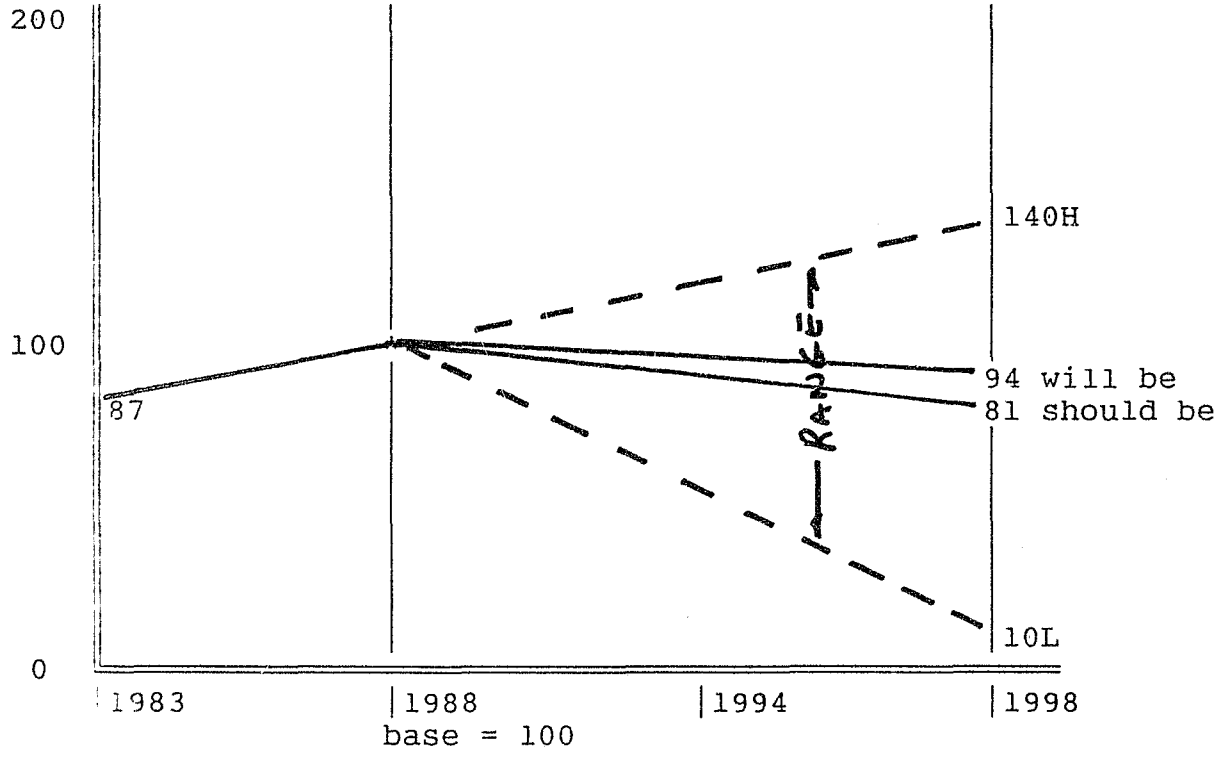


The "range" is the high and low of the S group forecast for what the demands for efficiency should be in 1998. (High = 500 / Low = 20) Mean average = 138.

The respondents report a steady growth (20%) in the demands for efficiency to today's level with a prediction that demand will continue into the future. The respondent felt that the demand should be higher than they feel it will be. This may mean that many managers believe they should be more efficient than they are and that the public should demand even more effectiveness. This is a pessimistic approach. (Seven respondents felt that a level of 200 or more was a valid target, while only 3 felt a level under 100 was acceptable.)

SURVEY TREND 8:

What was/is/will be the level of the number of traffic accidents involving police units?

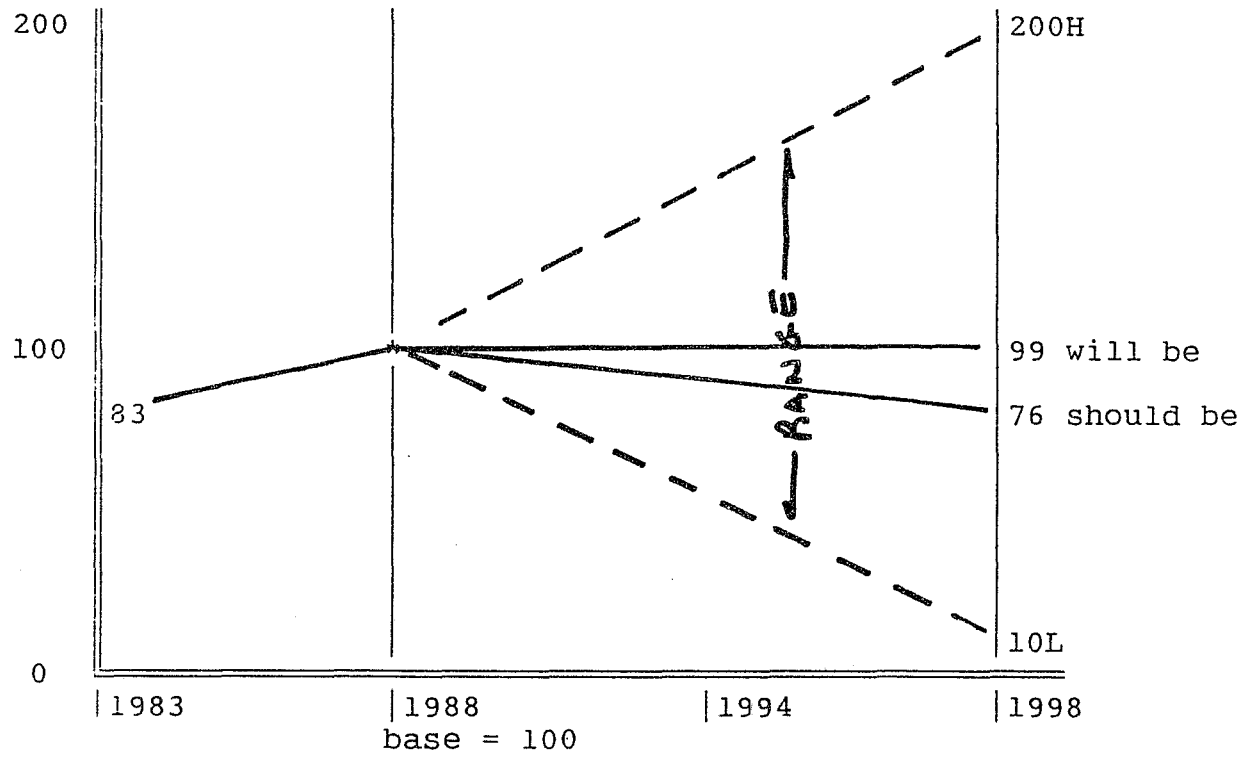


The "range" is the high and low of the S group forecast for what the number of police accidents should be in 1998. (High = 140 / Low = 10) Mean average = 81.

The respondents report a slight increase over the past five years and predicts a slight decrease from current levels over the next ten years. The group would like to see an even greater reduction. This trend is impacted by the recently added vehicle code section, which may help stem the frequency of such accidents by the implementation of strict pursuit and/or emergency response policies.

SURVEY TREND 9:

What was/is/will be the number of officer injuries or deaths?

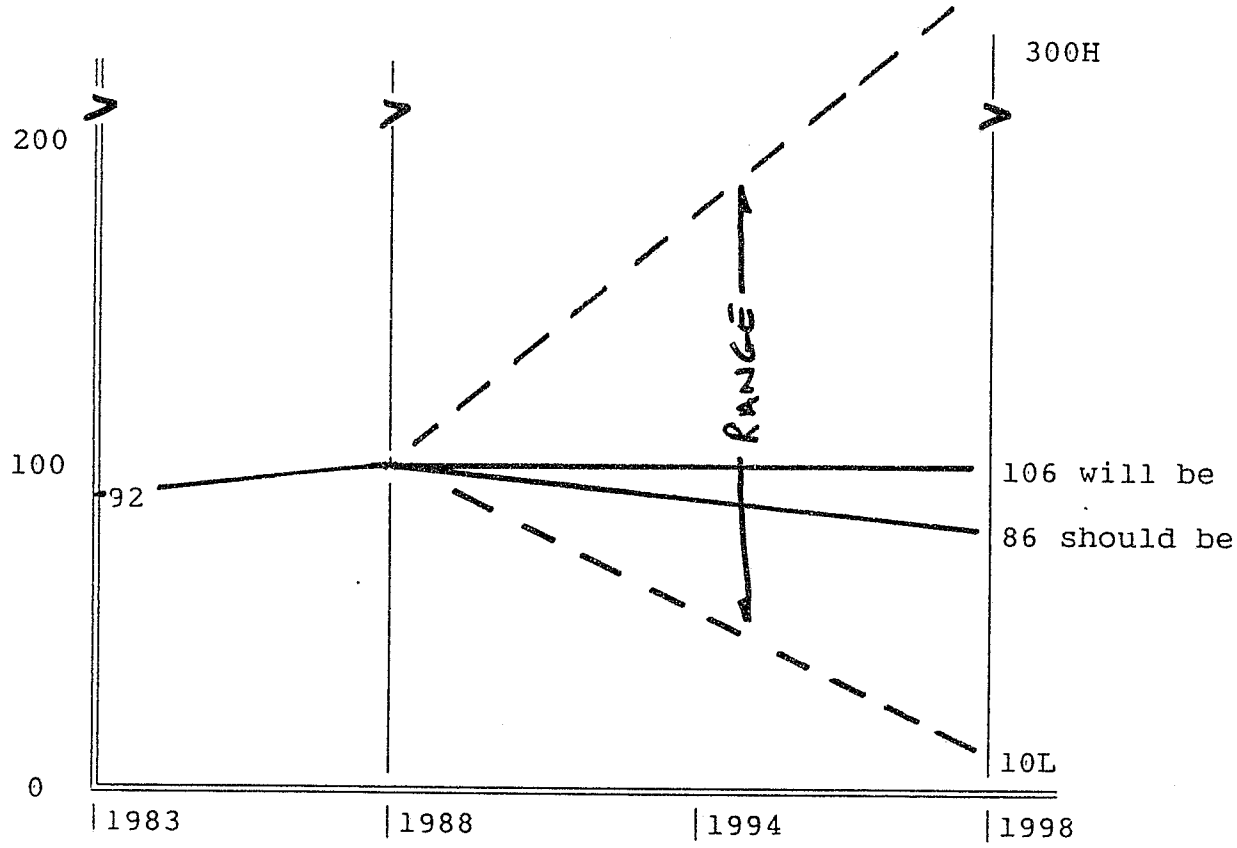


The "range" is the high and low of the S group forecast for what the number of officer injury/deaths should be in 1998. (High = 200 / Low = 10) Mean average = 76.

The respondents' perception is that there has been a increase in the level of this trend over the past five years, and predict that this current level will remain almost constant over the next ten years. As could be expected, the group felt that the level should be much lower than they feel it actually will be. Many respondent hoped for a much lower figure while others were very pessimistic. Officer safety is a major issue and any technology that may improve it will be a welcome and sought after item.

SURVEY TREND 10:

What was/is/will be the number of complaints about police misconduct?



The "range" is the high and low of the S group forecast for what the number of complaints of misconduct should be in 1998. years) (High = 300 / Low = 10) Mean average = 86.

The respondents report that there has been a slight rise in these complaints over the past five years, but that this level will remain almost constant over the next ten years. The group felt that the number of complaints should drop from current levels, but are not optimistic.

SURVEY EVENTS:

Two events were listed in part I of the survey and the respondents were asked to judge the probability and year of first occurrence of both. In both cases, the group response was such that the probability of occurrence was less than 7% by the year 2000. Given that response, these two events were not given further consideration in this section of the study.

Events pre-listed on survey:

1. A personally carried location device will be developed making VTD's obsolete, and:
2. State or Federal restrictions will be placed on the use of VTD's by the police.

Respondents were given the opportunity to write in any additional "events" that they felt may occur that might impact the future use of VTD's by the police. Thirty-two additional comments were received. They are listed, without editing, in Appendix #2, to help capture the actual feeling on the issue of a wide variety of police managers. (No judgments are offered as the probability of any of these events occurring at any time in the future.)

Part II of the survey asked those agencies that do not have any type of VTD to respond to three questions. The eighty-seven responses were analyzed and the results are detailed herein. These responses reflect the opinion of a variety of police managers and supervisors on the subject.

Part II-Survey Question Number 1:

1. Does your department currently use any type of automated Vehicle Tracking Device (VTD) or computerized vehicle navigation, tracking or location system to track your police units movements? If, No, please indicate all the reasons that apply. (Most respondents marked between 2 and 4 reasons.) The results are summarized here:

A. Unfamiliar with system technology. (11)

B. Not satisfied with present VTD technology. (12)

C. No identified need for services of system. (39)

D. Systems are too expensive. (45)

E. Community resistance. (0)

F. Chief/Management resistance. (4)

G. Police employees (union/association) resistance. (8)

H. No one in the agency/community really cares. (8)

I. Other reasons. (27)

The five highest rated reasons are:

1. Systems are too expensive. (45)

2. There is no identified need for the service of system. (39)

3. Not satisfied with the present VTD technology. (12)

4. Unfamiliar with the system technology. (11)

5. A variety of "other" reasons. (27)

Only eight (8) respondents indicated there was any degree of employee resistance and only four (4) felt there was any degree of management resistance. No respondents indicated there was any community resistance.

It appears from this section of the survey that the primary reasons that VTD are not widely used in law enforcement is because the current status of the technology is not widely known or understood, and a perception of the cost vs benefit issue, not resistance from any one group.

Part II - Survey Question Number 2:

2. If a VTD has been discussed for your department, but there has been resistance to it, please indicate source(s) and the degree of resistance for each source. Fifty-six respondents replied that to their knowledge, a VTD has not been seriously considered for their agency. In some cases some of those respondents indicated where they felt there might be resistance, if VTD's were being considered. Those responses are included in the overall results, summarized here. (scale 1 to 10 with 1 = none and 10 = great deal). (The number of responses at each level are indicated above the scale line and the mean average indicated by an *.)

A. Chief of Police	13	1	1	1	4	3	2	0	0	1	
(level: low	1	2	3*	4	5	6	7	8	9	10	high)

The mean average response is 3.2. This indicates a very low level of resistance overall, with only 10 marks over the mid-point. Resistance by the head of the agency is determinate when it exists in any degree, but the survey shows that the level is low.

B. Department staff: 11 1 4 2 3 2 0 3 0 1

(level: low 1 2 3 * 4 5 6 7 8 9 10 high)

Out of 27 marks, 11 marked 1. The mean was 3.5. This is a low level of staff resistance and is most likely due to poor understanding of the systems advantages. This area requires an education process directed at police managers. This is traditionally done by private equipment or software vendors and usually not very objective. This is an additional area for policy consideration.

C. Department employees: 6 1 0 4 5 2 2 1 0 2

(level: low 1 2 3 4 * 5 6 7 8 9 10 high)

Out of 23 marks, 6 marked 1, and only 3 marked above a 7. The mean was 4.5. This indicates a mid-range level of resistance and might be improved with in-house education. This is discussed in great detail in the rest of this paper.

D. City County manager: 5 1 2 0 2 1 1 1 0 2

(level: low 1 2 3 *4 5 6 7 8 9 10 high)

Out of 14 marks, 5 were 1. The mean was 3.9. As with the Department staff, this is minor resistance. What resistance there is may be based on either a poor understanding of the systems and/or cost/benefit questions. Again, this is a point for further in-house education.

E. City/County Council:	6	0	3	2	2	0	2	1	0	0	
(level: low	1	2	3	*4	5	6	7	8	9	10	high)

Out of 16 marks, 6 were 1 with no marks over 8. The mean was 3.9. This is low to mild resistance on the same basic level as the City/County Manager and may be based on cost estimates. A proper in house staff study could well show that the cost of a VTD or integrated system is much lower in relation to the total Department budget than commonly believed.

F. Public:	7	1	2	1	1	0	0	0	0	0	
(level: low	1	2	*	3	4	5	6	7	8	9	10 high)

Out of 13 marks, 7 were 1 and only 1 was over 5. The mean was 2.6. This is not resistance and reflects the perception that the public knows almost nothing about VTD. The public would notice the effect of an efficiently implemented system and would be the benefactor. There would be little opposition from this quarter.

G. Police Union:	4	1	1	1	6	3	2	10	0	3	
(level: low	1	2	3	4	5*	6	7	8	9	10	high)

Out of 22, 4 were 1. The mean was 5.1. This is the highest level of resistance report and it is mid-range. These figures are from supervisors and managers, not union representatives and may be either high or low, depending on how the VTD issue is approached. This is the primary area for education and policy considerations.

If this resistance is overcome, current VTD technology could be implemented in any department that can fund them. This group is discussed in detail latter in this paper.

H. Other city/ county Depts:	7	0	1	1	1	0	1	0	0	0		
(level: low	1	2	* 3	4	5	6	7	8	9	10	high)	

Out of 11 marks, 7 were 1. The mean is 2.3. This reflects no resistance (and most likely, no knowledge of the systems).

I. Other(s): No other sources of resistance or support were mentioned in any response.

Discussion:

As the situation currently stands in the state, there are few, if any, officially organized group that educate police agencies about available technology. What education that does occur is usually from individual private equipment and software firms, most of which are self-serving, in their attempts to sell their product. New concepts and products are only seen at "trade" shows and vendor booths at police "training" conferences and the like. Little or no objective comparison information is available at the state level. The National Institute of Justice Technological Assessment Program may be of assistance in some areas, but for the most part, each of the over 500 police agencies in the state must do their own research and reach their own conclusions.

Part II- Survey Question Number 3:

What do you think are the features of a VTD system that would encourage your agency to consider using VTD's?

The nine (9) items listed on the survey and the mean average of the response were are listed below and displayed on the graph.

RESPONSE TO SURVEY QUESTION #3,

(Desired features for VTD):

	A	B	C	D	E	F	G	H	I
Most important 10	2	8	20	4	19	6	7	7	20
9	2	11	14	4	13	6	7	7	13
8	13	18	13	5	8	5	17	17	17
7	3	13	9	3	9	13	6	11	6
6	4	1	4	9	8	7	10	9	5
5	16	6	6	13	17	15	12	10	5
4	2	1	1	11	2	5	2	6	1
3	14	8	4	16	3	10	5	8	3
2	10	2	3	7	3	5	4	0	1
Least important 1	6	6	1	3	2	3	3	0	1
0									
	(4.7)	(6.7)	(7.6)	(4.8)	(7.3)	(5.6)	(6.4)	(6.6)	(8.0)

Numbers in the columns = raw numbers of responses.
The mean average response line is marked with ▬.

A. Provide digital/visual navigation maps in the vehicle (4.7)
B. Provide two-way non-verbal (digital) communications between the dispatcher and the vehicles. (6.7)
C. Provide the dispatcher and/or supervisors with constant, real time display of police vehicle location. (7.6)
D. Provide dispatchers and/or supervisors with real-time display of police vehicle direction of travel and speed. (4.8)
E. Provide dispatchers and/or supervisors with real-time display of police unit readiness status. (7.3)

E. Provide dispatchers and/or supervisors with real-time display of police unit readiness status. (7.3)
F. Provide supervisors/managers with a complete computer recording of police unit locations at all times during the day.(5.6)
G. Provide crime analysis mapping. (6.4)
H. Provide fleet and human resources management statistics. (6.6)
I. Provide a direct interface with CAD access to police records and/or communications. (8.0)

Three of the possibilities received high interest marks. Those were: CAD/records/communications interface, real-time display of unit location and unit readiness status. Two areas received relatively low marks; (A) navigation maps in the units (4.7) and (D) the display of speed and direction of travel(4.8). This seems to indicate little current interest in the use of this technology in enforcing department policy regarding emergency response speeds. It appears that this potential is not understood. Such control should be a major liability concern for all department members.

The results of the survey may be interpreted in a variety of ways. First, only a very small percentage of the responding police officials have any definitive knowledge about the current status of VTD technology. Of the 100 surveys returned from agencies in California, only three responded that they currently had any type of VTD. These agencies are not the largest ones on the state. No local agency that was identified from any source as having a VTD failed to respond. The three current systems represent less than one (1) percent of the total police agencies in the state. None of these three that do have systems had any

degree of VTD integration with other automated systems. None of the three currently have any programed "management" reports generated from the system. Each uses the systems for tactical purposes from the dispatch and/or station watch commander positions. It appears that those agencies that do use a VTD, do not use them to there full potential. The reason for this, as expressed in all three cases, is lack of funds for additional programing.[20]

Survey Conclusions:

This survey provided some answers to the questions raised at the start of the futures forecasting process, namely, have reliable VTD systems been available? If so, has there been a need for the information that VTD's can provide? Has there been resistance or support for VTD use in police departments and if so, what is the source and strength of each? The responses to the survey have shown that very few police managers know what is currently available in the way of VTD's or have given detailed thought to how such systems might be utilized in their operations. Many have expressed the opinion that there is little need for much of the information that could be provided and that the systems are too expensive for what is available. It appears that little detailed thought has been given to the potential for integrated RMS/CAD/CA/VTD systems. Because of that, it does not appear to be a high priority with many.

This position will most likely change in the near future as police resources remain at steady low levels while the demand for effective police response increase. Police misconduct as it relates to the driving of police units under both routine and emergency conditions, congregating at crime scenes (or at meal time), non-patrol/response to specific areas of the community, officers "hiding" from their supervisors or the public, officers "straying" from their assigned areas, slow response times to calls for service, and the like, can all be taken under much closer supervision and management by the use of VTD systems. When the potential of the VTD systems to document police activities to protect against much of the unjustified criticism and liability that is currently "vogue" is clearly recognized, that alone will be a compelling reason to integrate it into standard police operations.

Nominal Group Technique (NG)

A Nominal Group Technique session was conducted at Pleasant Hill Police Department on February 18, 1988 to address the issue, "Police management's use of VTD's". See Appendix # 3 for a list of participants. These individuals were selected because they provided a wide range of experience in management positions, police or otherwise. One member is a assistance municipal finance officer and one is the director of the research and development section of a major VTD manufacturing company. This

group will be referred to as the NG group throughout this report. The NG group was briefed on the results of the survey noted above and a brief history of VTD systems was presented. Using the modified policy delphi process, the NG group then identified fifty-three (53) current trends that they felt may have an impact on the issue of the use of VTD by the Police Department. The complete list of NG trends and their rank order as determined by the NG are presented in Appendix 4. From this list the NG group selected seven (7) trends that were "voted" the most important. These trends were then subjected to evaluation by the NG group to determine the level and direction of the trends. Then, using the same process, they identified fifty-one (51) possible future events that might impact the use of the VTD. The complete list of NG events and their rank order of importance as determined by the NG are presented in Appendix 5. From this list the group selected five (5) possible events that were judged as having the most important possible impact. The seven (7) trends and five (5) events are listed here in the order of priority given them by the group.

Nominal Group (NG) Trends:

1. There is a trend toward police agencies integrating their Records Management Systems (RMS) with Computer Aided Dispatch (CAD , Crime analysis (CA) and Vehicle tracking devices (VTD).
2. There is a trend of continued demand by the public for improved police service.

3. There is a trend toward the regionalization of public safety agencies and resources.
4. There is a trend for the courts to demand verifying documentation of police conduct in both criminal and civil cases.
5. There is a trend toward the increased use of computerized assistance in the command and management of resources during critical incident situations.
6. The increased use of police information and records for community planning.
7. There is a trend toward improved coordination and integration of activities by neighboring law enforcement agencies.

Nominal Group (NG) Events:

1. An integrated RMS/CAD/CA/VTD system will be demonstrated that improves police efficiency by a significant amount.
2. Several major automobile companies provide navigator systems as options in vehicles, driving costs down.
3. Technological advancements allows the total integration of VTD's with all other computerized systems (RMS/CAD/CA).
4. A personally carried location device is developed and available to the police.
5. A VTD is credited with saving an officer's life.

This list of selected events was then evaluated by the NG group

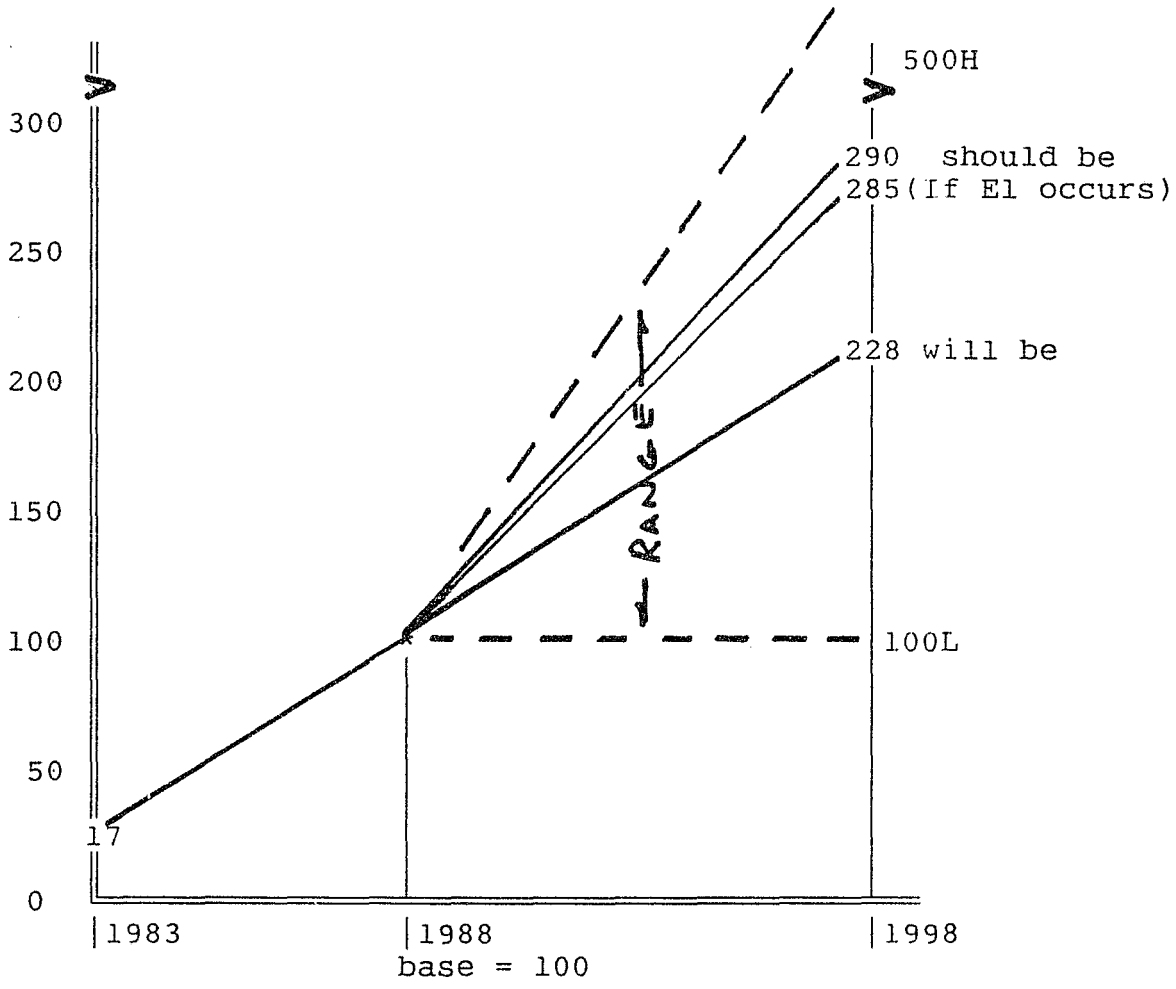
to establish both probability estimates and net impact estimates. They were then evaluated using a cross-impact analysis system. The results of that analysis are incorporated into the NG trend graphs, each on a separate graph, displaying trend lines, the median of the NG responses, ranges of responses and the predicted results of the possible event impact on a scale of +10 (highest positive impact) to -10 (highest negative impact)

The vertical scale on the graph represents the trend levels with today (1988) = 100. The horizontal scale represents the year. The key years for this study are five years ago (1983), today (1988), and ten years in the future (1998). The highest and lowest forecast numbers by individual group members are shown on the 1998 time line. This range is marked by a dashed line.

The events are likewise displayed on graphs. The vertical scale represents the degree of probability of occurrence and the horizontal scale represents the year. The key years for this study are five years ago (1983), today (1988) and twelve years in the future (2000). Each graph includes a figure of "potential impact on the use of VTD by the police" on a scale of +10 to -10.

NG TREND 1:

There is a trend toward police agencies integrating their Records Management Systems (RMS) with Computer Aided Dispatch (CAD) , Crime Analysis (CA) and Vehicle Tracking Devices (VTD).

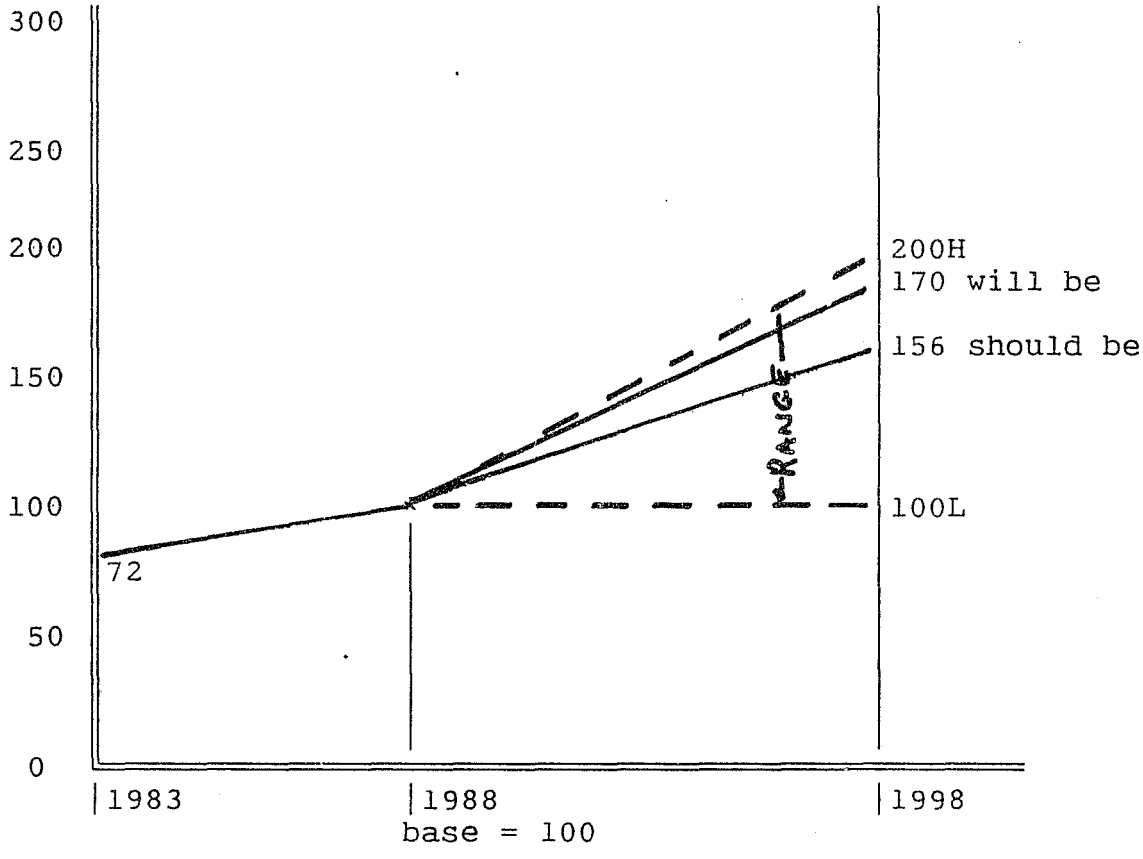


The "range" is the high and low of the NG forecast for what the degree of integrated systems should be in 1998. (High = 500 / Low = 100) Mean average = 290.

The group felt that the integration process should move ahead faster that they think it will by some 27% by the year 1998. (T1 will be increased by 25% if E1 occurs.) This is consistent with the prediction that cost will continue to drop while the status of the technology will improve. The members of this group have expressed an optimistic outlook. They are ready for improvements in all aspects of automation in law enforcement.

NG TREND 2:

There is a trend of continued demand by the public for improved police service.

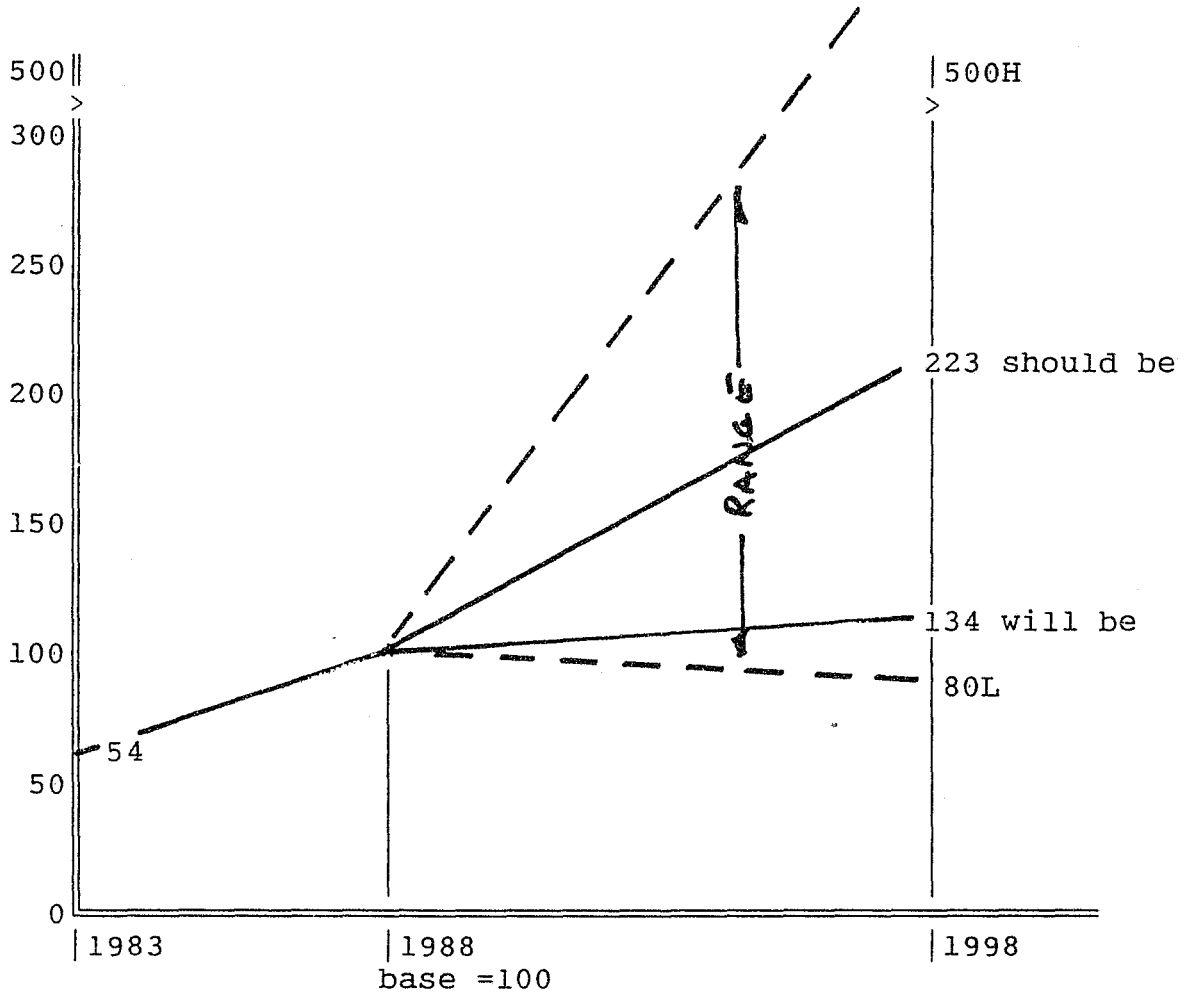


The "range" is the high and low of the NG forecast for what the degree of demand for improved service should be in 1998.
(High = 200 / Low = 100) Mean average = 156.
Low = 100) Mean average = 290.

The group predicts that the public demand for police services will be 9% higher that it should be. This reflects the feeling by many police managers that the general public has an slightly high expectation of the capabilities of the police. This situation may be somewhat corrected through public education programs that accurately report the reality of police procedures and policies. This could be the subject of additional research. This reflects the expectation that service requests will exceed resources, given current trends.

NG TREND 3:

There is a trend toward the regionalization of public safety agencies and resources.

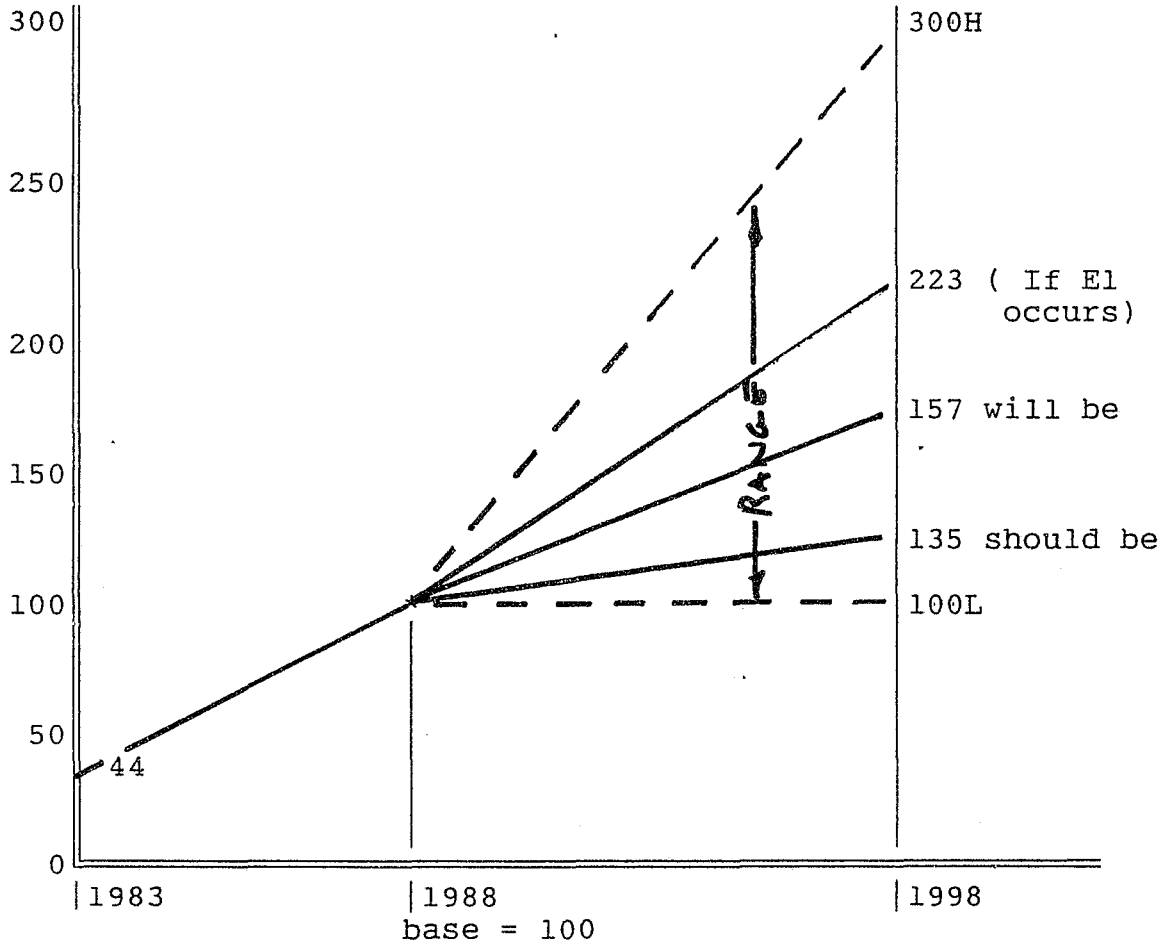


The "range" is the high and low of the NG forecast for what the degree of regionalization should be in 1998. (High = 500 / Low = 100) Mean average = 290.

The group feels that regionalization will be 66% behind where it should be in 1998. This reflects a clear perception of need for some regionalization beyond what current political reality will allow. There are in excess of 500 independent local police agencies in the state with a population in excess of 25 million. Most of these agencies have ten sworn employees or less.

NG TREND 4:

There is a trend for courts to demand verifying documentation of police conduct in both criminal and civil court cases.

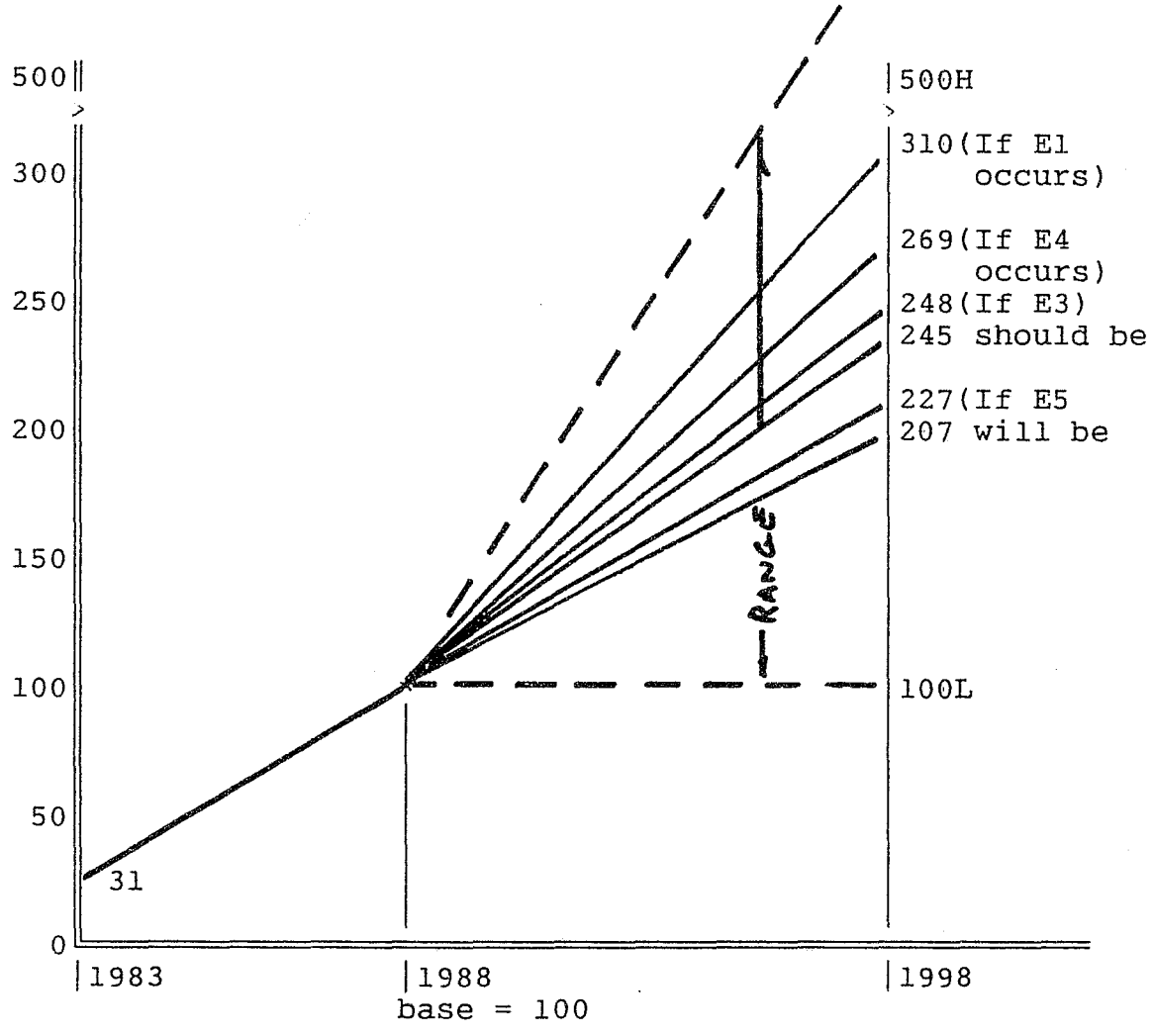


The "range" is the high and low of the NG forecast for what the degree of required documentation of police movement should be in 1998. (High = 300 /Low = 100) Mean average = 135.

The feeling of the group is that verifying documents will be necessary more than they should. RMS integrated with CAD and VTD is one method of providing much of this documentation. This generally reflects the wish by the group that the courts would take the police at their word, but this is in conflict with the political realities of the day. (ST4 is increased by 50% if E1 occurs.)

NG TREND 5:

There is a trend toward the increased use of computerized assistance in the command and management of resources during critical incident situations.

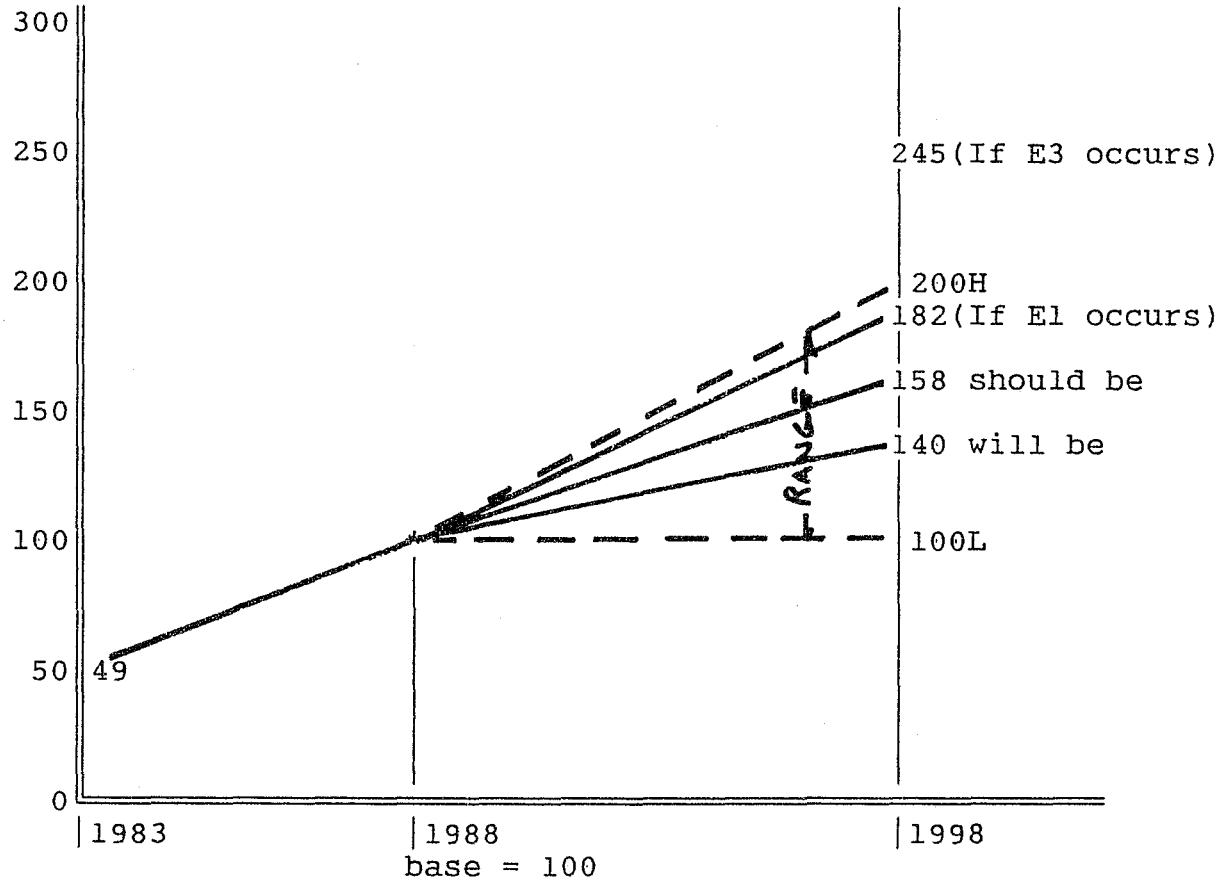


The "range" is the high and low of the NG forecast for what the degree of utilization of automated systems for command of critical incidents should be in 1998. (High = 500 / Low = 100) Mean average = 245.

The group predicts that the use of these systems will more than double over the next twelve years, but that the systems should be used more than they will be. This is an area that will take policy development. (ST5 will increase by 50% if E1 occurs, 20% if E3 occurs, 30% if E4 occurs and 10% if E5 occurs.)

NG TREND 6:

The increased use of police information/records for community planning.

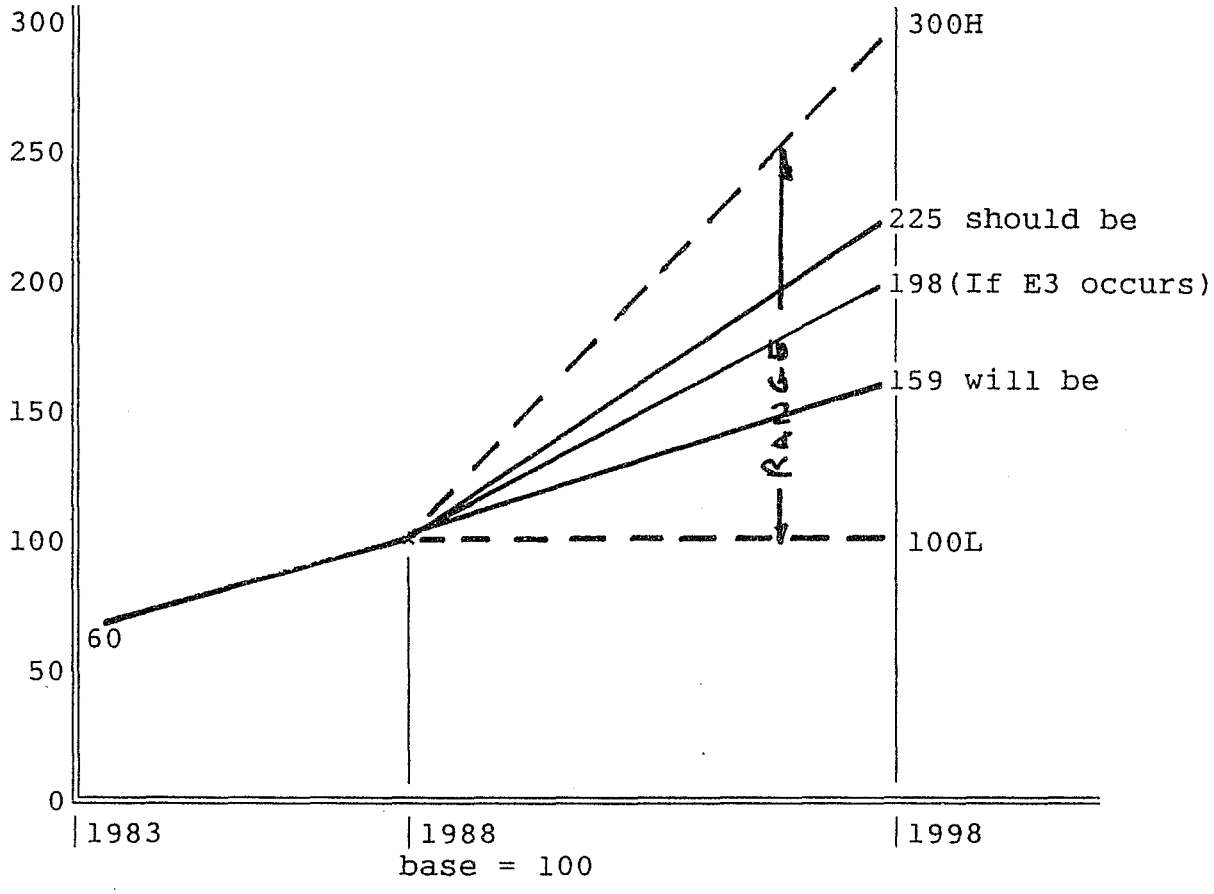


The "range" is the high and low of the NG forecast for what the degree of information from integrated systems should be in 1998. (High = 200 /Low = 100) Mean average = 158.

The group felt that police records will be used half again as much to assist in the community planning process than as is currently done, but that those same records could be used more than they will be. (ST6 will increase by 75% if E3 occurs and 30% if E1 occurs.) This reflects the fact that a totally integrated RMS/CAD/CA/VTD system can provide statistics on social issues that are not readily available through other means.

NG TREND 7:

There is a trend toward improved coordination and integration of activities by neighboring law enforcement agencies.

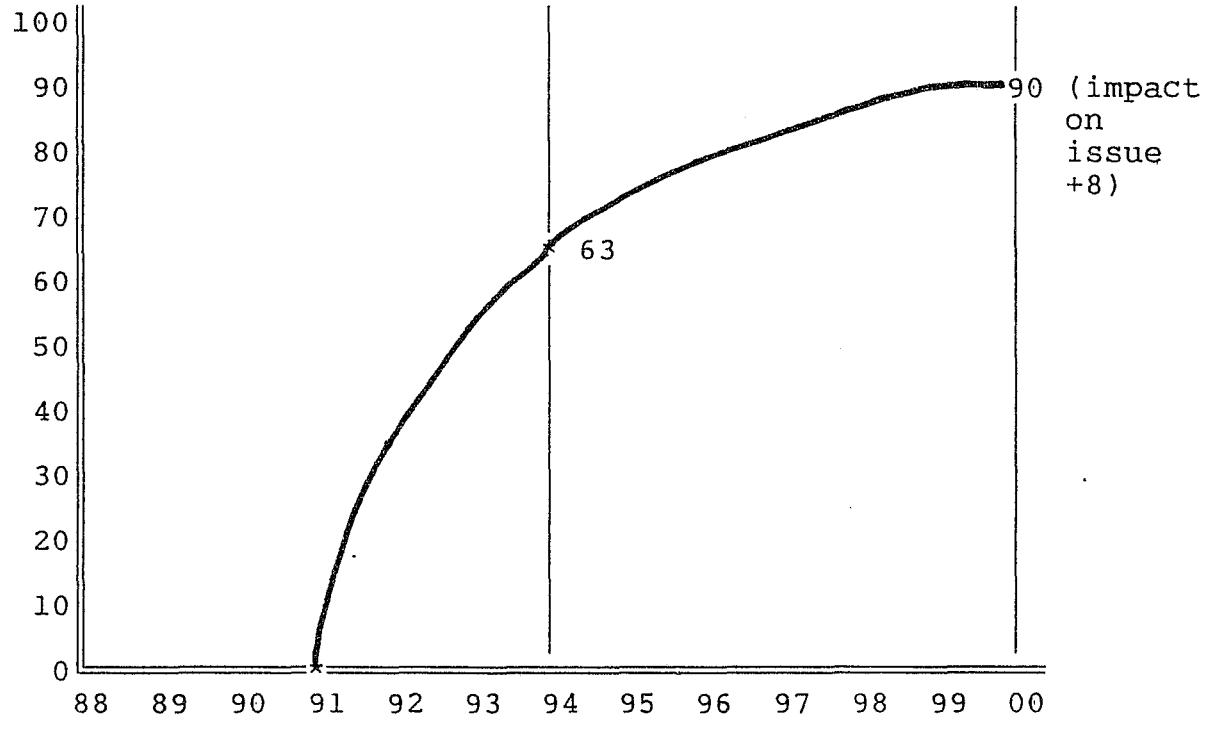


The "range" is the high and low of the NG forecast for what the degree of improved coordination between neighboring law enforcement agencies should be in 1998. (High = 300 / Low = 100) Mean average = 225.

The group predicts that interagency coordination will increase by over 50% by 2000, but feels that it should improve by over 125%. This reflects a belief that the police need to improve this situation.

NG EVENT 1:

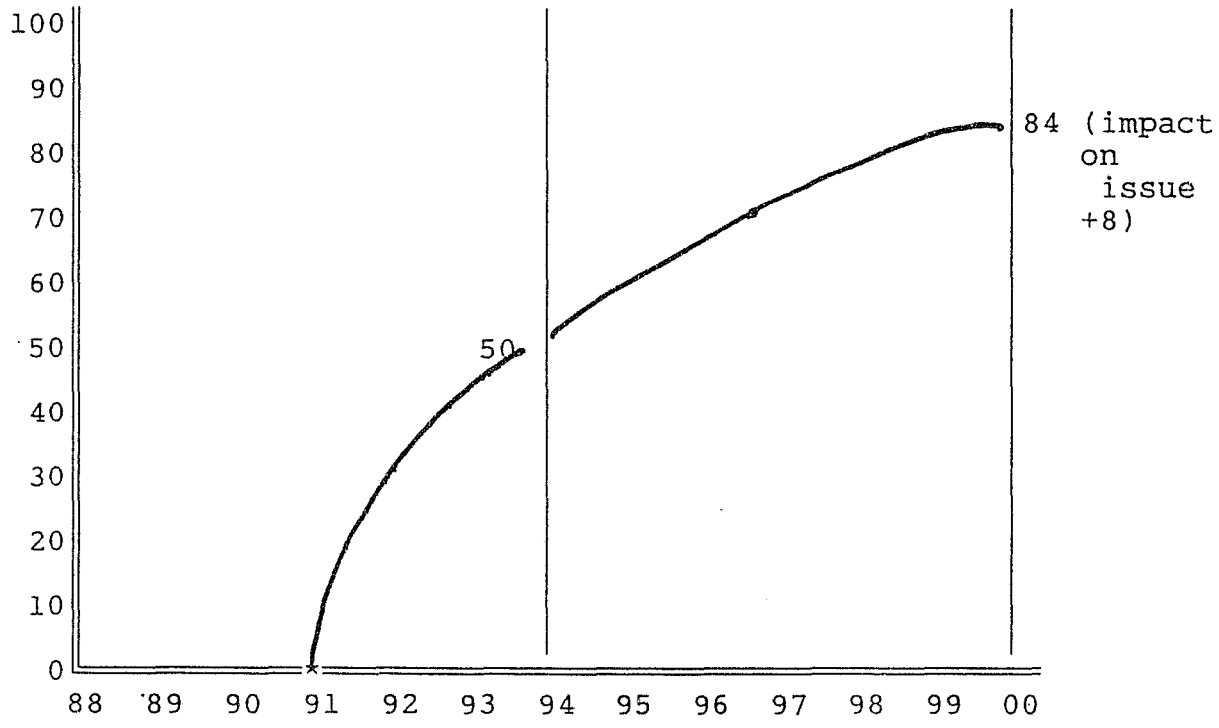
An integrated RMS/CAD/CA/VTD system will be demonstrated that improves police efficiency by a significant amount.



The group has predicted that there is a 63% change that an integrated system that includes VTD will be demonstrated to improve police efficiency by the year 1994 and a 90% chance by the year 2000. This is a high degree of probability. Some members of the group felt that this event has already occurred in one or more of those agencies that currently have some type of VTD system, even though the VTD is not integrated with other automated systems. The possible occurrence of this event was forecast to have a positive (+8) impact on the use of VTD's by police.

NG EVENT 2:

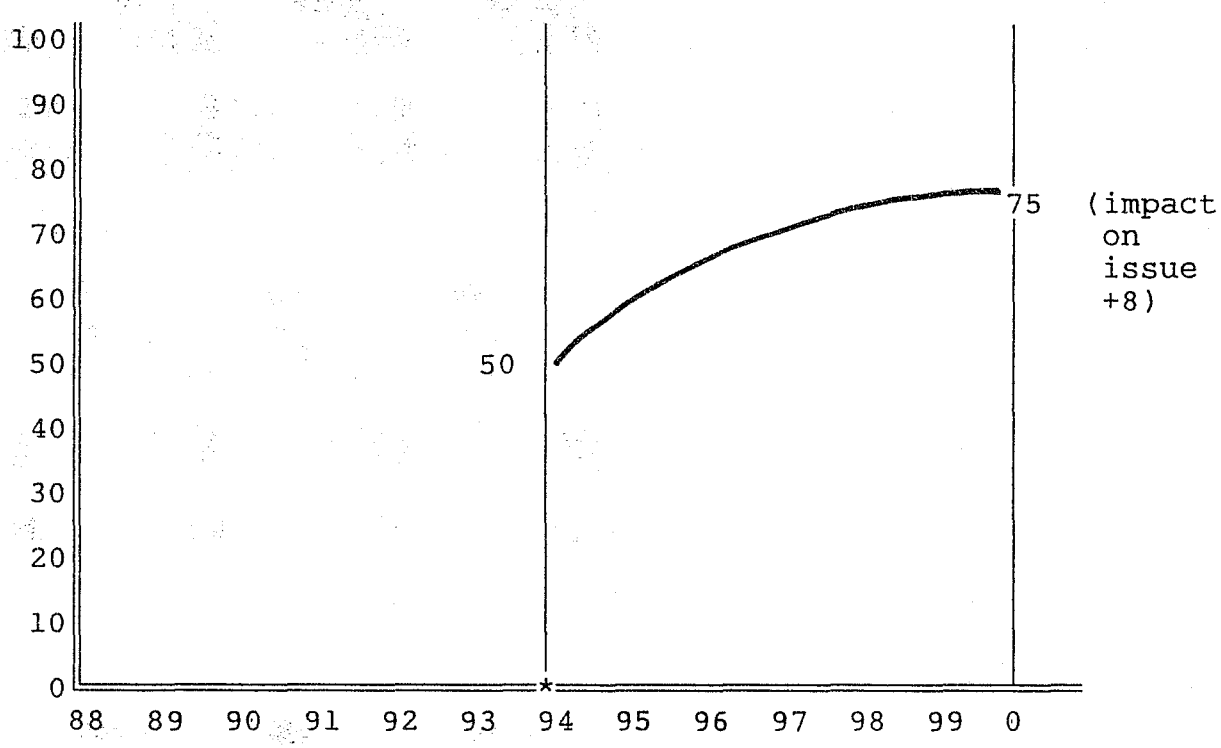
Several major auto companies provide navigation system as options in vehicles, driving unit costs down.



The group predicted that when a large number of major automobile manufacturers offer navigator units as options in their vehicles the per unit cost of the systems will decrease and make them more attractive to police departments. At some point in the not too distant future, when many private vehicles have navigators, the general public will expect that the police make use of the systems in their operations. One major American manufacturer, General Motors, will be offering navigators as options in their "top-of-the-line" vehicles starting in 1989 or 1990. The possible occurrence of this event was judged to have positive (+8) impact on the use of VTD's.

NG EVENT 3:

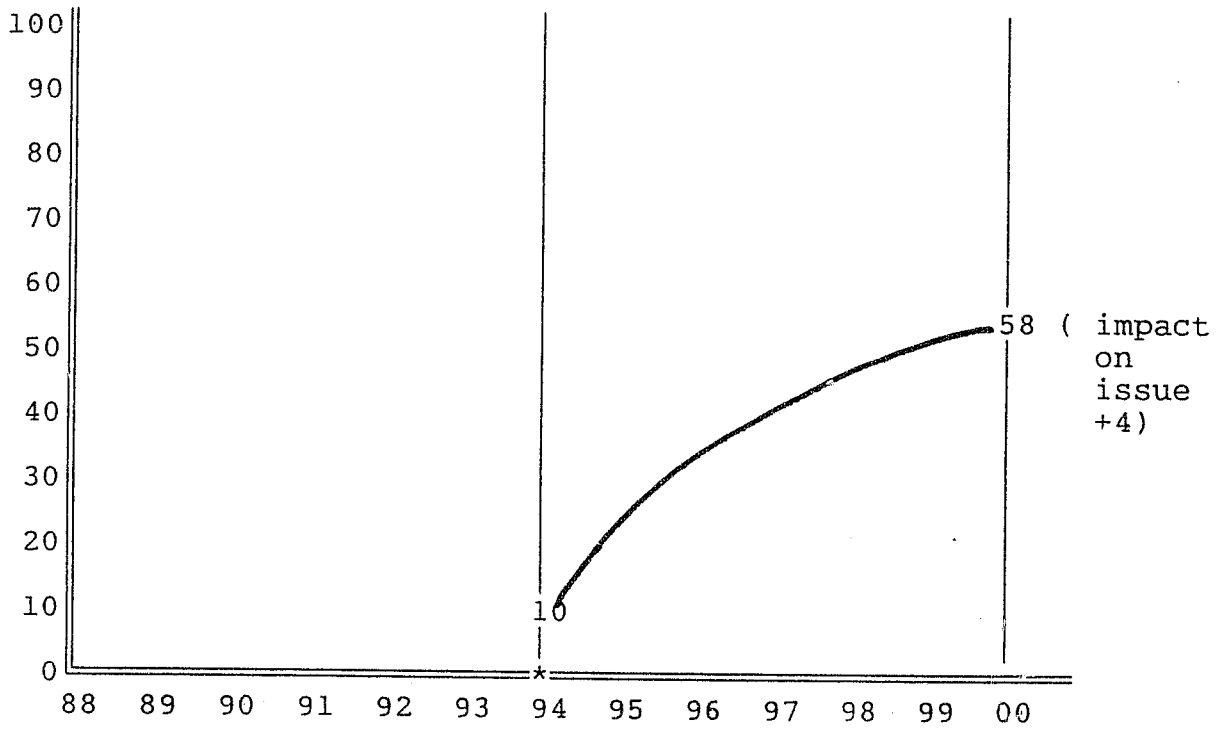
Technological advancements allow the total integration of VTD with all other computerized systems.



This event is another issue that is somewhat subjective, depending on the respondent's knowledge of current computer systems capabilities. At this time there are no reported totally integrated systems of RMS/CAD/CA/VTD operational anywhere in the world. That does not mean that the technology does not exist to allow such a system. As of this date, at least one trial project integrating RMS/CAD/VTD is being tested, but the outcome of the test is unknown as this is an ongoing project. (Pleasant Hill (CA) Police.) The possible occurrence of this event was judged to have a positive impact (+8) on the use of VTD by police.

NG EVENT 4:

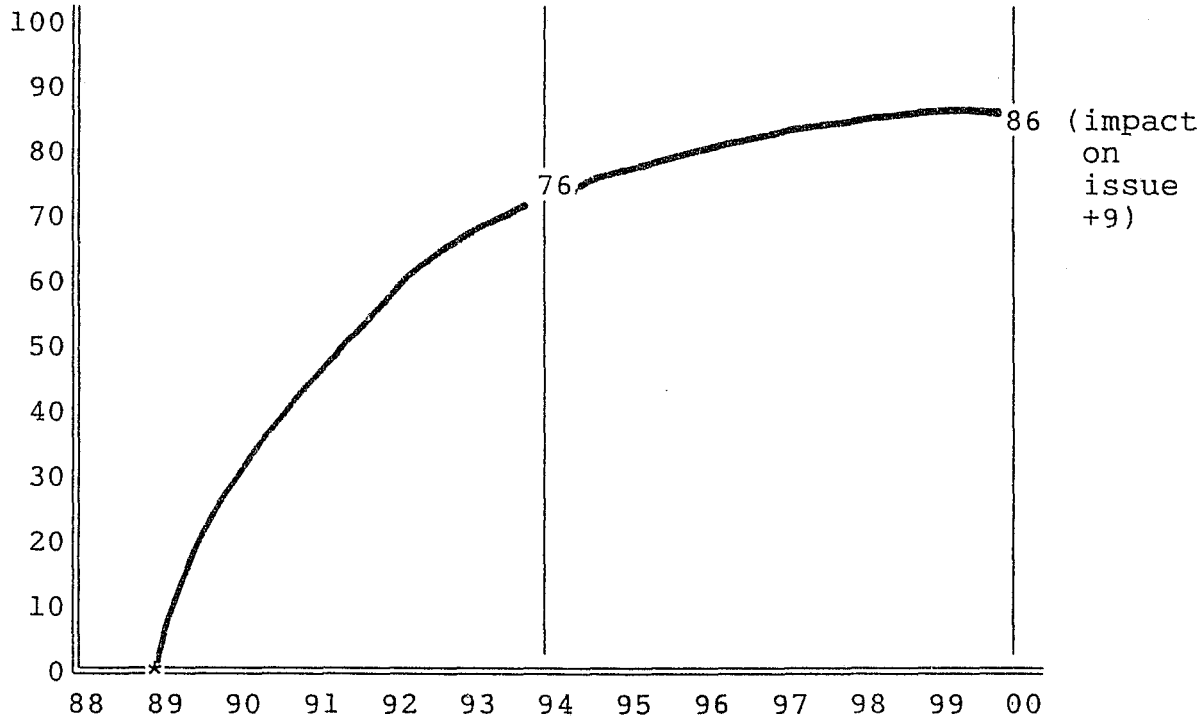
A personally carried location device is developed and made available to the police.



This prospect was rated by the group only slightly (10%) probable by the year 1994 and only 58% probable by 2000. Given current technology, the widespread use of this type of system depends on satellite systems. These are not currently available for local law enforcement use. Some group members expressed the view that it does not matter if a tracking device is located in the police unit or on the officer; the functions and systems uses remain the same. The possible occurrence of this event was judged to have a positive impact (+4) on the use of VTD's by police.

NG EVENT 5:

A VTD is credited with saving an officer's life.



This issue is also an area of subjective belief. There are no documented instances of any VTD system being credited with "saving" an officer's life. There was at least one instance reported by a current VTD system user that the system was instrumental in locating an officer that had been "kidnapped" at gun point in his police unit.[21] The system allowed the dispatcher to visually follow the first unit and move assisting units in position to help. The first unit was intentionally run of the road by the victim officer during a struggle for the gun and the assisting officers were immediately on the scene to assist. The victim officer escaped serious injury and the suspect was arrested.

The group felt that this was an important potential event and would have a positive impact (+9) on the development and implementation of these systems. Officer safety issues are of prime concern and one or more events such as these will demonstrate that the potential has become a reality.

Cross-Impact Analysis:

From the cross-impact analysis that follows, we see the "Year of first probability of occurrence of events" and the degree of impact, positive or negative, on the use of VTD by the police. The * on the trend graphs base line, indicates this year. These possible occurrences are incorporated into the scenarios.

1989 A VTD is credited with saving an officer's life. (E5)

1991 An integrated RMS/CAD/CA/VTD system is demonstrated to improve police efficiency by a significant amount. (E1)

1993 One or more major automobile manufacturers provide navigators as optional equipment in new vehicles. (E2)

1994 Technology allows a total integration of RMS/CAD/CA/VTD with mobile terminals. (E3)

1994 A personally carried location device is developed that becomes available to local law enforcement. (E4)

CROSS IMPACT ANALYSIS CHART:

EVENTS	EVENTS					TRENDS						
	E1	E2	E3	E4	E5	T1	T2	T3	T4	T5	T6	T7
E1	X	-20	0	0	+25	+25	0	0	+50	+50	+30	0
E2	+10	X	0	0	+20	+50	0	0	0	0	0	0
E3	+10	+25	X	0	+100	+25	0	+10	+30	+20	+75	+25
E4	0	0	0	X	0	0	0	0	0	+30	0	0
E5	0	0	0	0	X	0	0	0	0	+10	0	0
Re-actor	4	2	1	0	5	4	1	1	3	6	4	1
Actor	7	6	10	4	4							

Numbers in the cells indicate per cent of probable impact.
" + " = increase: " - " = decrease: 0 = judged to have no impact

The events (1,3) with higher "actor" scores are area where those Law Enforcement Managers interested in VTD systems must focus their attention and actively work toward the occurrence of the events.

None of the events listed are high with "reactor" scores. There are no negative events included in the ones in this study. The highest reactor score is for event 5, and this is a matter where the police use the system and hope for the best.

IMPACTS:

From the cross-impact analysis we see that the event on event impacts might be:

1. If E1 occurs, the probability of:

   E2 occurring decreases by 20%;

   E3 occurring increases by 10%;

   No change for E4 or E5.

2. If E2 occurs, the probability of:

   E1 occurring increases by 10%;

   E3 occurring increase by 10%;

   No change for E4 or E5.

3. If E3 occurs, the probability of:

   E1 occurring increase by 10%;

   E2 occurring increase by 10%

   No change in E4 or E5.

4. If E4 occurs, (58% by the year 2000) the probability of occurrence of the other events does not change.

5. If E5 occurs, (86% by the year 2000) the probability of occurrence of the other events does not change.

The impact of events on trends:

1. If E1 occurs, the impact on:

   T1 would increase its rate by 25%;

   T2 no change;

   T3 no change;

   T4 would increase its rate by 50%;

   T5 would increase its rate by 50%;

   T6 would increase its rate by 30%;

   T7 no change.

2. If E2 occurs, the impact on:

   T1 would increase its rate by 50%;

   Would have no impact on T2 through T7.

3. If E3 occurs, the impact on:

   T1 would increase its rate by 25%;

   T2 no change;

   T3 increase its rate by 10%;

   T4 increase its rate by 30%;

   T5 increase its rate by 20%;

   T6 increase its rate by 75%;

   T7 increase its rate by 25%.

4. If E4 occurs, the impact on:

   T5 would increase its rate by 30%;

   no impact on T1, T2, T3, T4, T6, T7.

5. If E5 occurs, the impact on:

   T5 would increase its rate by 10%;

   no impact on T1, T2, T3, T4, T6, T7.

The probable impact forecasts are used to adjust the probable first year of occurrence for NG forecast events as reflected in the adjusted NG trend lines.

Scenarios:

The material gathered in the research portion of this study, as detailed above, was used to write the following three scenarios as they might occur in the City of Pleasant Hill. All three are written in the "slice of time" style The first is Exploratory, in the play-out mode. In this scenario none of the events describe above will occur and the trends will continue

in the direction forecast. The second scenario is Normative, in the "desired and attainable" mode. In this case we will assume that any event with a probability exceeding sixty percent by the year 1998 has occurred. Trends are impacted accordingly.
The third is scenario is Hypothetical in the "best case mode" and here we assume that any event with a probability exceeding thirty per cent by the year 1998 has occurred. Trends are impacted accordingly.

SCENARIO 1: (EXPLORATORY - PLAY-OUT)

To: Pleasant Hill City Council

From: Chief of Police

Subj: Police Department ten year report... 1989-1999:

1. As you know, from prior annual reports, there has been a continuing trend of increases in demand for police services over the past twelve years (and then some!). During this same period the Department has experienced fifty per-cent rise in reported crimes and other calls for police services. (Refer to the attached copy of the Uniform Crime Report summary). As the percentage of city resources allocated to the police function has remained all most constant during this same time we have been unable to expand our personnel strength over the ratio that existed back in 1988. City resources have not increased in proportion to the demands for service. We currently employ the same number of officers that we did in 1988.

The Department response times to calls for service has not changed significantly over this period due primarily to the continued use of the automated police records management and automated communication systems that are in place. At the same time we have had to eliminate some of the more traditional smaller community police response patterns. We no longer respond an officer to non-injury traffic accidents, non-violent aid calls, "cold" civil complaints, "insurance" reports, and the like. This allows officers to concentrate their time on the more serious cases. "White-collar" crime is investigated by appointment with our investigators. Crime prevention and juvenile referral activities are at less than fifty percent of that provided ten years ago. Somehow, all of this has not resulted in a significant increase in the number of complaints about "lack of service." We judge this to be because the changes have been incremental and because we have maintained high recruitment and employment standards. This same situation exist in almost every city and county in the state and it is "the norm."

2. The Department has continued to improve the coordination of activities with neighboring police agencies. The regional narcotic task force as well as the regional burglary suppression task force continue to operate successfully. At the same time, there has been little additional work on regionalization of other police resources. The demand for local control has not outweighed

the potential savings of funds due to scale.

3. Our RMS/CAD/CA integrated computer system allows a degree of command and control of city resources at critical incidents that is more than double what was possible just ten years ago. This has improved overall officer safety at these situations and the officer "injury rate" has remained constant over the past ten years. This same command and control system is used frequently to provide documentation of police conduct in both criminal and civil court cases.

4. The California Vehicle Code section adapted in 1988 that provided immunity for police departments in some "code 3" responses encouraged us at the time to adapt a very strict policy regarding such response and as a result, the number of accidents involving our police units has decreased slightly during this time. The number of lawsuits filed against the department for all reasons has increased annually, but they have been as a result of other circumstances, not police unit caused accidents.

5. Vehicle tracking device: Again in this year's budget requests, we will be asking for funds to implement a VTD and integrate it with our RMS/CAD/CA system. This is one available technology that can assist in the efficient management of the Department's available resources. The potential benefits from

the system far outweigh the cost. We need to work smarter!

Looking ahead:

All things considered, we have evolved into a "un-comfort zone" of service level that is well below what we were able to provide the community ten years ago.

If the current trends continue in the same unchecked directions, we will be forced to make drastic changes in the police service levels. We may find it necessary to suspend routine/random patrol and hold our available officers at pre-determined locations (Police station or Fire station), and respond officers directly from the station only to serious calls for assistance (violent crimes or felonies in progress). No more house calls! We may have to require other complainants to make appointments to report minor criminal cases. We may need to increase the standard fees that we now charge for non-emergency services.

SCENARIO 2: (Normative - desired and attainable)

January 1, 2000

Dear Dad:

Hi! How are things on the beach in Maui? It was nice to hear from you and Mom last Sunday. Wish we were there! Well, the real purpose of this letter is to try to answer some of the questions you asked about the recent historical development

of the integrated RMS/CAD/CA/VTD system that we are using here at the Police Department. The students in your classes there at the college are getting their "money's worth" with you as their Professor of Criminal Justice. You ask more questions and have more answers that anyone I know! Well, here goes:
As you know, just prior to and since your retirement from the Department, resources generally in our city, like the rest of the state, have been limited. At the same time we have continued to experience increases in demands for police services, and in fact calls for service are up fifty percent over the past ten years. One of the things that has allowed us to keep our heads above water is the general improvements made in computer technology and the fact that their mass production has allowed a steady decrease in their cost. Twenty years ago we couldn't afford one, now we can't afford to be without several. Our equipment is only three years old and already we are looking to "up-grade"!

As you may recall, June 13, 1993, was the date of the most celebrated case of the trial VTD's saving of police officers' lives when four Bay Area officers were abducted by a PLO terrorist at the airport. With the assistance provided by the VTD, and its silent alarm feature, they were quickly located and rescued with no fatalities. (Except the terrorist). That was the real start of the widespread use of the integrated VTD systems by local law enforcement agencies here in California. Then the following year in September of 1994, a totally integrated

RMS/CAD/CA/VTD systems was demonstrated by our own department to provide sufficient tactical and strategic information to the Department supervisors and managers that the efficiency of the force was judged to have been improved by a significant amount. We were able to better coordinate with the neighboring agencies in routine and well as critical incident situations.

On October 1, 1995, both General Motors and Toyota announced that digital navigators would be available in all production models as an optional feature. As you know, this feature caught on as a "yuppy" status symbol and by now, all of the major auto companies offer them and they are commonly sold and installed throughout California as well as the rest of the Western World. I know you see them all the time in the vacation rental cars there in the Islands.

In late 1996, our own programers finished the last step in the total integration of the "state-of-the-art" computer RMS/CAD/CA/VTD system and it has been on-line ever since. Many of the largest agencies are now using the satellite VTD system in this integration. To date, our beta-test site work continues on programs for better utilization of the artificial intelligence (AI) and voice interface technology that we see as the next logical step in the process. Our projected completion, if one can ever complete this type of work, is about five years down the road, scheduled for July 1, 2005.

I hope this information is helpful. I can provide more details if you think it is necessary. I am sending a package of brochures about the all of these systems to you, as soon as my secretary gets them together. (I would guess in a day or two.)

That's all for now; hope to see you soon.
Love, Junior.

SCENARIO 3 (Hypothetical - "Best Case")

Column appearing in the Pleasant Hill Morning Star

Spotlight on: Police Dispatch and Vehicle Tracking Devices.

Date line: March 16, 2000. Clark Kent reporting:

Good morning readers! I had an interesting day yesterday. I visited with the Pleasant Hill Police Department yesterday for a full eight hours "ride-a-long" and a demonstration of "what's happening" with our own "thin blue line." I appeared with some trepidation, voice activated comp-type machine in hand, at the 7AM "roll call briefing." It wasn't anything like most of the TV shows or movies. These folks are serious about their business and a no-nonsense sergeant handed out assignments and instructions in quick order. I was impressed with the computer printouts that detailed the most recent criminal and traffic activity in the city, and also made many detailed recommendations as to what was most probable to occur and where and when officers should be at specific locations to deal with the predicted

situations. After roll call, I met with the Chief and we went outside to one of the patrol units for a demonstration of the way the police use the navigator system. We are all familiar with the standard civilian navigators because they have been optional features on almost all new cars now for the past six or seven years, but the police have theirs interfaced with a complex command and control system, linked by radio, to the police station.

This provides the officer in the field not only navigation data, but direct interface with the total array of local, state and national police communications systems. The Chief and I then visited the dispatch control center for a tour, and I found that the dispatcher uses this same system to keep track of each police unit at all times during the shift. These systems are called Vehicle Tracking Devices, or VTD's. When calls for assistance are received, the computer recommends appropriate assignments to reduce response time and distribute the workload. This is now coupled with the artificial intelligence and voice interfaced systems that we have heard so much about in the past few years. The police have put these features to good use. When you call for routine service, a computer may answer the phone and screen the call!

This complete system was installed in 1994, just two years after the initial pilot project here demonstrated that such a system

would significantly improve the tactical and strategic operations of the police. In 1996, when the satellite-based personally carried tracking devices became available to the police, they were smoothly incorporated into the operation with hardly a ripple.

Some of my readers may recall the incident at the airport back in 1991 where four officers' lives were saved with the assistance of the vehicle tracking device. Well worth the money !
The chief referred me to the FBI statistical reports that show that the number of officers killed or injured on duty has declined over the past ten years and some of this improved safety record is a result of the VTD systems. These same statistics reflect that the clearance rate for serious crimes has improved by about ten percent over the past ten years in those communities where the police have such integrated computer systems. Even though the amount of available resources for the police has not increased in proportion to what it was back in 1988, routine supervisory and management reports from the complete system have been used by the department staff to assist in making strategic decisions on both the long and short term and the department has been able to maintain almost all of the services that it did back then. The department uses a form of "directed patrol" assisted by the VTD that has increased the efficiency of the field force by seven percent over prior deployment plans. In a city with a minimum of fifteen patrol units on the street at any given time,

allows them to reduce the units by one, to fourteen, and achieve the same results. The annual cost to the city for one single officer patrol unit, around the clock, exceeds $500,000. The cost of the integrated computer system paid for itself several times over in the first year, and it is impossible to know how many police vehicle involved accidents were prevented. Now the Chief and City Council depend of the accuracy of the management information from the system to assist in budget allocations and projections. Courts accept the computer documentation as to police timing and location in both criminal and civil suits and cases. Complaints about the lack of coverage in particular areas and response times can be quickly investigated and resolved. All things considered, the VTD systems have really paid off!

I was then turned over to Officer Chilimidos, a veteran officer, who took me with him for his tour of duty. He told me that there had been some initial resistance to the VTD use by some of the officers, but that resistance had quickly passed when it became apparent that the systems were used in a positive way and had both improved officer safety and the command and control of tactical situations. The officers' job became easier, their timing had improved, and the clearance rates and arrests went up. He keep the dispatcher informed of his readiness status by use of status buttons on the VTD unit console.

Over the course of the day, we responded to a number of calls for

service, all relayed to us via the secure data channel for the VTD. It was apparent that the dispatcher used the computer's knowledge of our location to assist in the timely dispatching to calls. We followed the briefing instructions he had been given at roll call and we seemed to be in the right place at the right time! We were never more than two minutes away from any call! I could go on and on, but I think you get the picture.

A lot of work went into the development of the systems. Few police agencies can now function with any degree of efficiency without one of the systems that were pioneered right here in our own City of Pleasant Hill, as well as several other cities in the U.S. and abroad. Keep up the good work Chief and crew!!

III. STRATEGIC PLAN:

The second objective of this study is to develop and implement a strategic management process, to include strategic decision-making, strategic planning, and policy considerations. Because strategic management is not linear, these items are interactive in the process. Using the SMEAC method for categorizing information, the outcome is a strategic plan, bridging the gap from the analysis-defined present to a scenario-defined future (best case-desired). The point here is to design a plan whereby the department can move from the present situation to a time in the future where as much as possible of the the best case scenario is fact. We want to avoid the "play-out" scenario.

Situation.

In September of 1987, the Pleasant Hill Police Department made a commitment to become a "beta test" site for an integrated RMS/CAD/VTD system in cooperation with a software development firm, Data911, Inc. of Emeryville, CA, and the ETAK Corporation, of Menlo Park, CA. This system, nicknamed "PHCOPS" for Pleasant Hill Police COmbined command computer Program Systems, is currently under research and development. Site testing is on-going. The target for phase one implementation is now set for July 1, 1988. This phase includes use of the ETAK navigator units in the patrol units and transmission of vehicle location and status to the host computer for integration with the CAD operations already in operation. This will provide tactical use

of the system for dispatchers and watch commanders.

Phase two of the implementation will provide a variety of strategic (management) reports for staff. This system will provide a limited mobile data terminal feature in each vehicle.

On March 24, 1988, A strategic planning session was held at the Pleasant Hill Police Station which was attended by the Chief, the Captain and the three Lieutenants. Hereafter, this group will be referred to as the P (planning) group. The first step taken was a review of the background of the issue including the results of the survey on VTD systems. The trends and possible events forecast by the nominal group were reviewed in detail. The P group then discussed the current situation in the Department and the immediate environment (Police Association, City Government) as it relates to the a stand-alone VTD or integrated RMS/CAD/CA/VTD system. Then, using the modified policy delphi process, the P group brainstormed possible policy alternatives to accomplish the desired end result; that is, the implementation of an integrated RMS/CAD/CA/VTD computer system for the Pleasant Hill Police Department.

Through this process, the P group selected one (1) basic policy (modification to existing mission statement) designed to express the intent of the Department to acquire and use VTD technology and three (3) complementary policies that might be adapted in

furtherance of the desired program. These policy alternatives are presented in order of priority as established by the P group.

Mission Statement:

It is the mission of the Pleasant Hill Police Department to protect the lives and property of all of the people in the community by the most efficient, effective means possible within the constraints of the existing law and available funding. The Department will utilize all legally available techniques and technologies to accomplish this mission.

Execution:

The following policy statement (alternative strategies) has been drafted to assist the Department in the achievement of its mission.

PROPOSED POLICY STATEMENTS:

Policy Alternative # 1.

In furtherance of the Department's mission, the Department personnel will make full use of all available technology, including but not limited to, computerized records, communications and vehicle tracking devices (PHCOPS).

A. System Management. The Services Division Manager shall be assigned as the PHCOPS project manager. Services Division monthly reports shall include a section on the status of the project.

B. Tactical Operations: Shift Watch Commanders or other supervisors responsible for the tactical operations of the Department at any situation involving the coordination of activities between two or more employees, shall take into consideration the features of and the information available to them from the PHCOPS when making necessary decisions. Supervisors' reports on such tactical operations shall contain a section describing what, if any, use was made of the PHCOPS.

C. Strategic planning: Division Commanders or other managers responsible for strategic planning for the Department or its divisions, shall take into consideration the information potentially available from the PHCOPS when formulating policy or procedures. Each completed staff report shall contain a section describing what, if any, use was made of the PHCOPS.

This policy alternative was drafted in consideration of NG T1, that is, by 1998, the integration of RMS/CAD/CA/VTD should be almost three times (from a level of 100 now to 290 in 1998) and NG T2, that there is a continuing demand by the public for improved police service (from 100 now to 170 in 1998.) NG T5, that is, the increased use of integrated systems for command and control functions during critical incident response, which is forecast to reach a level of 310 by 1998, if NG E1 occurs.

Policy Alternative # 2.

Concerning the utilization of the PHCOPS, the following policies and procedures will be in effect.

A. During each employee's initial training program, they will complete the VTD training module. Officers and dispatchers will receive additional on-the-job training from their individual training officer.

B. The system monitoring and maintenance program will be administered by the Services Division Commander. Weekly checks on the accuracy of the VTD units will be made and recorded. These records will be maintained for a minimum of two years.

C. Each and every employee assigned a vehicle equipped with a VTD will turn it on and insure its operation condition throughout the assignment. No modifications or repairs shall be made without the prior approval of the duty watch commander.

D. Every employee that becomes aware of any malfunction on the part of any segment of the PHCOPS will immediately verbally report same to their supervisor. If the malfunction is not immediately correctable, the supervisor shall bring it to the attention of the on-Duty Command Officer. The Duty Command officer shall make necessary arrangements for repairs as soon as possible. Reports of any such incident shall be forwarded to the Division Commander for the next work day.

This police alternative was drafted in response to NG T4, the increasing demand that there be verifying documentation of police conduct. A 57 percent increase is forecast by 1998 unless or until NG E1 (probability of ninety percent by 1998) occurs, (Integrated systems is demonstrated to improve police efficiency) at which time the forecast level jumps to 223 by 1998.

Policy Alternative # 3.

Concerning the records maintained in, or generated by, the PHCOPS, the following policies and procedures will be in effect.

A. System records will be maintained in the data bank for a minimum of two years.

B. In-house request for specific historical information (non-current) from the system will be routed through the requestor's supervisor to the Services Division, in writing.

C. No copies of PHCOPS records will be released outside of the Department except upon a proper court order.

This policy alternative was drafted with consideration to NG T6, that is, the increased use of these systems information in the community planning process. Such use is forecast to be up almost 250 percent if NG E3 occurs. This is quite likely.

Policy Alternative # 4:

Concerning the utilization of PHCOPS information, the following policies and procedures will be in effect.

A. When using the VTD system for any purpose, Department supervisors and managers will keep foremost in their minds that the primary purpose for the implementation of the VTD system is to provide one additional technology that may assist the Department and its officers in maintaining the safest possible working environment for all persons concerned.

B. Records from any aspect of the PHCOPS will not be used as the sole criteria for any disciplinary action against Department personnel. Such records may be used in the same fashion as any other official police records during the investigation of allegations of misconduct or criminal activity.

This policy was drafted in consideration of the results of the "source and strength of VTD resistance" as detailed in survey question number 2. Because patrol officers and the Police Association are forecast to present the greatest degree of possible resistance, the policy alternative is designed to clearly state to these groups the department's intentions. Each of the possible policies were evaluated by the group as to feasibility and desirability. Alternatives one (1) through four (4) received the highest scores possible and were judged to be

definitely feasible and very desirable. One group member presented arguments against section A of Policy 4, expressing a preference for Alternative #5.

Policy Alternative # 5.

"Evidence of officer misconduct developed from the PHCOPS system may be used as the sole basis for disciplinary action."
This policy alternative was given low scores in the feasibility and desirability process by the group and was eliminated from any further consideration by the group as a whole.

Again, using the same process, the P group established a list of potential stakeholders that might be impacted by one or more of the policy statements as detailed above. Twenty-four potential stakeholders were listed. Because this list paralleled those items and groups that would be evaluated on a standard "capability analysis," this same list was used for that purpose. Each P group member was asked to record their subjective evaluation on a one-to-five scale, as to the current capability of each category of stakeholder, as well as their opinion, again on a one-to-five scale, of the ability of the stakeholder to adapt in the future to each of the possible policies. The results of this process resulted in scores (mean averages) as tabulated and displayed in the Capability and Adaptability Chart. The P group again used a modified policy delphi process to

list assumptions as to the likely positions of the stakeholders on the list. Following the chart is a discussion of the possible stakeholders' positions for the most important ones.

I. CURRENT CAPABILITY ANALYSIS:

Scale:

1. Superior. Above present needs.
2. Above average. Suitable for present needs with no problems.
3. Average. Meets present needs, but there is room for improvement.
4. Below average. Not as good as it should be.
5. Poor. Cause for concern. Action must be taken to improve.

II. FUTURE ADAPTABILITY ANALYSIS:

Scale:

1. Proactive change encouraged
2. Some proactive change possible
3. Reactive change only
4. Little ability to change
5. Very little ability to change.

	SCORE I	SCORE II	Stakeholder(s)
1.	2.5	2.25	City Council
2.	2.5	1.25	VTD Equipment Vendors (+)
3.	2.5	1.25	ETAK, Corporation (+)
4.	4.5	5.0	Suspects (-)
5.	3.0	2.5	Department Reserve Officers
6.	2.5	2.25	Department Non-Sworn Personnel
7.	3.0	3.0	Media
8.	3.0	2.75	County and State Office of Emergency Services
9.	2.25	2.0	Neighboring Law Enforcement Agencies
10.	2.5	2.0	Department Dispatch Personnel (+)
11.	3.75	2.25	Department Patrol Personnel (-)
12.	2.5	3.0	Defense Attorneys *
13.	2.75	3.5	Insurance Companies *
14.	1.75	1.25	Department Supervisors and Managers (+)
15.	3.0	3.0	City Attorney
16.	2.25	3.0	Courts
17.	4.25	3.0	Department Police Officers Association. (-)
18.	3.0	2.25	City Risk Management Group *
19.	2.5	2.25	City Manager
20.	3.0	2.5	Department Investigators *
21.	3.0	2.75	County District Attorney's Office
22.	2.75	3.0	State Legislature
23.	3.0	3.0	Federal Legislature
24.	3.0	3.0	Community Chamber of Commerce

In both the current capability and future adaptability columns, the lower scores indicate a greater ability to accept change and adapt to future changes.

Those stakeholders followed by a (-) were judged to hold a position of level 4 or more in general opposition. This is a "block change" position, however, the one stakeholder in that category (suspects) is judged by without impact and may be ignored for the immediate future.

Those groups or individuals in the 2.0 to 3.9 range in both the current and future columns were judged to be in the "let it happen" (wait and see) to the "make it happen" category. Movement toward the "make it happen" position away from the "let it happen" position is desirable, but not necessary. No identified group judged to have any impact on the issue was judged to be in the "block change" position.

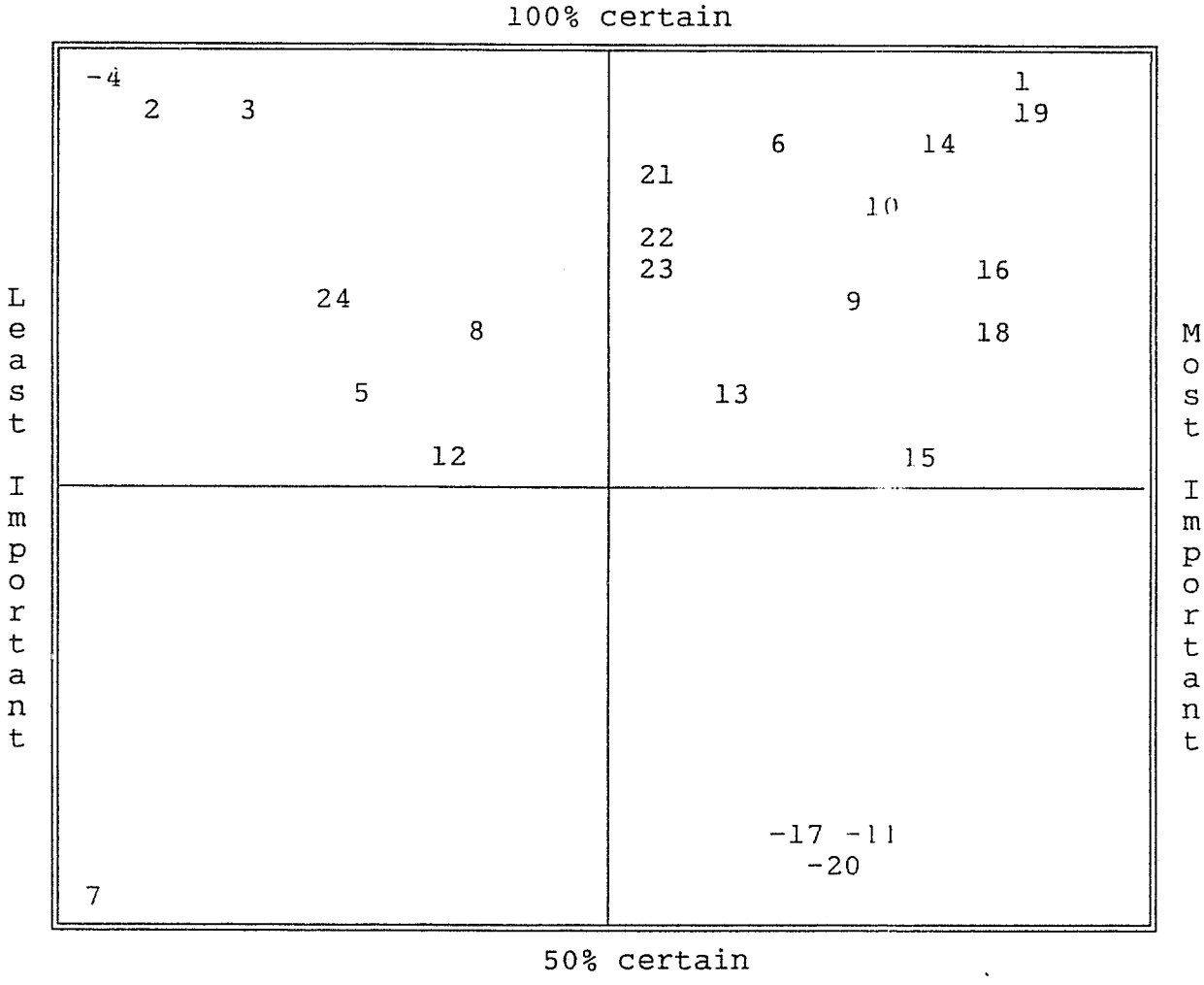
Those stakeholders followed by a (+) were judged to hold a position of a level 2 or better for support. That is in the "help it happen" position. Those stakeholders followed by a (*) indicate "snaildarters," that is, groups that may have or develop a position one way or the other in relation to the issue, but their position will only be developed and forthcoming after the proposed policies are implemented and some initial results are known. These positions may or may not impact the issue, but for the most part must be dealt with after positions are known.

STAKEHOLDER ASSUMPTIONS / POSITIONS:

In addition to the results of the capability analysis's that the planning group completed, a Strategic Assumptions Surfacing Technique (SAST) was used to identify those stakeholders that potentially presented the strongest support or strongest opposition position. Only those stakeholders from the complete list judged to have any possible interest in the proposed policy are shown on the graph. This process was completed for each of the stakeholders identified above for each of the four possible policy positions. This process placed three groups in the most important, but least certain area. Those three are: Department Patrol Personnel, Investigators and the Police Association. These are the same groups that received scores of concern on the capability analysis.

SAST GRAPH for proposed policy # 1.

"--- department will make full use of available technology--"

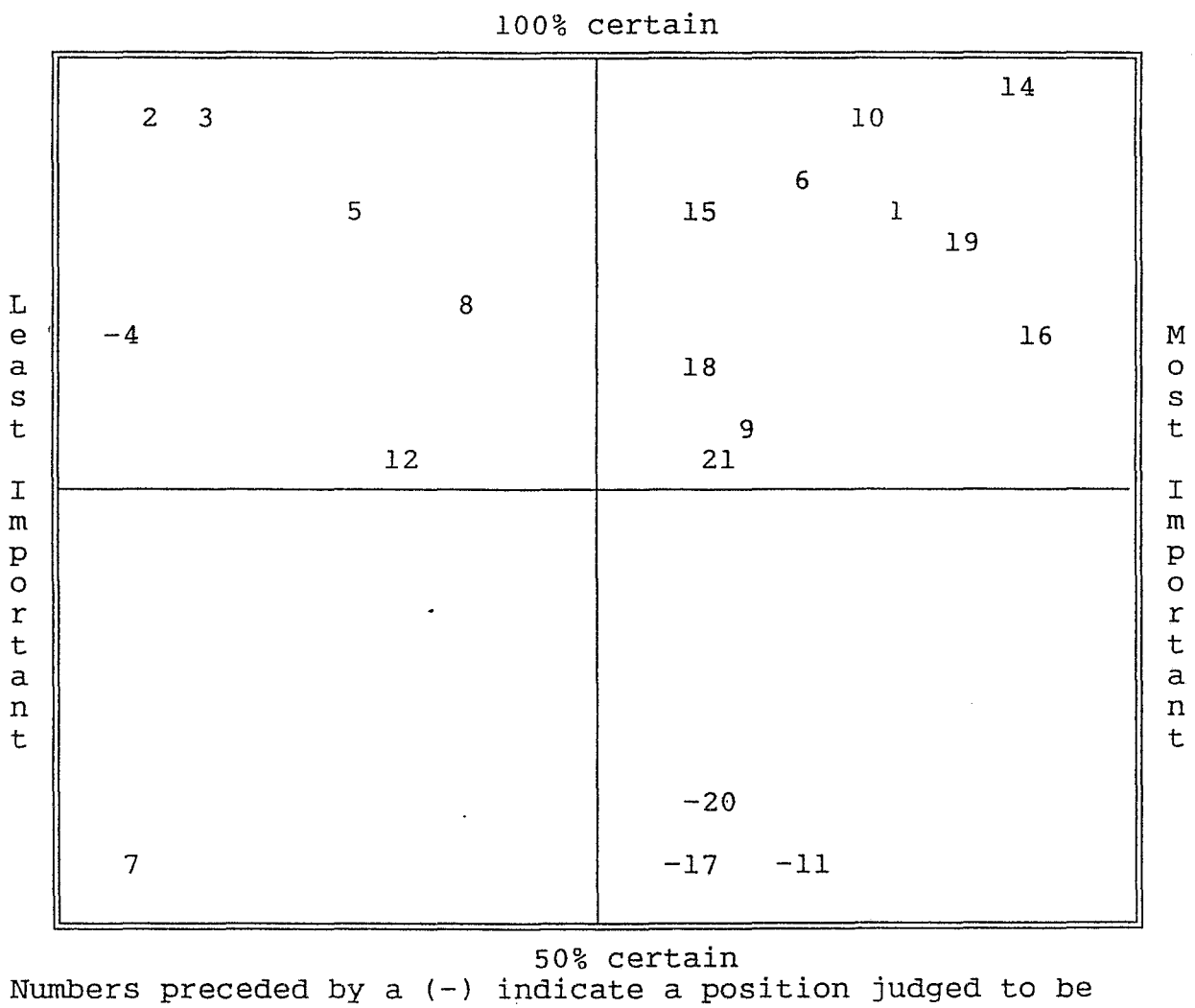


(Numbers - stakeholder preceded by a (-) sign indicate an position judged "oppose".

Stakeholder # 17 (PH Police Officers Association), # 20 (PH Investigators) and # 11 (Sworn officers) were placed in the high importance but low certainty areas. They were judged to initially hold an "oppose" position.

SAST GRAPH for proposed policy # 2.

"--training, use, records and reporting malfunctions--"

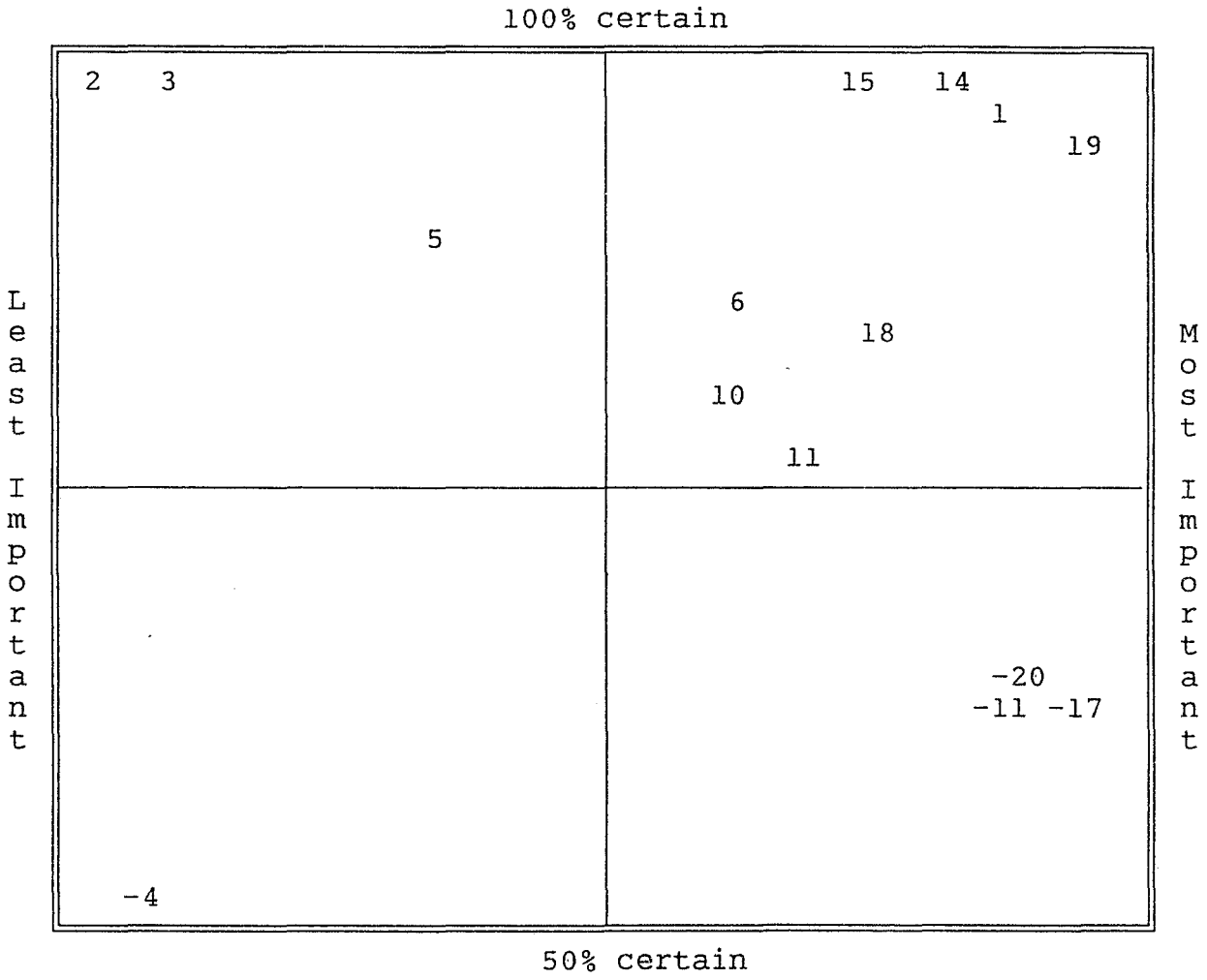


Numbers preceded by a (-) indicate a position judged to be "oppose".

Stakeholder # 17 (PH Police Officers Association), # 20 (PH Investigators) and # 11 (Sworn officers) were placed in the high importance but low certainty areas.

SAST GRAPH for proposed policy # 3.

"-- generating and maintaining PHCOPS records--"



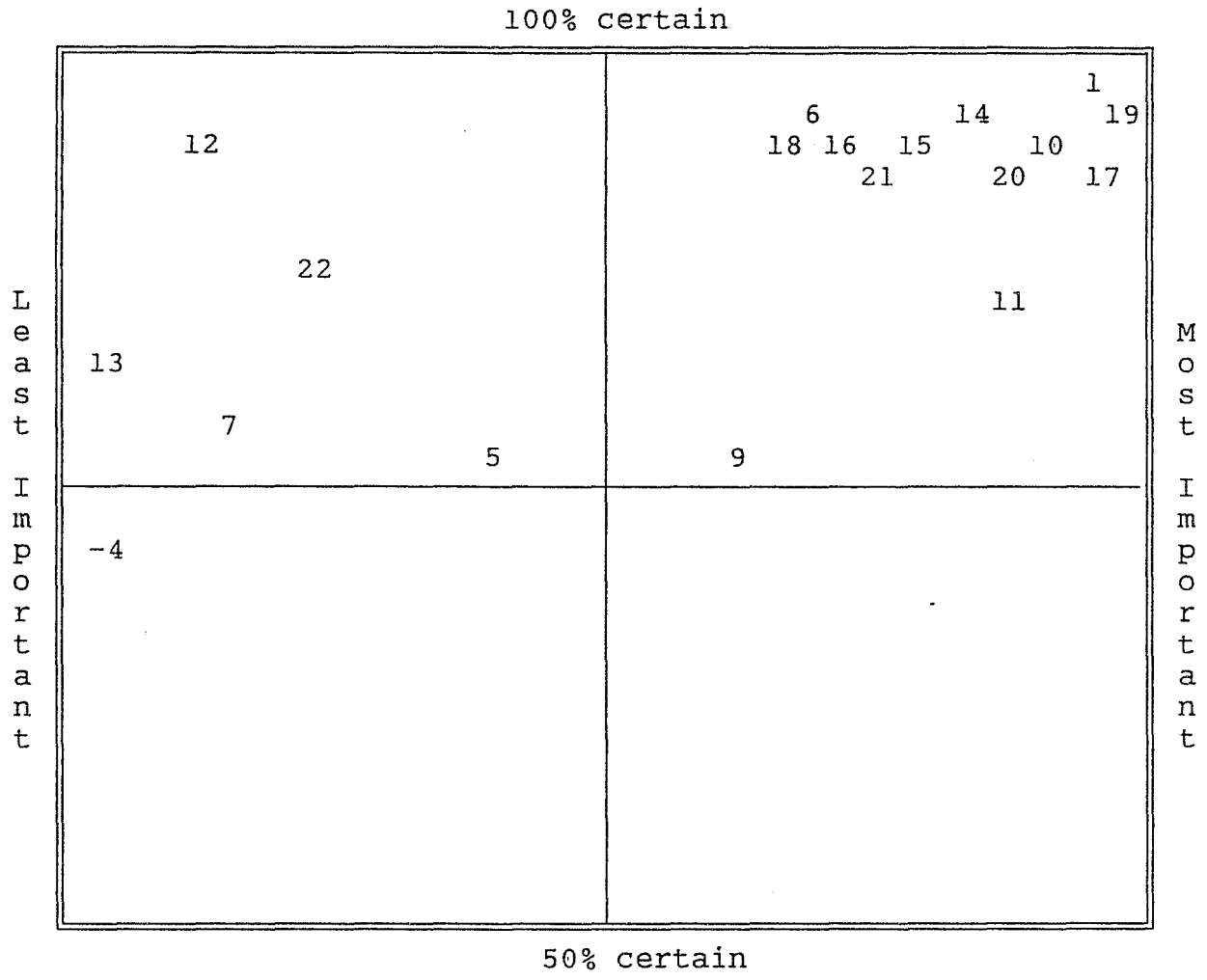
Numbers preceded by "-" indicate an "oppose" position.

The position of the Officers Association and the sworn officers have been judged as uncertain, but most likely holding an "oppose" position on this possible policy.

Again, #4 represents "suspects".

SAST GRAPH for proposed policy # 4.

"--use of VTD information for internal disciplinary actions--"



Numbers preceded by a "-" indicate an "oppose" position.

No stakeholder judged to have any influence on the issue were judged to be in the "most important" and "low certainty" area.

Discussion of possible stakeholder positions:

One group is the "suspects" with both current and future scores judged as "strongly oppose." We will not be overly concerned with their possible impact on the issue in the short term (next twelve years) as it is judged as less than minimal. In the long term, of course, some of them may design a way to defeat VTD technology. This is unlikely in the near future. Again, in the long term, one or more organized crime organizations may actively attempt to defeat the VTD or other law enforcement computers. This possibility needs further consideration and attention must be paid to system security.

Most of the individuals and most of the groups are judged to be slow to adapt to and usually non-attentive to, changes in police procedure, but in this issue there is no reason to believe they would resist these policies even if known to them, and at any rate, have little or no impact.

One possible cause for in depth consideration is the possible reaction by the State and/or Federal Legislatures on the "privacy" of police officer issue. If a sufficient number of Police Union political action groups begin to pressure their local representatives for legislative protection, there might be some movement in that direction. Such pressure may be applied if widespread department supervisory "abuse" of the systems became an issue. Departments with VTD systems must take care to

maintain a fair and reasonable approach to the supervisorial uses of the systems.

So far to date, State and Federal courts have consistently held that an employer has the right to supervise and observe the work activity of each and every employee throughout the work day. There is no indication that this legal position will change in the immediate future. As noted above, this again depends on the fairness and reasonableness of application of the internal supervision policies of the agencies using the systems.

The concerns of the patrol personnel, and the Police Association, although different groups in name and legal status, will be considered as one group. Far and away, the majority of the members of most police associations are the officers from the Patrol Division. The resistance and negative views that have been or might be expressed by some of the officers can, for the most part, be related back to the emotional issue of the closeness of the day by day supervision of the officers' activities. Many of the more negative comments have been or may be from the more senior officers, ones who may have established long standing patterns of conduct that might include such things as being in the wrong place at the wrong time and they may not want to be scrutinized closely by the supervisor. Fears have been expressed that the VTD would be used to unfairly evaluate individual officers and or be the basis for disciplinary action.

These is little doubt that these same fears were no doubt expressed by many police officers in the 1930's, when first one-way then two-way radios were introduced into police work and officers were required to maintain constant radio availability with the base stations. Now, the vast majority of the police in the state depend on the instant communications available via radio and most "routine" patrol functions cease when the communication links are inoperative, even for a short while. In summary, while opposition has been expressed in some quarters, most of the officers do not feel overly threatened by the VTD system and most recognize the advantages offered by such systems. In most cases the younger officers are more willing to adopt to advances in technology. The Police Association has been judged to have a higher degree of initial opposition than just the patrol force itself, because it is heavily influenced by, and the leadership is comprised of, the more senior officers, even though they may be few in number. Policy alternative number four (4) was written to address these concerns.

Generally speaking, investigators have enjoyed even greater latitude as to time and place while on duty that officers assigned to uniformed patrol. Some of them may feel that their traditional "leeway" is being threatened by the use of VTD's.

As the primary intent of implementation of a VTD or integrated system is to provide more efficient patrol operations, investigator's vehicles, as well as administrative vehicles would most likely be the last ones to be equipped, if ever.

When the strategic planning group completed its process of identification and assumptions setting for the stakeholder, the policy alternatives were again reviewed and, where necessary to address the assumptions made about the stakeholder, modified. Alternative Policy number 1 was rewritten to insure that full use of the PHCOPS system is made in appropriate circumstances. Policy Statement number 4 was rewritten to address the Department's intentions on the subject of supervision and the potential for possible discipline resulting from VTD information.

Administration and Logistics:

All of the acceptable alternative policy statements are designed to provide appropriate administrative control over the utilization of the PHCOP system.

Command:

Command and control is maintained by daily review of the use of the system by the assigned manager. Annual reports are required from the system manager.

Overall, it is the opinion of the Department management group that the Department is capable at this time of adapting to the necessary changes and policies. No major future obstacles are foreseen that cannot be overcome through planning, education and properly designed administered policies.

The management group also has expressed the opinion that the majority of local law enforcement agencies in the state could adapt one or more aspects of the VTD systems into their current operation with the objective of improved officer safety and overall improved efficiency of department operations.

VTD System Cost Vs Benefit:

Costs:

In 1967, the President's Commission Task Force suggested that VTD systems should not cost more that $1,000 per unit. These were 1967 dollars. Taking into account inflation over the past twenty-one years, VTD units that now cost something under $3,000 each are well within the suggested cost range. Systems that integrate RMS/CAD/CA/VTD were not given a "suggested" price range by the commission because the technology was not available at the time, but if those features added 100 percent to the cost, systems would still be in the $6,000, per unit, range.
At least two stand-a-lone units currently on the market sell in the $3,000 per unit range.

Costs for totally integrated systems will vary greatly, depending upon the size and nature of the system desired. The accuracy ranges that were suggested in that same report, 0.4 miles, have been refined to the point that under normal circumstances, current VTD's accuracy is within 100 feet or less. Basic VTD systems are no more expensive than superior quality police radios, and a very small amount in relation to the total cost of operating a patrol unit over a one year period. The annual cost for around-the-clock operation of a single officer patrol unit is in the neighborhood of $250,000 to $300,000 per unit, depending of the agency. Two officer units may be well in excess of $500,000. If stand-alone VTD systems are available for between $2,000 and $3,000 each, the addition of one of the units to a patrol vehicle would increase the total cost by between one and one and one half percent. In most all California police departments, the capitol outlay for a stand-alone VTD system would be less than one and one half percent of the total budget. VTD systems that were integrated with other computer operations within the department would, of course, cost more for programs and coordination, etc. Again, however, the total capitol outlay would seldom exceed one and one half percent of the budget and annual expenses less than one tenth of one percent (.1).

Benefits:

Benefits from either stand-a-lone VTD systems or integrated RMS/CAD/CA/VTD systems generally fall within two categories.

The first is the potential reduction in exposure to liability for both the public and the police agency. In the past few years dozens of court decisions have awarded many millions of dollars to injured "victims" of incidents involving the police in a variety of circumstances, most prevalent being awards for injuries suffered in police involved traffic collisions. When such accidents occur there are always negative long range impacts on the victims, the involved officers, the reputation of the agency and the budget. Emotional scars, let alone punitive awards, can destroy careers. The prevention of one high speed accident per agency over the life of the program would more than compensate the agency for the capital outlay and annual maintenance costs. The cost of the technology is decreasing rapidly while the cost of litigation is increasing dramatically.

Effective January 1, 1988, the California Legislature passed Vehicle Code Section 17004.7, which provided some civil immunity to public agencies involved in accidents resulting from police pursuits, if the agency has adopted minimum pursuit policy guidelines.

Historically, police pursuits have been almost uncontrollable. by supervisors. Some agencies have used "tac-o-graphs" devices in patrol vehicles, but these are usually resisted as a strictly negative tool by line personnel because their only function is to record vehicle speeds. Some VTD's (dead-reckoning) have the

potential to provide additional supervision of pursuits as a secondary benefit to their primary use as a tactical and strategic tool. They can provide improved officer safety in collision avoidance (at least between responding emergency vehicles) and reduced or eliminate the need to constantly broadcast voice radio messages of direction of travel, speed and location, allowing the officer to keep both hands on the wheel and concentrate on the driving. These VTD's may be of valuable assistance in the liability control issue.

The second major benefit is in the realm of improved operations. The VTD systems have the potential to reduce emergency response times, reduce radio traffic in the voice bands, improve dispatch efficiency and coordination, improve tactical command and control and generally improve the supervision of the patrol force. If and when these objectives are realized, it is probable that there will be improved officer safety, increases in the apprehension rates and general improved patrol efficiency and effectiveness. Absent unforseen events, it is probable that within the working lifetime of the newest police recruits, virtually every major local law enforcement agency in the state will be equipped with at least stand-a-lone VTD systems, if not integrated RMS/CAD/CA/VTD systems. Like police radios, most local police agencies will hard pressed to function without them.

One additional potential operational benefit of VTD's, etc., is more efficient use of available radio frequencies. Radio frequencies available to the police are limited and as the existing ones reach capacity, new ones must be allocated by the Federal Communication Commission (FCC) or more efficient uses of the existing frequencies must be found. The LORAN, dead-reckoning and satellite VTD systems all require the use of a radio frequency dedicated to data or voice/data in addition to the normally assigned voice frequency(s) for the agency.

These systems then, require additional frequencies for data transmissions while at the same time, reduce the need for voice only frequencies. The transmission of data in bursts lasting only micro-seconds in place of voice transmissions increases the efficiency of the a radio channel many fold.

Dozens of police VTD and or MDT units can be placed on a frequency that has reached it's peak load with fifteen to twenty voice users. "Upgrading" the efficiency of limited frequencies to data use by VTD's and MDT's in place of increased voice use seems to be a reasonable "trade-off". The new "trunked" radio systems also allow greatly increased use of limited frequencies. These, and other similar technologies, offer partial solutions, at least in the short term.

IV. TRANSITION MANAGEMENT:

The third objective is to develop a transition process by which the plan (suggested policies) developed in Objective Two is strategically managed to produce the desired future scenario.

Critical mass analysis:

In the case at hand, there is no issue of inadequate levels of current support from the Department management or City government management. The PHCOPS project has been approved by both levels and has been funded. Some equipment has been installed and the necessary computer interface programs are being developed at this time. This plan will be used to implement the systems in the Department. The "critical mass" for this issue was and is:

1. The Chief of Police and Department Staff:

The Chief and Department staff had to be convinced that the PHCOPS was a cost-effective program. The tragic results of a series of unfortunate but timely traffic accidents involving police vehicles was one of the prime motivator for interest and acceptance of the proposed system. It could be reasonably concluded from the circumstances of at least one of the accidents that the proper use of a VTD system might have prevented the collision. The rest of the Department managers agreed that this project was a worthwhile attempt to improve officer safety and Department tactical responses. This served the purpose of value clarification.

In the City of Garden Grove, it has been reported that the primary reason for implementation of the VTD system was to establish and maintain objective documentation to accurately reflect the deployment of officers relating to time and place.

2. City Government: The City Council and City Manager.
The same circumstances as detailed above were presented and funding was forthcoming. The ETAK/navigator-VTD phase of the computerization of the Departments records and communications systems is projected to cost between $50,000 and $60,000 in capital outlay. The ongoing costs are minimal, consisting of both equipment and software maintenance, estimated not to exceed $250 per unit, per year, or $2,500 for ten units. This is a small outlay in exchange for the potential savings.

3. Department Employees:
The focus of the attention here should be and was placed on the president and leadership of the Police Employee's Association. Their initial position, even though in general opposition to the program was, "lets wait and see."

The preliminary proposals for the VTD project were presented in written form to the President of the Police Association, inviting comments from the Association and its members. Detailed project status reports were made each time there was any significant movement on the project.

Employees were invited to a demonstration of the navigator units in the vehicles and demonstrations of the map work station. The dispatchers were quickly in a "help change happen" position, as they could see the obvious benefits to them in their duties. Training tapes and booklets were circulated to every patrol and traffic officer. Phase one of the program was instituted where ETAK Navigator units were installed in one-half of the patrol fleet and officers allowed to use or not use them as they wished.

4. Others:

A review of the agency survey returns shows that there is little to no resistance or opposition to the police implementing a VTD system. No outside individual or group was identified as holding a position other than "let change happen." Under normal circumstances, the only police "equipment" issue raised by most city governments is funding and once that is resolved, councils seldom are concerned with the use made of the equipment.

Implementation:

Phase one of the implementation plan for the Pleasant Hill Police Department has been described in detail in the preceding sections. Phase two of the project will be the integration of the navigator units and the CAD system. Prior to this step, additional training for all dispatchers, officers, investigators, supervisors and managers must be provided to insure a basic understanding of the systems and policies involved.

Prior to final acceptance and implementation, the detailed policy statements as to the use of the system must be issued. Policy alternatives one (1) through four (4) as detailed above will be issued at that point in time. The timing here in the case at issue must be flexible, as progress at beta-test sites is seldom smooth or on schedule. Individual concerns that might be expressed by employees must be answered in a fair and timely fashion. An honest, open approach is by far the best. There must not even be the appearance of manipulation or deceit. The key to dealing with the opposition of some members of the Department is the policy statement that information obtained from the VTD system will not be used as the sole criteria for any disciplinary action by the Department. The key issue here is that the Police Association leadership and the most senior officers be convinced of the good intentions of the Department managers and supervisors. This good faith has been demonstrated numerous times in the past by the degree of fairness with which employees have been treated in disciplinary situations.

All the sophisticated computer programs in the world are worthless to the organization if they do not put them to the appropriate or intended use. Managers must be educated as to what information is available from the system, whether it is pre-programed daily reports or ad hoc reporting from the relational data base in the host computers, and consider the data in the decision making process.

"Unintended" results commonly occur when such systems are implemented. We seldom are able to see every possible effect or impact from these changes. Those that are judged as "negative" or against the best interest of the organization as a whole must be eliminated as soon as possible. Those judged as in the best interest of the organization must be incorporated into the process. Value judgments of this nature are best made by a committee of impacted users, not by one individual.

Phase three of the transition plan includes the periodic review of the operation of the PHCOPS system. This will be accomplished by the Services Division Commander as chairperson of a review committee appointed annually to report on the PHCOP system and its operation during the preceding twelve months. This might well be a standing committee that would also be responsible to review the any discovered "unintended" results or effects of the system, and make recommendations to staff concerning corrective action, if necessary.

V. Conclusion:

The original reason for this study was to answer the question " By the year 2000, how can automated vehicle tracking devices (VTD) be utilized in the management of the Pleasant Hill (CA) Police Department?" The answer to that question is that the use of vehicle tracking devices (VTD) will be incrementally developed over the next twelve years to be used by the department in three primary ways.

The first is to improve the day-to-day direction, control and supervision of the patrol force in its "routine" response to calls for service as well as preventive patrol. VTD information will be used in a "directed patrol" style so as to improve response times and increase clearance rates. Officers vehicle driving habits, for both routine and emergency conditions are expected to improve with a corresponding improvement in officer safety rates.

The second way is an improvement in the Department's response effectiveness to "critical incidents" or other tactical operations that require the coordination of several police units or agents. This means increased efficiency and safety in the deployment of forces in all emergency circumstances.

The third way is an improvement in the amount and range of information available to management, both within the Department

and the City government, to make both short term and long term strategic planning decisions.

As reported in this paper, a number of trial VTD programs have been conducted during the past twenty years, but nearly all of these tests have ended with the conclusion that the demands and expectations of the system were ahead of the then available technology. That is no longer the situation. The advances that have been made in computer technology in the past ten years have now brought the level of sophistication of the equipment and programing past the point of the demands of the current applications in VTD's (ST4,NGE3.) There are now systems available that can meet all of the historical demands and, in fact, make possible features that have not been given serious consideration by more than one or two local law enforcement agencies (Survey Question #3.) It is now apparent that a properly designed system that has direct connections through and with RMS/CAD/CA systems and communications system could provide a wide range of meaningful tactical (dispatch and supervision) and strategic (management) data that would not only provide increased officer safety features, (ST2,ST3,ST6,ST7,ST8,ST9, ST10,NGE5) but a whole range of real time supervision and management information that is not currently available under any other known methods (NGT2, NGT3,NGT6,NGE1.)

The agency survey that was conducted showed clearly that very

few police agencies in California are using these systems at this time, and very few police managers have any real knowledge about the available technology and the potential for the systems (ST7) (Survey Question #3.) If technology is available to provide these features, the question is, "Why aren't these systems in widespread use by the police in California?" The basic answer, as detailed in the survey "source of resistance" results, is that the systems technology is too new.

As with virtually all revolutionary advances, it needs time to be accepted into the average "traditional approach" oriented local police agency. The next five to ten years will see considerable additional advances in computer technology, including VTD's, (ST4) as well as changes in the expectation of the public for the police to make full use of all legally available technology (NGE2.) The natural result of this trend and the other identified trends and potential events, makes for a high degree of probability that VTD's and other integrated computer systems will be incorporated into the standard operations of many of California police agencies.

ENDNOTES

1. U.S. companies manufacturing Loran based VDT'S:

   Audio Intelligence Devices
   Ft. Lauderdale, FL

   HDS
   Reston, VA

   METS, Inc.
   Pompano Beach, FL

   Motorola, Inc.
   Schaumburg, IL

   OAR Corp.
   San Diego, CA

   II Morrow, Inc.
   Salem, OR

2. Most manufacturers were free with installation information and together have listed ten (10) local agencies in the U.S. using their systems. One manufacturer declined to "reveal" more than two installations, expressing concerns about competition. As a result of this, the total number of VTD installations is not known for certain, but believed not to exceed fifteen.

3. Detroit, MI; Redding, CA.

4. The President's Commission of Law Enforcement and Administration of Justice, Task Force Report: Science and Technology. 1967. Washington, D.C., U.S. Government Printing Office, pp 149-156.

5. McLean, R.L. "LOCATES-Vehicle location and status reporting system project report - Phase I" City of Montclair (CA) Police Department. 1972.

6. Earl Robitille and Roger Ham," Integrated CAD and AVL System." Law and Order, February 1981. pp 78-79.

   Interview with Lt. Gary Davis, Huntington Beach (CA) Police Department, 21 January 1988.

7. "Digital Communications Systems Placed in Oakland (CA) Police Cars." Law and Order, March 1973. p 22.

8. G. R. Hansen and W. G. Leflang, Application of Automatic Vehicle in Law Enforcement - and Introductory Guide. Jet Propulsion Laboratory, Pasadena, CA. January 1976.

9. G. C. Larson, et al., Evaluation of Police Automatic Vehicle Monitoring (AVM) Systems - Study of St. Louis (MO) Police Experience, Washington, D.C., U.S. Government Printing Office. June 1977.

10. National Institute of Justice, Technology Assessment Program, "Vehicle Tracking Devices," NIJ Standard-0223.00. May 1986. Washington, D.C., U.S. Government Printing Office.

11. Interview with Lt. Jack Campbell, Kern County (CA) Sheriff's Office, January 1988.

12. "Irvine (CA) Police Install Vehicle Tracking System. Law and Order, May 1986. p 74.

    Interview with Lt. Norden, Irvine (CA) Police Department, 21 January 1988.

13. Interview with Lt. Whitman and Ms. Jean Ferrell, Garden Grove (CA) Police Department. 21 January 1988.

14. Refer Endnote #8. The AVL Planning Guide.

15. Refer to Endnotes #4, #6, and #8.

16. Motorola, Inc. "Tracknet, AVL System Planner" Issue 587.

17. Interview with Dr. Zavoli, Director of Research and Development, ETAK Corporation, Menlo Park, CA. February 1988.

18. II Morrow, Inc. brochure, "VTS - Vehicle Tracking System." 1985.

19. Interview with Mr. Dennis Holt, Regional Ambulance Co., Fremont, CA. January 1988.

20. Interviews with Lt. Norden, Irvine P.D., Ms. Ferrell, Garden Grove P.D., and Lt. Campbell, Kern Co. S.D. Refer to Endnotes #11, #12, and #13.

21. Interview with Lt. Norden, Irvine P.D. Refer to Endnote #12.

APPENDIX # 1

"Trend" comments added to the survey by respondents.

1. Increased civilization of L.E.
2. Demands to work closer with other police agencies.
3. Demands to work closer with other city departments.
4. Cost of service recovery.
5. The widespread use of VTD for non-sworn personnel functions who will make up a significant per centage of police operational services.
6. Labor organizations resistance to the "big brother" performance measure.
7. Computer technology in LE
8. Communications systems expansion.
9. Civilization within police management ranks.
10. Utilization of part time or volunteer employees.
11. Quality of the new recruit.
12. Additional reliance on hardware and technology.
13. Re-emphasis on personal communication
14. Increasing public frustration with the justice system.
15. In the area of VTD technology, Motorola, MDI, Electro-com will integrate with ETAK technology or ETAK will integrate MDT technology.
16. The addition of word processing on MDT features into the same box.
17. Higher baud transmission rates.
18. Real time unit status monitoring.
19. 100% increase in automated records and communications systems.
20. Automated tracking of officer statistics and crime activity by date, day, hour, etc.31. Consolidation of communications.
21. Civilization of investigative and research development positions.
22. Technological advances re: computers
23. Peoples acceptance of VTD.
24. Use of force will be greatly reduced by law.
25. Increasing dicotomy between management and field officers, more specialization.
26. Increased hiring of victim police officers. Hiring of soft personality types.
27. Increase in domestic terrorism.
28. High unemployment.
29. Development of artificial Intelligence.
30. FCC mandates regarding frequency allocation and utilization.
31. Regional movement towards multi-jurisdictional communications.
32. Trends toward CAD
33. Trends toward automated records management systems.

APPENDIX # 2

Possible future Events/Comments listed by the respondents to the survey.

1. If management misuses VTD's to "spy" on line personnel, the use of VTD's may be limited by MOU, Court injunction, and possible State or Federal law.
2. The development of satellite communications for local L.E. incorporating VTD.
3. New, unknown technology. Budgetary cost effectiveness. Is it necessary. This is an unknown variable.
4. A satellite based system gives accuracy and 100% coverage.
5. The development of lap-top portable computer with radio telephone interface and report narrative formulas included.
6. Right of privacy law at the federal level precludes the use of VTD.
7. Radio frequency waves found to be hazardous to the individuals health.
8. Police labor units prohibit VTD use.
9. Development of cost-effective satellite-based VTD technology.
10. Anti-Association.
11. Big brother debate.
12. L.E. professionals will recognize their inability to cope with efficient applications of technological advancements without specialized technologically trained staff.
13. Need for training staff to "bridge-the-gap" in translating technology for field officer understanding and acceptance.
14. All positive. The only negative forces against it are negative perceptions. Those will change.
15. Acceptance.
16. Price change.
17. Word processing.
18. Integrating with MDT's.
19. Court rules VTD's constitute change in working conditions and must be bargained for in MOU's.
20. ACLU files suit on behalf of PORAC to block VTD's as an invasion of privacy of police officers.
21. Computer chips implanted at birth coded by DNA which tracks all individuals.
22. Restrictions negotiated by police units.
23. Staffing levels to handle workload
24. Radio system interference.
25. MOU contracts
26. Union/POA suits re: violation of privacy claims of possible harassment.
27. Police Associations/PORAC pushing for VTD especially if officer safety becomes an increased concern.
28. Available frequency spectrum in a given population.

29. I would hope that we would continue to have the management right to keep track of our employees.
30. Microelectric circuity and superconductors.
31. Regionalized dispatch centers, lower costs, simplification of installation and maintenance and enhancing features.

APPENDIX # 3

Nominal Group Participants, 18 February 1988.
Session held at Pleasant Hill Police Department.

The Nominal group consisted of at total of ten (10) individuals. Five are currently middle-managers in local police agencies in Contra Costa County.

They were:

City of Pleasant Hill (CA) Police Department,
Capt. Kevin Sharp and Lt. Tim Martell, author.

City of Walnut Creek (CA) Police Department,
Capt. Neil Stratton.

City of Concord (CA) Police Department,
Lt. Jerry Zwicky.

Contra Costa County (CA) Sheriff's Department,
Lt. William Shinn.

Representing the Pleasant Hill (CA) Police Officers Association:
Cpl. Hakeem Shabazz, immediate past President.

Representing City Government, the Administrative assistant to the City of Pleasant Hill (CA) Finance Officer,
Ms. Kathy Schmitz.

Representing technology, the Director of Research and Development for the ETAK Corporation (manufacturer of VTD's),
Dr. Walter Zavoli.

Representing the public:
Mr. Albert Gurvich, retired Insurance Co. Manager.
Mr. Al Gray, retired middle-manager from the City of Oakland (CA) Fire Department.

APPENDIX # 4

This is a complete list of trends, as identified by the nominal group (NG) technique, that may impact the use of VTD by the police. The rank orders (priority) were determined by the the "average" scores by the NG.

RANK ORDER	TREND NUMBER	NOMINAL GROUP (NG) - TRENDS IDENTIFICATION	GROUP SCORES	AVERAGE SCORE
T8	1	Decrease percentage of community resources available for law enforcement.	5	.5
T8	2	Tight money limits affordability for technology.	5	.5
T8	3	Increased sophistication of crime.	5	.5
	4	What spinoffs of technology can effect by year 2000?		
	5	Can radar be interfaced with technique?		
5	6	Utilization of computer management of resources for critical incidents command.	5-5	1
	7	Integration with natural disaster for inter-agency coordination.		
6	8	Increase use of police information records for community planning.	5-1-3	.9
4	9	Verifying a trend for courts to demand documentation of police conduct for civil/ criminal litigation.	3/4/3	1
	10	Doing more with existing resources.	1	.1
	11	Improvement with VTD technology.		
	12	Technology continues to improve combining elements reducing size and costs.	1	.1
T8	13	Need to keep track of undercover operators.	5	.5
	14	(Combined with another trend.)		
	15	Potential to integrate/coordinate all public safety.		

T13	16	Integrate VTD information with crime analysis information and beat structure development.	4	.4
	17	Demand for increased personnel development/ training.		
	18	Help officers learn geological features of community.		
2	19	A trend of demand by the public for improved police service.	5-5-3 3-2-2	2
	20	Increasing frequency of traffic accidents of police vehicles.		
	21	Automated records and communication proliferate. AVL the next step.		
	22	Civil rights challendged in court over technological information.		
T8	23	Need for digital maps for city wide analysis planning.	1-4	.5
7	24	Improved coordination/integration of activities by neighboring law enforcement agencies.	1-4-4	.9
	25	Develop data bank on site specific hazardous situations.		
	26	Increased awareness for law enforcement fleet management.		
T13	27	Increase in frequencies of organized tactical response.	4	.4
	28	Demands to improve police response time. (Combined with number 19.)		
	29	(Combined with another trend.)		
	30	Decrease in available radio channels for law enforcement.		
T13	31	Increase demands to track and control location of specific vehicles.	1-2-2	.4
	32	Trend to insure creditability of police officers.		

	33	Clandestine monitoring of specific individuals.		
	34	Blending of private and public resourses.		
	35	Courts require use of technology to avoid lawsuits.		
T13	36	Trend towards more small and powerful computers - easier to learn.	4	.4
1	37	A trend towards the integration of RMS/VTD/ CAD/CA for police.	2-2-2-1 3-5-3	2.0
	38	Increased training needs to learn to operate technical equipment.	3	.3
	39	Tendencies to reject "questionable" technology. (Need test case.)		
	40	Increase law enforcement attempts to recover costs.	1-2	.3
3	41	A trend towards regionalization of public safety agencies/resources.	1-3-4-4	1.2
	42	New technology makes existing systems obsolete.		
	43	Increased vehicle traffic conjestion reduces police response time.		
	44	Increased demand for officer safety products from labor organizations.	3	.3
	45	Resistance by labor organization to increased observation.	3	.3
T13	46	Increase accountability of personnel supports increased accounting systems.	4	.4
	47	Electronic systems complexity requires backup system increasing costs.		
	48	Tendency to become slave to technology due to higher expectations.		
	49	(Combined with another trend.)		
	50	Need to maintain secure radio traffic.		
	51	Increase technlogy increased labor demand/costs.	1	.1

52 Increase use of navigators in private vehicles.

53 Technology designed to decrease labor demands.

APPENDIX # 5

RANK ORDER	TREND NUMBER	NOMINAL GROUP (NG) - EVENTS IDENTIFICATION	GROUP VOTES	AVERAGE VOTE
11	1	Law prohibits use of AVL's.	5	.5
8	2	Technology becomes available for criminals to track/jam PAVL's.	2-5	.7
	3	Courts require use of AVL for civil review of police actions.	3	.3
	4	Any disaster/earthquake/conflagration/ natural.		
	5	(Combined with another event.)		
	6	Using a technology for more efficient 911 system.		
T12	7	Specific entities refuse to participate.	4	.4
	8	Technological improvement of vehicles makes use of AVL system not practical.		
	9	Crash of world market.		
5	10	Personally carried location device developed makes VTD obsolete.	3-3-4	1
	11	AVL system found to interfere with TV system.		
7	12	Labor group of ACLU wins restriction on use of VTD for supervision -	5-2-1	.8
	13	or loses court decision.	3	.3
	14	Results of earthquake automated systems are mandated to talk to each other.		
T12	15	Lack of public understanding limits funding for VTD.	1-3	.4
	16	Sabotaging system by labor organization or individuals.	1-4	.5
	17	Increased drug traffic reaches all time high.		
	18	(Combined with another event.)		

	19	Over-population causes permanent gridlock and makes VTD obsolete.	1	.1
	20	Police force replaced by private company.	2	.2
	21	(Combined with another event.)		
	22	Environmentalists destroy AVL equipment.		
6	23	Tracking system will be credited with saving officer's life.	2-2-5	.9
	24	Real time traffic information system reduces congestion and aids in emergency dispatch.		
T12	25	Faulty integration with existing systems causes entity to scrape program.	1-3	.4
	26	Detecting drunk driving takes 30% of enforcement resources.		
	27	Enhance public education increases efficiency of the system.		
	28	Overthrow government.		
	29	AVL used for tracking device of convicted drunk drivers.		
	30	Police union in New York City strikes over lack of AVL safety system.		
	31	Court will or will not accept tracking device documentation as legal evidence.	1-1-1	.3
3	32	Major auto companies provide navigation system, driving costs down.	5-4-2	1.1
	33	Exceptance of VTD and PTD by labor organizations.	3	.3
	34	All non-violent offenders tracked by police with PTD's		
	35	Grant funds made available for VTD		
T12	36	VTD built into police cars as standard equipment.	4	.4
	37	New radio technology opens up dedicated data radio channel availability.	2	.2

4	38	Technological advancement allowing integration of VTD with all other computerized systems	1-2-3-4	.1
	39	Aircraft shared amongst agencies.		
	40	Sun spots interfere with ATD devices.		
9	41	Satellite technology replaces current technology for VTD.	4-2	.6
	42	Nation-wide digital map date base is completed.	3	.3
	43	Covert PTD utilized for apprehension of criminals.		
	44	Police officers refuse to drive police cars due to hazard to health.		
T12	45	Stolen police vehicle recovered by using VTD.	4	.4
1	46	Integrated RMS/VTD/CAD/CA demonstrated to improve police efficiency by significant amount.	5-2-4 5-5	2.1
	47	TV transmission block out AVL radio signals.		
	48	Enthusiastic recognition of improved police service due to VTD.		
	49	NASA narrowly averts second disaster - delays satellite program.		
2	50	AVL features costs exceeds benefits.	5-3-4 5-1	1.8
	51	PHPD innovation use of VTD in robotic vehicles.		

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