Technological Opportunities for Traffic Law Enforcement to Mitigate the Impact of Growth on the Transportation System and Environment between Now and the Year 2000

AN INDEPENDENT STUDY PROJECT

by

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Executive Summary

Part One - Charting the Future

Background: Traffic on the nation's highways will increase 50 percent by the year 2000, with a mere six percent increase in roads, according to the U.S. Department of Transportation.

In an era of tax reductions and other revenue-limiting measures, law enforcement agencies cannot expect increases in resources commensurate with increases in traffic. However, efficient movement of people and goods is critical to the economic well-being of California and, indeed, the nation.

To ensure the continued efficiency of our highway transportation system, we must implement new enforcement technologies to facilitate traffic flow and reduce environmental pollution.

How will opportunities for implementation of new technologies be identified and addressed? A literature search and futures research methodologies were employed in this study. A Nominal Group Technique (NGT) panel consisting of representatives of law enforcement, traffic engineering, transportation planning, computer technology, and consumer activists was established to study this issue.

Five trends were forecasted: Traffic Congestion, Candidates Qualified for Employment as Traffic Law Enforcement Officers, Hours of Training Required to become a Traffic Officer, Traffic Operations Centers in Operation, and Funding of Traffic Law Enforcement. Additionally, five high probability events were forecasted: Legalization of Automated Enforcement, Telecommuting by Ten Percent of the Workforce, Right of Access to Freeways Controlled, Electronic License Plates Installed on Ten Percent of Vehicles, and Computerized Navigation Systems Installed In Ten Percent of Vehicles.

These trends and events served as the basis for a Cross-Impact Analysis, and were used as the foundation for the creation of three future scenarios. From this information, policies to attain the desired future state were developed.

Policies: Upon consideration of the key trends and events and the information from the Cross-Impact Analysis, three general policy guidelines were found to be politically and economically sound:

- Basic constitutional rights should be fully protected.
- Technological solutions to traffic law enforcement should be strongly encouraged.
- Human resources management considerations should be fully integrated with new technologies.

Part Two - Strategic Management

Strategic Plan: The strategic plan comprises four methodologies. A situational audit was conducted to determine salient weaknesses, opportunities, threats, and strengths impacting the issue. A strategic assumptions surfacing technique was used to clarify assumptions about external forces impacting the issue. An internal capability analysis was conducted to assess the organization's strengths and weaknesses in dealing with its environment. Finally, a Modified Policy Delphi was used to select the alternative strategy to be implemented. The selected strategies were to establish public/private partnerships to implement new technologies, and to seek legislative solutions to legal obstacles.

Part Three - Transition Management

To move the organization from the current state to the desired future state, three major steps were identified: (1) commitment planning, (2) a recommended management structure, and (3) methodologies to be used in support of the transition plan.

The study concludes that police managers are the key to provide the catalytic leadership to implement the plan. A top-level task force, including representatives from all affected entities, should be established to develop strategic plans for demonstration projects.

Will the future ever arrive? . . . Should we continue to look upwards? Is the light we can see in the sky one of those which will presently be extinguished? The ideal is terrifying to behold, lost as it is in the depths, small, isolated, a pin-point, brilliant but threatened on all sides by the dark forces that surround it; nevertheless, no more in danger than a star in the jaws of the clouds.

Victor Hugo

INTRODUCTION

California is a state that demands intense study of the future: California's economic output has increased by $200 billion a year since 1982; its growth alone is the equivalent of the entire Australian economy. By the turn of the century, the State should have a trillion-dollar economy, placing it among the top four or five in the world. This continuing economic boom will place tremendous pressure on traffic law enforcement agencies to provide for the safe and efficient movement of people and goods. To provide such services, these law enforcement agencies must turn increasingly to technology.

The impacts of technology on traffic law enforcement in this country are foreshadowed by developments in other nations. Just last November, the Dutch government approved "road pricing" a futuristic pay-as-you-drive plan that is light-years ahead of the American toll-road system. Soon, every automobile imported into or manufactured in Holland will carry a specially designed microchip with its own unique "signature." This chip will be detected by sophisticated computer sensors embedded in selected roads, bridges and tunnels. As the chip-carrying automobile drives over the sensor, it records the signature, traces it to its registered owner, and adds the toll to a monthly bill.

For the purposes of this paper, this issue was studied in the context of a large (approximately 8,000 employees) organization with statewide responsibilities for enforcement of all laws relating to highway transportation. Such an agency will likely be affected to the greatest degree by technological advances, and increasingly will turn to technology for solutions to its problems.

BACKGROUND

Traffic on the nation's highways will increase 50 percent by the year 2000, with a mere six percent increase in roads, according to the U.S. Department of Transportation. [1]

At a 1987 Los Angeles hearing on traffic problems, Transportation Commission Director Rich Richmond estimated that the amount of wasted time spent by local commuters and travelers in traffic tie-ups on county highways and roads at about 458,000 hours per day. "That converts by our (Transportation Commission) estimates to a minimum of about $505 million per year in wasted time and about 72 million gallons of gasoline just in our county," Richmond said.

Los Angeles County's transportation problems are not unique to Southern California's infrastructure system. Public affairs writer John Yoo reported in the Wall Street Journal that the 42,798-mile interstate highway system launched in 1956 was engineered to last 20 years, yet the highway system is still three years from completion. In other words, Yoo pointed out, portions of the interstate system are already 13 years obsolete–and the job isn't even finished!

According to Associated General Contractors of America, the estimated cost of repairing the nation's infrastructure is $3 trillion ($3,000,000,000,000!).

The unfortunate fact is that the condition of our infrastructure directly affects our economy. A National Council of Public Words study over a 25-year period showed a steady decline in the nation's public works investment. From 1960 to 1985 the dollar outlay for public works fell from 2.5 percent of the gross national product to 1.5 percent, and the study showed an alarming correlation between the investment and the decline in national productivity.[2]

In his keynote address to the California Republican Party convention on March 10, 1990, California Governor George Deukmejian said, *"Californians now waste nearly 1.2 billion hours a year sitting in traffic. These traffic jams also waste over 750 million gallons of gasoline. Traffic gridlock diminishes our quality of life. It dirties our air and it threatens our powerhouse economy because businesses and jobs will leave our state unless we take bold action now."*[3]

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[1]Government Technology, Vol. 3, no. 2 February 1990.

[2]Ibid.

[3]The Vacaville *Reporter*, March 11, 1990.

And according to the pre-eminent futurist of our time, Alvin Toffler, *"The fact is that almost all the major systems on which our society depends—from the transportation system and the health system to the postal system and the education system—are in simultaneous crisis.*

We are witnessing the massive breakdown of America as we knew it and the emergence of a strange, new 21st-century America whose basic institutional structures have yet to be formed. The 1990s will either see a further deterioration of old systems and the social order that depends on them, or a serious effort to restructure America for the 21st century.

Failure to prepare in advance for the turbulent '90s could produce a grave breakdown in public security."[4]

If the above statements are even partially accurate, current methods of traffic law enforcement will be woefully inadequate for the next century. The entire philosophical basis for such enforcement must be reexamined in light of two overwhelming factors—traffic congestion and atmospheric pollution. And as increased enforcement resources are not likely to be forthcoming, solutions must be sought in technology.

The use of technology in traffic law enforcement springs from an inauspicious beginning. In August 1929, when the California Highway Patrol was inaugurated, "they had no radio system, no plans for a system, and virtually no money for any kind of experimentation."[5] During this era, a system of signal flags at roadside businesses was used to alert the beat patrolman to telephone headquarters for messages.

Communications systems were not the only technological shortcoming. As there was no radar, the only means of determining the speed of a vehicle was by pacing or by timing with a stopwatch (the latter method was later determined to be illegal).

Traffic monitoring was rudimentary at best. The only available method was direct observation and tallying of results. This was later supplanted by pneumatic tubes and mechanical traffic counting devices.

Beginning in the 1940s, some agencies also experimented with aircraft for traffic law enforcement. Several fixed-wing and helicopter configurations were use for various missions, such as traffic observation, speed enforcement, and evacuation of injured persons.

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[4]Alvin Toffler and Heidi Toffler, FBI Law Enforcement Bulletin, January 1990, pp. 2-5.

[5]Zenith 12000, Winter 1989.

From these unpromising beginnings, traffic law enforcement has made significant strides. Complex telecommunications systems providing voice, video, facsimile and data links are common to all enforcement agencies. The use of radar and aerial observation for speed enforcement is widespread. Some agencies have implemented automated citation issuance and processing systems.

However, the surface of technology has only been scratched and the potential for application is enormous. Many tasks in traffic law enforcement are currently done in a labor-intensive fashion that exacerbates the problems of traffic congestion, air pollution, and economic waste.

PURPOSE AND FOCUS OF THE STUDY

This study will address selected applications of new technology, and how they might be used in a traffic law enforcement setting to provide enforcement services in a more efficient and effective manner. The product of the study will be a strategic plan with recommended policies to incorporate these technologies into a large traffic law enforcement agency. A transition plan will also be developed to guide implementation of the strategic plan.

The organizational setting for the study will be a large agency with primary responsibility for traffic law enforcement, having statewide jurisdiction.

THE STUDY PROCESS

This study will employ a variety of techniques presented by Command College faculty. This paper will present a futures study addressing implementation of selected new technologies in accomplishing enforcement of traffic laws. An underlying purpose will be to enforce these laws in the most efficient and effective manner, while mitigating traffic congestion and concomitant vehicular pollution of the atmosphere. The study will comprise three discrete parts.

Part one will include various forecasting techniques in an attempt to clarify a vision of what the future might be. A scanning process was used to develop a futures wheel to surface and explore issues and graphically depict their relationships (see fig. 1). A review of relevant literature in the field was conducted. A Nominal Group Technique (NGT) panel was used to surface significant trends and events, and to develop a forecast of their likelihood of occurrence. Finally, three scenarios were developed to present brief sketches

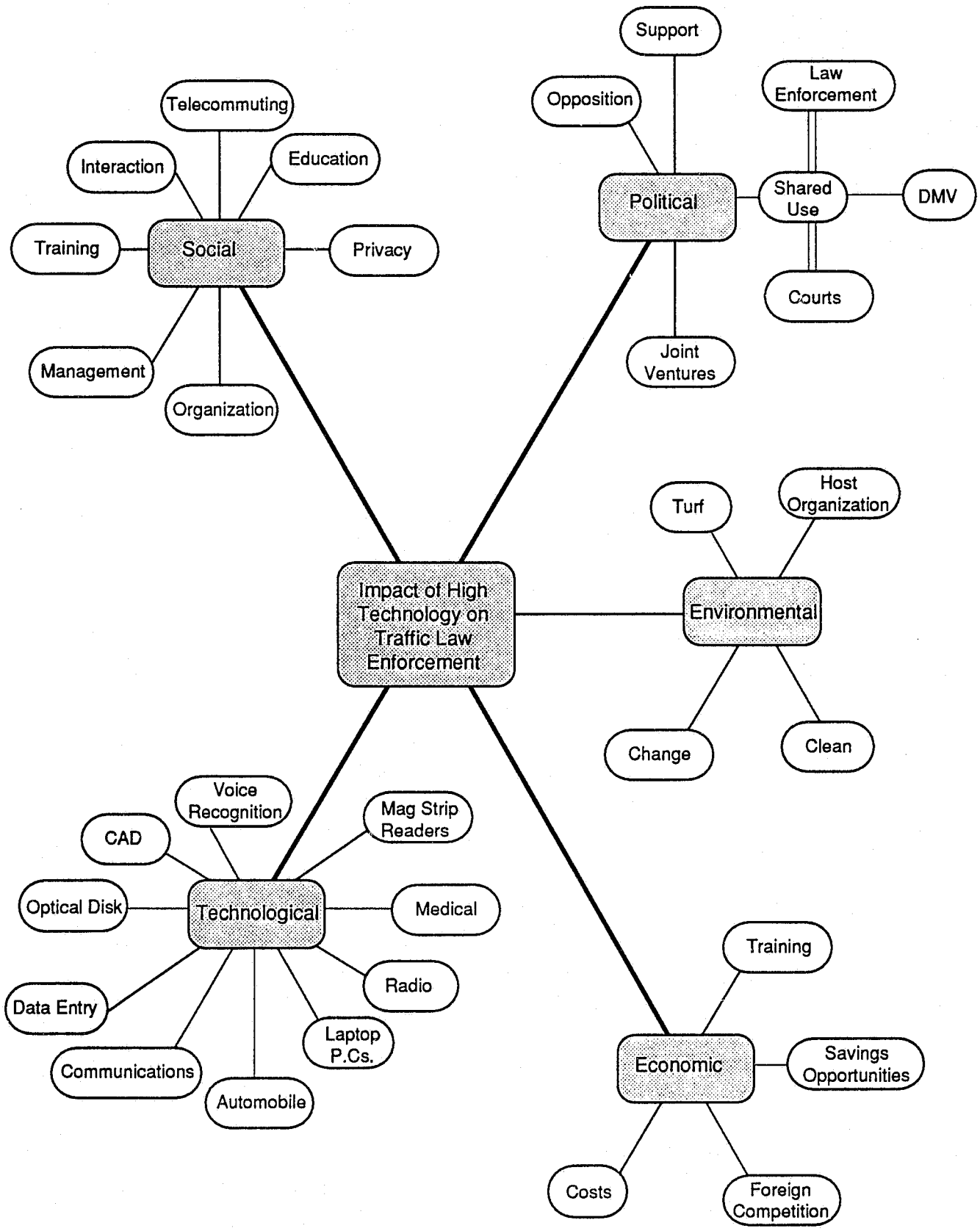
of what some alternative futures might hold, using the information developed in the NGT process.

Part two will present a strategic plan based on the normative mode scenario. Policies necessary for actualization of the strategic plan will be developed and examined in the light of this scenario.

Part three will include a transition plan required for implementation of the strategic plan, to guide the subject agency to the desired future state.

Figure 1

FUTURES WHEEL



LITERATURE REVIEW

A wealth of information is contained in the available literature, and the police use of technology has been highly publicized in the popular media. This study included research in the California Highway Patrol Library, the Sacramento Public Library, the California Commission on Peace Officer Standards and Training Library, and the database of the National Criminal Justice Reference Service.

Perhaps the most common and widely known traffic law enforcement use of technology is radar. As early as 1954, the CHP was examining the potential application of radar for traffic law enforcement. A study of departments using radar was conducted, paying close attention to problems in deployment and effects on authorized officer strength. The early public reaction was very positive, and a variety of supportive letters and resolutions were received. During the 1967 regular session of the State Legislature, the first formal request for the purchase of radar was made by the CHP. This bill failed passage, as did similar bills introduced in many subsequent sessions though 1981, largely due to political opposition led by the trucking industry. Although there is no law prohibiting radar enforcement in California, lack of legislatively-approved funding for a Statewide radar program has inhibited its use by the CHP.

Radar was first deployed by the CHP in the unincorporated community of Orinda, in Contra Costa County, during the latter half of 1981. The radar units were purchased by the county and "loaned" to the CHP for operation by its officers. Under a similar procedure, radar is currently being deployed by the CHP in 31 counties across the State, primarily on targeted county roads.

More recently, radar has been combined with photographic and computer equipment in attempts to automate speed law enforcement.

Another use of technology for speed enforcement is VASCAR (Visual Average Speed Computer and Recorder). This system depends on the officer's accurate visual observation of the violation vehicle, but is preferred by some agencies because there is no electro-magnetic radiation, which might be detected by radar detectors, allowing violators to avoid apprehension.[5]

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[5]"Speed Measuring Devices (radar/VASCAR) [IACP Models for Management]," The Police Chief, March 1988, 55(3): pp.77-78.

Computerized traffic accident records systems are also in widespread usage. During the early 1970s, the federal government made great strides toward a national traffic accident records system by requiring each state to have an integrated statewide system.[6]

Several newer developments are beginning to show more of the potential of technology. Some departments are using mobile digital terminals (MDTs), which transmit data directly to a terminal screen in the patrol vehicles, and allow the patrol unit to send data messages back to headquarters.[7]

"Other departments are using MDTs in conjunction with highly-sophisticated computed-assisted dispatching and enhanced "911" telephone systems."[8]

"Automatic issuance and processing of citations had its beginning with parking enforcement."[9] Some departments are experimenting with expansion of this concept. The California Highway Patrol is currently conducting a pilot project in Ventura County using computers to issue citations for heavy truck violations. This pilot project is networked with the local courts for citation processing.

Traffic monitoring and control of signals is a long-standing use of technology. Current extensions of this concept are using video, radar, acoustic, and magnetic vehicle detectors to monitor traffic flow and reduce congestion.[10]

Automatic license plate readers have also been developed. A system in use in Japan takes a still photograph of violation vehicles to allow citation issuance. A more sophisticated system has been tested in this country using image-recognition technology.[11]

License plate readers, or systems using transponders for vehicle identification, have numerous applications. They are currently being used for heavy-truck monitoring by California and several other western states in the "Crescent" project. They are under consideration for other uses, such as vehicle location monitoring, road pricing (tolls based

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[6]"Integrated Statewide Traffic Records System Study Information Bulletin," California Highway Patrol, Information Bulletin, December 1970.

[7]James Caldwell, "Mobile computer terminals," FBI Law Enforcement Bulletin, November 1984, 53 (11): pp. 21-24.

[8]"E911 and CAD systems: a result of cooperation," Law and Order, February 1988, 36(2): pp. 46-48.

[9]Roy Williams, "Portable computers ease parking patrol," Law and Order, May 1986, 34(5): pp. 56-60.

[10]John L. Barker, "Radar, Acoustic and Magnetic Vehicle Detectors," IEEE Transactions on Vehicular Technology, February 1970.

[11]Stanley Jordan, "Automatic license plate reader tested," POLICE: The Law Officer's Magazine, September 1989, 13(9): pp. 22-24.

upon time of day, vehicle type, and number of occupants or load carried), and stolen vehicle recovery.

Computers are invaluable in collision reconstruction. They can quickly manipulate complex algorithms to calculate crash forces and vectors, and perform other intricate calculations such as roadway friction analysis and determining vehicular speed from skidmarks.

In-vehicle navigation systems based on computer technology have recently been unveiled. These should prove helpful in reducing traffic congestion, and should be invaluable to police and other emergency responders in determining precise locations and quickest response routes.

A large number of developments have yet to be incorporated into traffic law enforcement, and show great promise. These include laser, infrared imaging, and artificial intelligence/expert systems.

Laser technology has strong potential for speed law enforcement. It is even more precise then radar in speed measurement, and because it emits only a pencil-thin, directional energy beam, it is extremely difficult to defeat with a detection device.

Infrared imaging has application in settings where it is desirable to determine the number of vehicle occupants, such as car pool lane enforcement. With such technology, it might be possible to enforce car pool lane laws without stopping the violation vehicle, so that traffic could flow uninterrupted.

Artificial intelligence or expert systems could enhance law enforcement decision-making. Many decisions requiring quick response lend themselves to computer assistance.

Part One

CHARTING THE FUTURE

Charting a course for the future is possible only if we know where we want to go, or what condition or state we desire to obtain— or avoid. It is impossible to accurately predict the future, but various forecasting techniques can be used to provide a range of estimates concerning several "futures." For the purposes of this study, the forecasting was done in light of the issue, "What will be the impacts of new technologies on traffic law enforcement in California by the year 2000?"

To further examine the issue of new technology impacts on traffic law enforcement, a futures research methodology was utilized. The past was examined to determine "forerunner" issues, to consider emerging sub-issues, and to scrutinize the future for potential sub-issues. This process was also helpful in setting the limits and sharpening the focus of the study.

The relevant forerunner issues identified were:

- Public dissatisfaction concerning traffic congestion
- Failure of California's transportation bond proposal
- Crisis in the automobile insurance industry in California
- Public concern about governmental regulation of atmospheric pollution
- Protection of individual constitutional rights

Present and emerging sub-issues were identified as:

- October 17, 1989 earthquake which highlighted California's economic dependence on a fragile transportation system.
- Aging of the entire transportation infrastructure.
- Crises in governmental transportation funding

Potential future sub-issues were identified as:

- Failure of Proposition 111 (state gas tax increase).
- Significant State economic loss caused by deterioration of transportation capacities.
- Even stricter pollution control legislation.

FORECASTING METHODOLOGY

The STEEP process— categorizing information as Social, Technological, Economic, Environmental, or Political— was used over an eighteen-month period to organize data from a variety of sources, including newspapers, periodicals, and other publications. The STEEP process provided a background of understanding of the milieu in which the issues were developed.

The literature review provided insight into the current state of technology in traffic law enforcement, and an understanding of the stream of technological infusion. It also indicated possible contact points for future technological applications development.

The Nominal Group Technique (NGT) is a structured process of group participation for generating ideas or solving problems. There are six steps in the process including: (1) silent generation of ideas in writing, (2) round-robin recording of ideas, (3) serial discussion for clarification, (4) preliminary vote, (5) final discussion, and (6) final vote.

Information Application

The **Futures Wheel** is a graphic representation of the primary issue as it relates to sub-issues.

A **Trend** is an objective or subjective observation, over time, of any social, technological, economic, environmental, or political measurement.

An **Event** is any discrete, one-time occurrence that affects the issue.

A **Cross-Impact Analysis** is a method of developing data on potential interactions of the final set of events upon other events and trends. These data are subsequently used for scenario creation.

Future Scenarios

Futures scenarios are integrating mechanisms for bringing together and synthesizing large quantities of both hard and soft projections that cannot be handled systematically by any other known means. They provide a means of making a forecast happen in full view of other causes. They provide a framework to systematically and rigorously ask" what if" questions. They allow for manipulation for differing results.

The Exploratory — Driving Force Scenario posits a "scenario space" by specifying distinctly different levels for each trend (or macro-indicator) in a set, and then describes the future associated with one of the combinations, assuming that the trend levels remain constant as postulated.

The Normative — Slice of Time Scenario jumps to a future period in which a set of conditions has come to fruition (or can now do so), and behave in that environment.

The Hypothetical— Demonstration Scenario posits a particular end-state in the future and then describes a distinct and plausible path of events that could lead to the end-state.

Futures Research

To brainstorm ideas, develop trends and events affecting the issue, and to evaluate those trends and events, the Nominal Group Technique (NGT) was used. The NGT group consisted of traffic law enforcement professionals of the rank of assistant chief, sergeant, and officer. Also included were a research manager and a program analyst from a large traffic law enforcement agency, as well as a senior transportation planning expert, an executive of a large computer technology corporation, and a representative of a consumer activist organization.

Prior to the first meeting of the NGT, the group members were provided with the issue question, and brief individual discussions were held to clarify the issue and assist them in their own scanning activities. A review of pertinent literature was conducted, utilizing futures files compiled during previous Command College endeavors.

Initial discussions with the NGT further clarified and refined the issue. Specifically:

1. Should the issue be limited to technologies that might be available only to the largest agencies?
2. What cost-benefit assumptions and parameters should be used?
3. What level of trend actualization should be deemed significant?
4. What legal or moral ramifications should be considered?

The NGT then brainstormed and used round-robin techniques to develop lists of candidate trends and events (see Appendixes A and B). Each item on the lists was discussed and refined to ensure mutual understanding and clarity of expression.

TREND SELECTION PROCESS

The long list of trends was reduced using the trend screening chart (see Chart 1).

For purposes of this paper, the number of trends to be carried forward was arbitrarily limited to the five which were considered by the group to be most helpful for purposes of strategic planning. The individual members of the NGT group evaluated the five trends using a trend evaluation chart to estimate the level of each trend five years ago, five years from now, and ten years from now. The group median scores and the high and low for each cell in the chart were calculated, (see Chart 2)

CHART 1

TREND SCREENING

CANDIDATE TREND	For purposes of top-level strategic planning, how valuable would it be to have a really good long-range forecast of the trend?				
	Most helpful	Very helpful	Moderately helpful	Not very helpful	Least helpful
T1 TRAFFIC CONGESTION traffic moves at less than 35 MPH on freeways	6		2		
T2 CANDIDATES QUALIFIED for employment as traffic law enforcement officers	4	2	2		
T3 Hours of TRAINING REQUIRED to become a traffic law enforcement officer	5	1	2		
T4 Number of TRAFFIC OPERATIONS CENTERS in operation	3	3	1	1	
T5 FUNDING of traffic law enforcement	6		2		

CHART 2

TREND EVALUATION

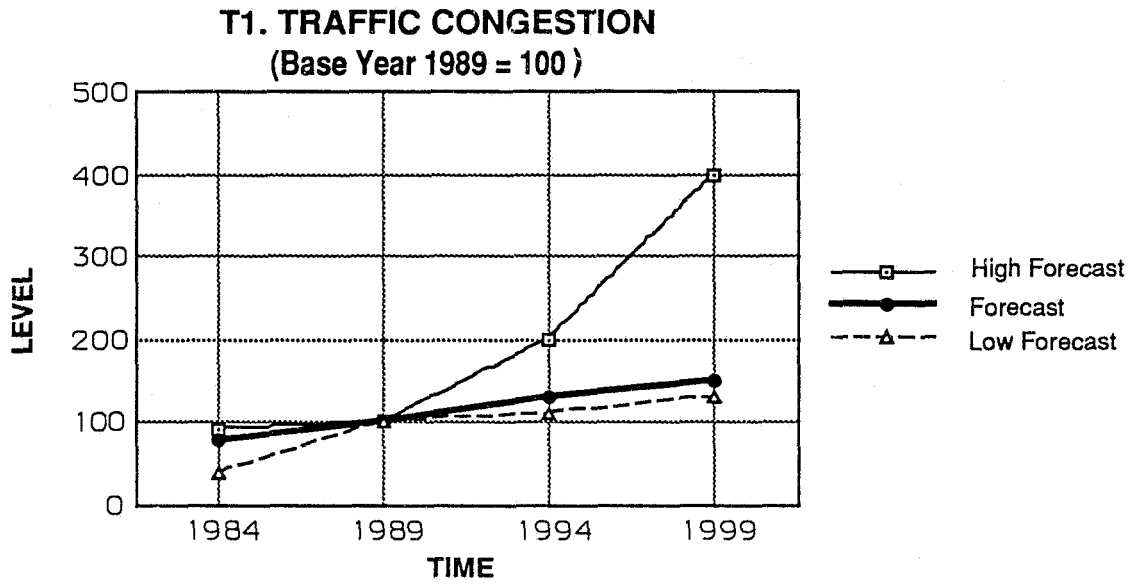
TREND STATEMENT	LEVEL OF THE TREND* (Ratio: Today = 100)			
	5 Years ago	Today	5 Years from now	10 years from now
T1 TRAFFIC CONGESTION - traffic moves at less than 35 MPH on freeways	Median 80 / 40 to 90 Range	100	130 / 110 to 200	150 / 130 to 400
T2 CANDIDATES QUALIFIED for employment as traffic law enforcement officers	110 / 95 to 125	100	90 / 75 to 150	90 / 60 to 200
T3 Hours of TRAINING REQUIRED to become a traffic law enforcement officer	85 / 70 to 95	100	120 / 105 to 175	150 / 110 to 350
T4 Number of TRAFFIC OPERATIONS CENTERS in operation	100 / 100	100	200 / 100 to 300	300 / 200 to 600
T5 FUNDING of traffic law enforcement	90 / 50 to 95	100	120 / 110 to 170	150 / 115 to 200

* NGT panel medians, plus low and high estimate

Trends

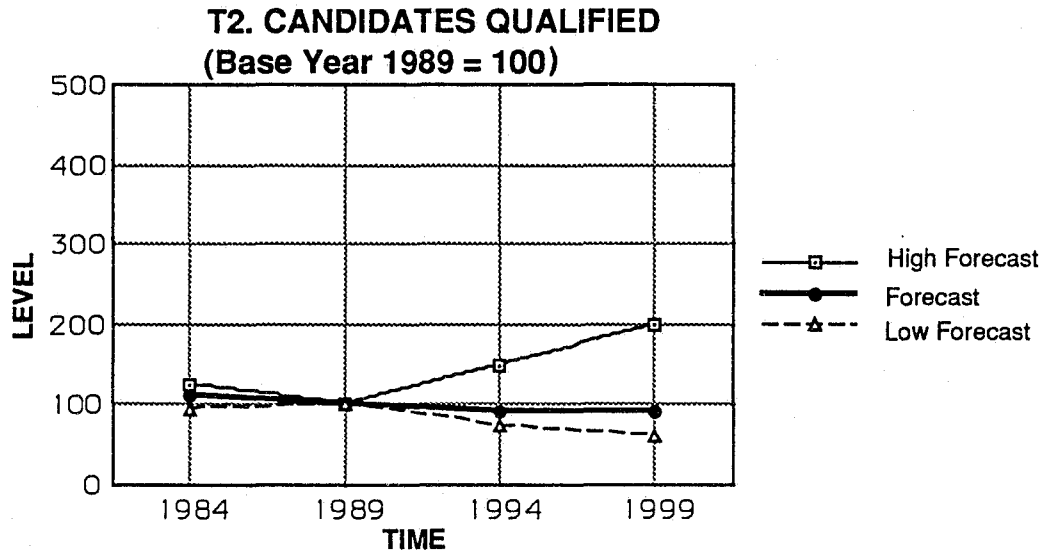
The five trends are:

Trend 1 (T1) - Traffic congestion: the number of freeway lane miles where traffic moves at less than 35 MPH.



Traffic has been defined as "congested" by the California Department of Transportation if it moves at less than 35 miles per hour. This trend has an obvious impact on the need for increased use of technology in traffic lew enforcement, and on public acceptance of such technology.

The number of miles of state highway where congestion meets these parameters was projected by the NGT panel as most probable to increase by 50 percent by the end of the century. Some panel members projected an increase of 400 percent. None of the panel members projected no increase.

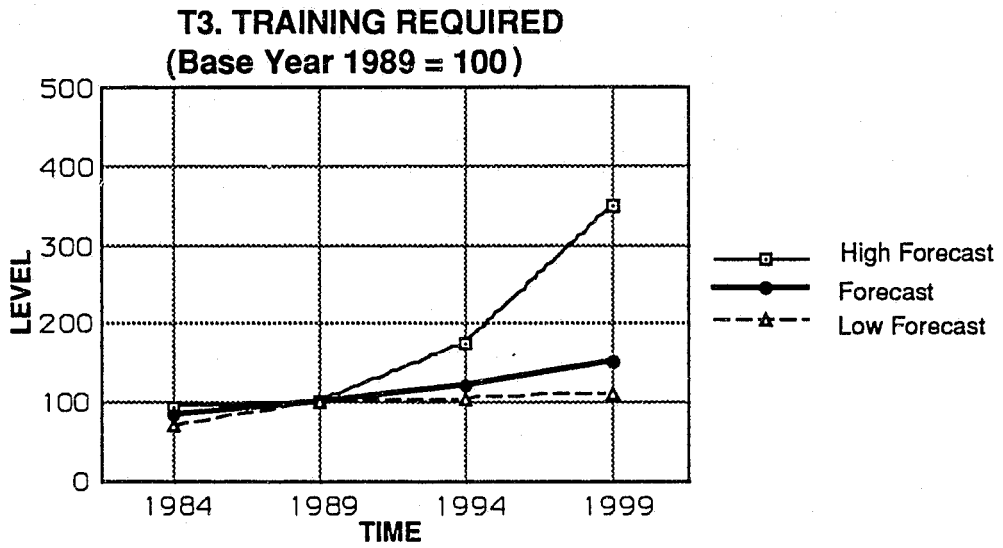


Trend 2 (T2) - The number of candidates qualified for employment as traffic law enforcement officers.

The number of candidates qualified for jobs in the increasingly complex law enforcement field is critical to the success of the organizations involved. The candidate pool is shrinking as the population ages, and competition among agencies for the remaining candidates is becoming increasingly keen. As the candidate pool shrinks, agencies must turn more to technology to increase the efficiency of their human resources. At the same time, the growing complexity of the technology itself makes it more difficult for candidates to qualify for employment.

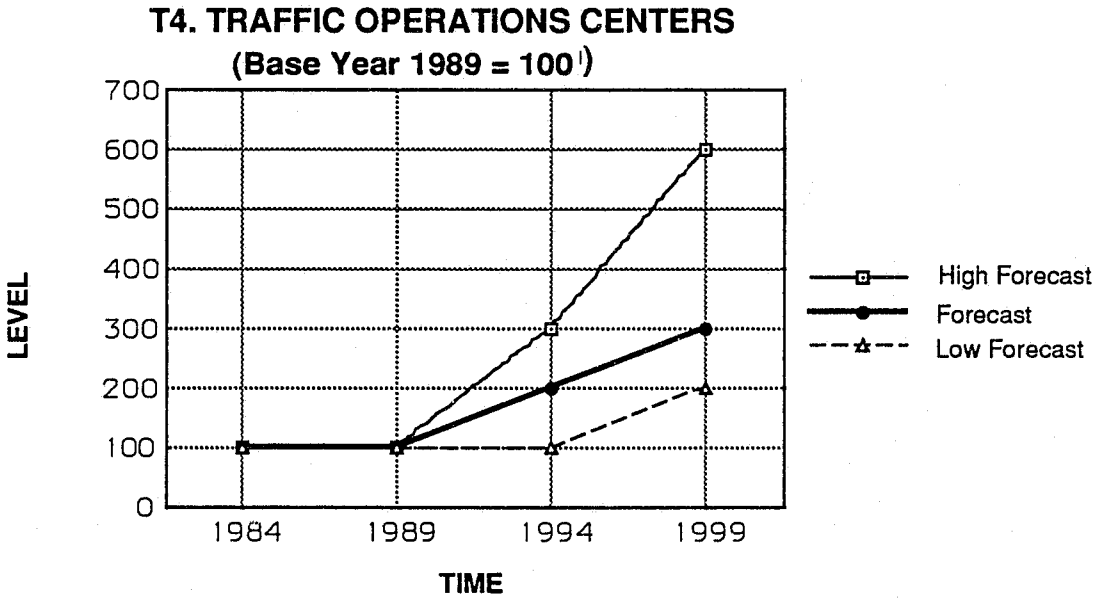
The panel projected that the number of candidates qualified for law enforcement jobs would likely drop slightly by the year 2000. During this period, the general population of California is expected to increase dramatically, making this slight decrease in candidates much worse than it first appears.

One panel member forecast that the number of candidates would double in the next ten years; one forecast that it would decrease by 60 percent.



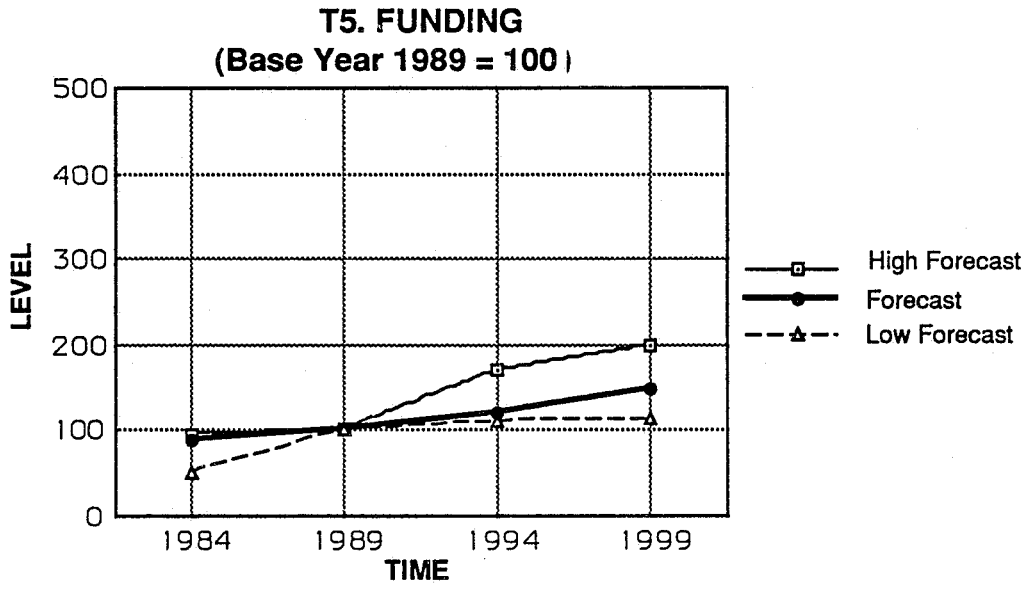
Trend 3 (T3) - Hours of training required to become a traffic law enforcement officer.

Increasing application of technology can be expected to increase the hours of training required to become a law enforcement officer. The group forecast that this required training will probably increase 50 percent by 1999. Other panel members projected it might increase just slightly, or as much as 350 percent. No one projected a decrease.



Trend 4 (T4) - The number of traffic operations centers (TOCs) in operation.

TOCs are jointly operated by transportation and traffic law enforcement officials in congested metropolitan areas to gather real-time traffic information and take necessary actions to optomize traffic flow. Only one TOC is currently in operation, and the cost to establish each additonal TOC is enormous. The panel projected that the number of TOCs in California would probably increase by 300 percent by 1999. One panel member forecast a 600 percent increase, while one forecast a 200 percent increase.



Trend 5 (T5) - Funding of traffic law enforcement (of a major statewide agency).

Obviously, funding is critical to the success of any endeavor to implement high technology. In this instance, forecasts were based on funding for the California Highway Patrol. The CHP is currently funded by the Motor Vehicle Account, which has vehicle registration fees as its revenue source. The Department of Motor Vehicles and the Air Resources Board are also funded from this account.

Based on their knowledge of current funding and historical funding data, the group forecast that funding by the CHP would probably increase by 150 percent by the year 1999. One panel member projected a more modest increase of 15 percent, and one member forecast an increase of 200 percent.

CHART 3
EVENT EVALUATION

EVENT STATEMENT	PROBABILITY: Year that Probability first exceeds zero	PROBABILITY: Five years from now (0 - 100)	PROBABILITY: Ten years from now (0 - 100)	IMPACT ON THE ISSUE AREA IF THE EVENT OCCURED: Positive (0 - 10)	IMPACT ON THE ISSUE AREA IF THE EVENT OCCURED: Negative (0 - 10)
E1 AUTOMATED ENFORCEMENT of misdemeanor traffic violations is legalized	Median 1992 / Range 1989 to 2025	5 / 0 to 30	50 / 0 to 90	7 / 0 to 9	3 / 1 to 10
E2 TELECOMMUTING expands to include ten percent of the work force	1995 / 1990 to 1999	0 / 0 to 100	25 / 0 to 100	6 / 3 to 10	0 / 0 to 4
E3 Right of ACCESS TO FREEWAYS CONTROLLED	1992 / 1991 to 1998	0 / 0 to 20	50 / 0 to 60	6 / 4 to 9	4 / 1 to 10
E4 ELECTRONIC LICENSE PLATES are installed in ten percent of the vehicles	1995 / 1992 to 2000	0 / 0 to 50	65 / 0 to 100	6 / 3 to 9	2 / 0 to 5
E5 Computerized NAVIGATION SYSTEMS are installed in ten percent of the vehicles	1994 / 1990 to 2000	0 / 0 to 35	40 / 0 to 100	8 / 2 to 10	4 / 0 to 5

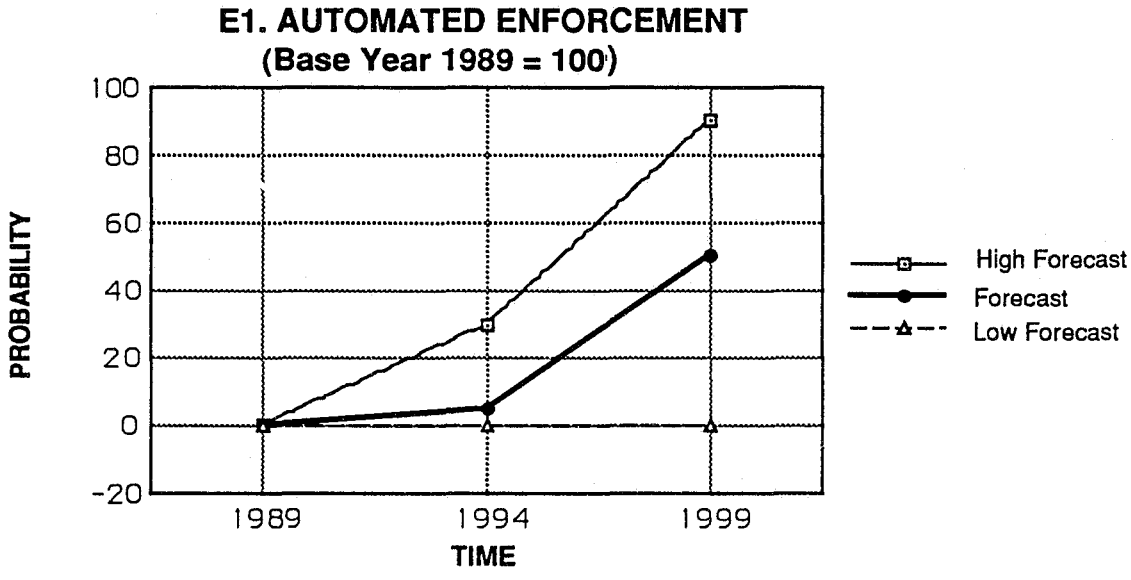
* NGT panel medians, plus low and high estimate

EVENT SELECTION PROCESS

The NGT group reduced the events list to five events to be considered further, selecting those deemed to have the greatest potential impact on the issue. The cumulative probability of occurrence and impact of occurrence on the issue area of each of these five events were evaluated. (See Chart 3)

Events

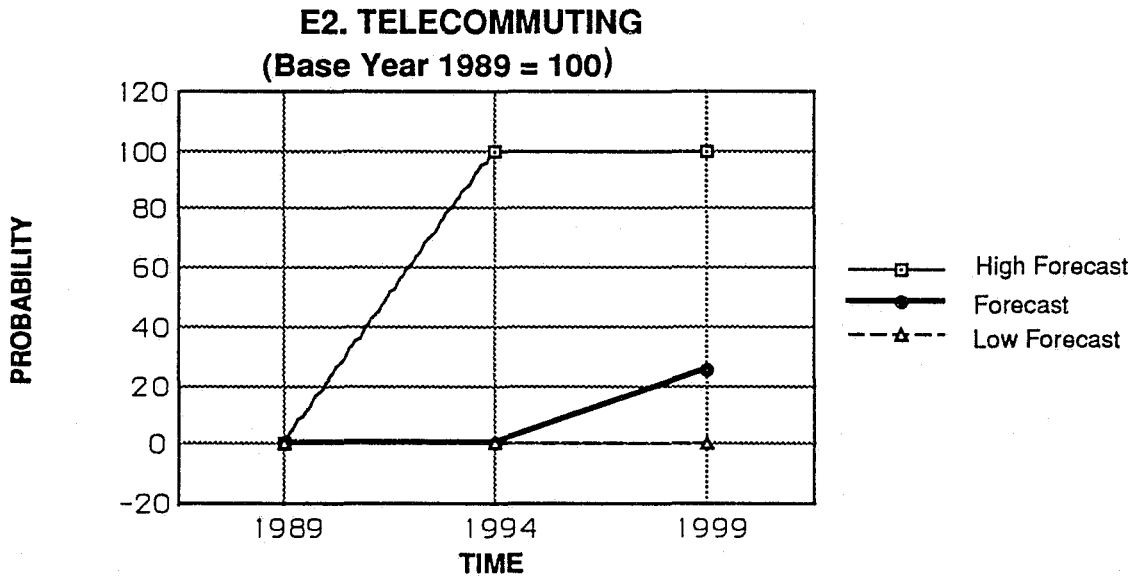
The events are:



Event 1 (E1) - Automated enforcement of misdemeanor traffic violations is legalized.

This chart depicts the cumulative probability of legalization by the California Legislature of automated, or robotic, enforcement. This concept is in operation in some jurisdictions (automated radar speed enforcement in Pasadena, California), but its legality has not been established. Other technologies, such as infrared imaging, could be adapted to enforcement applications if automated enforcement is legalized.

The range of probabilities depicted illustrates the divergent personal opinions of the NGT group, which varied from adamant disbelief to virtual certainty of occurrence by 1999.



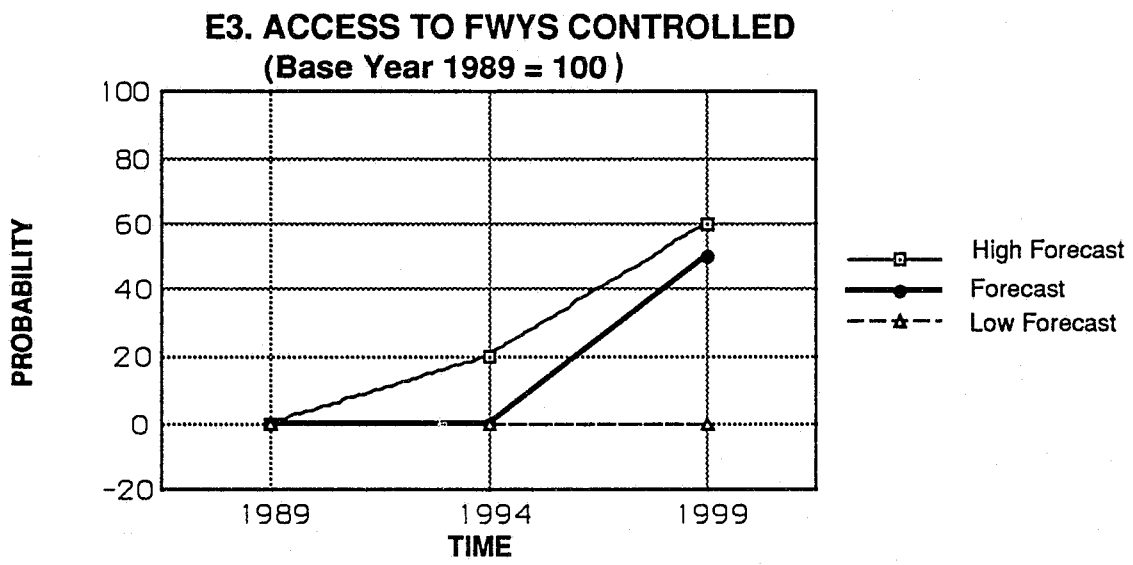
Event 2 (E2) - Telecommuting expands to include ten percent of the work force.

This event produced a wide divergence of probabilities— from zero to 100 by 1999. But as shown by the median forecast, its cumulative probability of occurrence was projected by the NGT group as rather low.

This concept has received much attention in the media. "The popular fear that computers and telecommunications will deprive us of face-to-face contact and make human relations more vicarious is naive and simplistic"[1] summarizes one side of the argument. Others recite a litany of advantages to both employer and employee (as well as to the general public) that can be provided by the "selective substitution of communication for transportation."[2]

[1]A. Toffler, Third Wave (New York, NY: Bantam Books, Inc., 1980), 372.

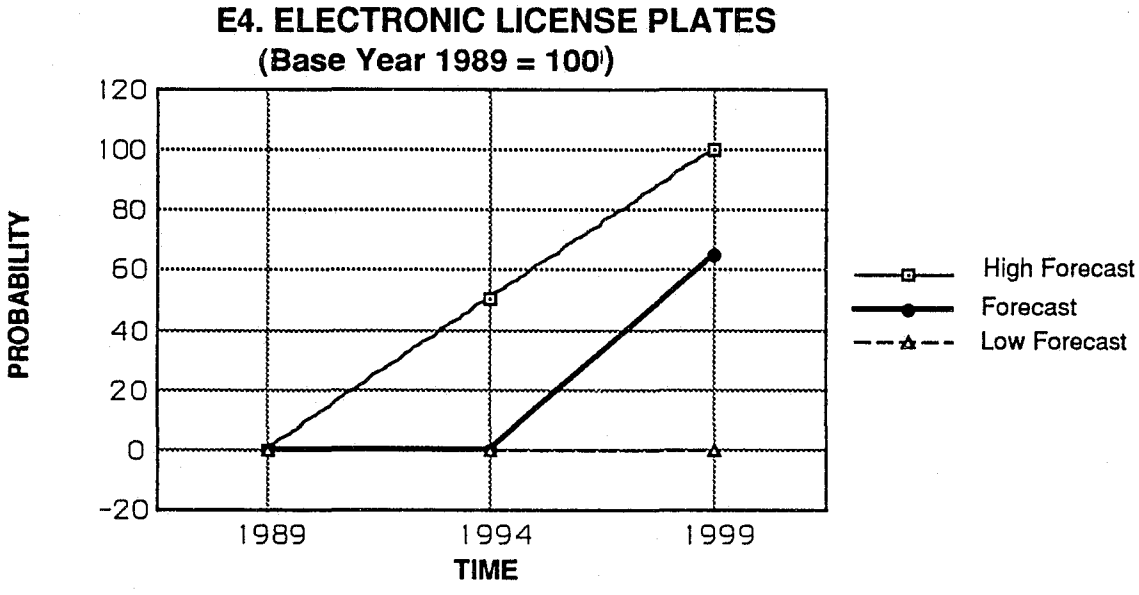
[2]Ibid., 319.



Event 3 (E3) - Right of access to freeways controlled.

Controlling the right of individuals to have vehicular access to the freeways is an event closely linked with others, specifically Event 4, Electronic license plates. Electronic identification of vehicles would be a precursor event to this event.

Probability of this event occurring by 1999 was forecast by the group to be 50 percent. One group member forecast 60 percent probability and one forecast zero.

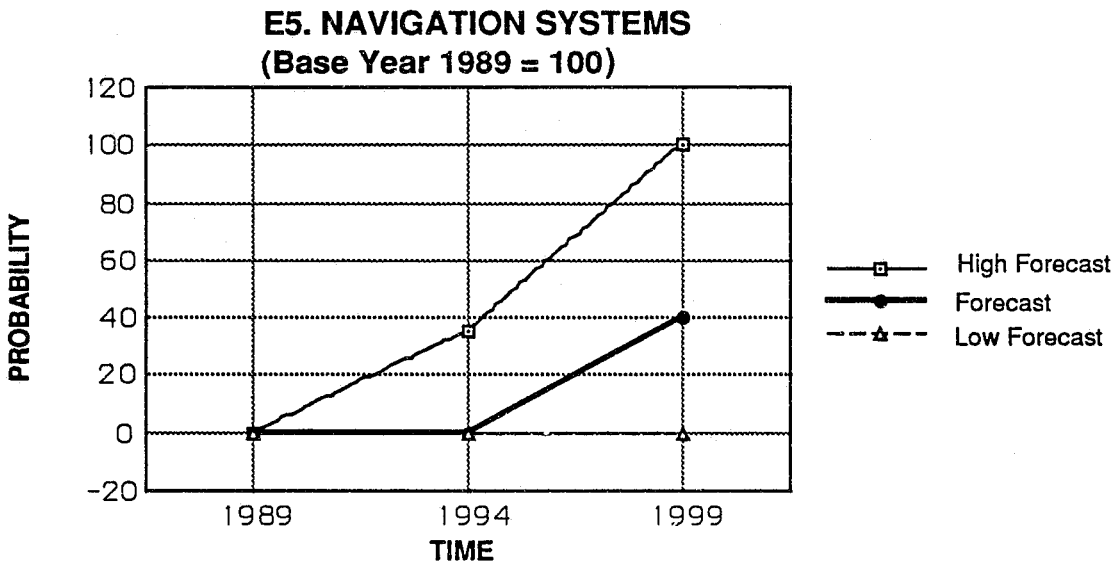


Event 4 (E4) - Electronic License Plates are installed in ten percent of the vehicles.

The panel projected that this event had a 65 percent probability of occurrence by 1999. Other panel members' forecasts ranged from zero to 100 percent.

This event is the precursor event, indeed the sine qua non (without this, nothing) for several other occurrences, notably automated enforcement and control of access to freeways.

This is another concept that is currently being tested (on the Coronado Bridge in San Diego), using a transponder that is automatically read without stopping the vehicle. An expanded version of this concept has been approved in Holland, as described in the Introduction.



Event 5 (E5) - Computerized navigation systems are installed in ten percent of the vehicles.

The group forecast the probability of this event as 40 percent by 1999. The high forecast was 100 percent and the low was Zero.

Several competing products are currently being developed. One is the Pathfinder Project, "designed to test the feasibility of electronically linking traffic-condition information with TV-type computerized mapping devices on automobile dashboards."[3] Projections are that such a system could hold street maps of all major cities in the United States on only four optical disks.

[3]E. Janicki, "Pathfinder Project," California Highway Patrol, August 1988.

Cross-impact Analysis

A cross-impact analysis was conducted to consider what impact a given event might have on the others if it occurred first, and how it might affect the levels of the selected trends. The trends and events were also analyzed to determine which were the most potent "actors" and which were the most volatile "reactors." (See Chart 4)

The most potent of the events was Automated Enforcement, which could have a strong effect on reducing traffic congestion while increasing the number of hours of training needed by traffic officers. This event could also precipitate occurrence of Event 3, Access Control, and Event 4, Electronic License Plates.

Access Control was also a strong actor, again reducing Traffic Congestion and increasing the training needs of traffic officers. It was perceived as closely linked with the occurrence of Event 1, Automated Enforcement, and Event 4, Electronic License Plates.

The most volatile of the trends and events was Trend 1, Traffic Congestion, which reacted to all the events by a reduction of ten to thirty percent. Trend 3, Hours of Training, reacted to four events; they all caused an increase in the number of hours required to train traffic officers.

Event 2, Telecommuting, although widely touted as the lifestyle of the future, was a very weak actor/reactor. In fact, as an actor, it was uncoupled with the four other events, and affected only one trend, Trend 1, Traffic Congestion. It reacted only to Event 3, Access Control, causing a mild ten percent increase in the probability of occurrence. (If access to freeways was controlled, more workers might telecommute.)

CHART 4

CROSS-IMPACT EVALUATION

Suppose this event actually occurred? ▼	....How would the probability of events shown below be affected?					How would the level of these trends be affected?			ACTORS
	E1 AUTO ENF.	E2 TELE-COMMUTE	E3 ACCESS CONTROL	E4 ELECT. PLATES	E5 NAV. SYSTEMS	T1 TRAFFIC CONGEST.	T2 # OF CANDS.	T3 HRS. OF TRNG.	
E1 AUTO ENF.		Median 0 / Range -20 to +10	+50 / 0 to 80	+50 / 0 to 100	0 / 0 to 65	-30 / -70 to -10	+10 / 0 to 20	+20 / -15 to +75	MEDIAN 6 / RANGE 3 to 7
E2 TELE-COMMUTE	0 / 0 to 5		0 / -10 to +30	0 / 0 to 20	0 / 0	-25 / -95 to -5	0 / 0	0 / -2 to +25	2 / 1 to 4
E3 ACCESS CONTROL	+65 / 0 to 75	+10 / 0 to 20		+70 / 0 to 100	+10 / -5 to +45	-25 / -60 to -10	0 / 0	+10 / -2 to +20	5 / 3 to 6
E4 ELECT. PLATES	+75 / 15 to 100	0 / 0 to 10	+60 / 0 to 100		+10 / 0 to 20	-10 / -15 to 0	0 / 0 to 2	+10 / -5 to +10	4 / 2 to 6
E5 NAV. SYSTEMS	0 / 0 to 25	0 / 0 to 5	+10 / 0 to 45	+5 / 0 to 10		-10 / -75 to +75	0 / 0	+5 / -2 to +20	4 / 1 to 6
REACTORS	MEDIAN 2 / RANGE 1 to 4	1 / 0 to 4	3 / 1 to 4	3 / 1 to 4	2 / 0 to 3	5 / 4 to 5	1 / 0 to 2	4 / 3 to 5	

Scenario One - Hypothecical Mode

Lieutenant Andro Jin shifted position slightly. The new Kevlex V jumpsuit was still a bit stiff, but the climate-adaptive system, with the fabric pores opening and closing in anticipation of changes in temperature or humidity, was a big improvement over the IV model. And it was still bulletproof and imperious to fire.

Jin was working traffic facilitation patrol on the toll road between what was now called "Stockramento" and the Great Bay Area. Even though the "cocooning" movement of the nineties had increased the number of people who worked/ate/slept/played entirely at home, traffic was still heavy. Some of the people in the vehicles were obvious cocooners—they had the pallor of workers who go to the office only once a month for a staff meeting. And while the new vehicular guidance technology allowed narrower traffic lanes and less headway between vehicles, road capacity was still barely adequate.

An amber light blinked on the console, indicating to Jin that the Autoll automated toll processor had detected a violation and was guiding the offender into the nearest enforcement bay. Jin punched the F5 key and hit "enable." The patrol module surged forward as the turbine kicked in and the navigation system selected the route and speed to the enforcement bay. With any luck, the computerized adjudication system at the enforcement bay would have completed processing the offender by the time Jin arrived, and physical intervention would not be necessary. The new adjudication system was good, although there were still some problems with the sentencing enhancements, especially the light/sound aversion therapy. The monetary sanction systems were working well, now that the links to the AllCard system were completed.

Enroute to the enforcement bay, Jin leaned back and reflected on the changes in law enforcement in the ten years preceding the turn of the century, especially the changes in organizational structure. The new way of organizing almost defied description, but some called it an inverted cone (detractors called it "Baskin-Robbins"). With the advent of expert systems for almost all decision-making, entry-level officers were initially assigned as "supervisors" or "managers." In reality, they were babysitters for the expert system computers. They had to work their way up to lieutenant before being assigned to facilitation patrol, a job that allowed some autonomy. This new "looping" structure then allowed them to re-enter the managerial ranks in the last few years of their career.

When Jin arrived at the enforcement bay, a short pause was required before dismounting from the patrol module to allow the stabilization gyroscope to wind down and the side stands to deploy. The power transmission link made a little spark as it disengaged from the power strip in the roadway. Jin thought about the "good old days" in the eighties when traffic officers rode those archaic motorcycles, but only for a moment.

Scenario Two - Normative Mode

Although it was only the year 2000, the number of vehicles in California was well on its way to the predicted 45 million that would be registered by 2010. This increase continued, despite the fact that the voters had turned down bond issues for road construction and rehabilitation in the late eighties, and efforts to raise the gas tax had failed. "Congestion" as it was called back then with less than 20 million vehicles, had become gridlock, choking the economic lifeblood of the State. In the five largest urban areas, "rush hour" was indistinguishable from the rest of the 24-hour day.

Several new technological proposals were developed during the nineties, such as automating traffic law enforcement and controlling access to the freeways. These concepts, combined with electronic license plates and computerized in-car navigation systems, would probably have made the current gridlock avoidable. But no one took the lead to make it happen. The government was reluctant to institute "big brother" type systems, and private industry was unwilling to make the necessary capital investments.

At the same time, the agencies responsible for moving traffic through the road system had severe personnel problems. There were not enough qualified applicants to fill their job vacancies, and the amount of training required kept increasing. Funding for traffic law enforcement had also not kept pace with needs.

The deteriorating condition of the roads and the severe traffic congestion just seemed to get worse day by day. The director of the California Department of Transportation had said back in 1989, "We're not going to build our way out of this one." He was right.

Scenario Three - Exploratory Mode

During the eighties and nineties, new technologies were developed that greatly enhanced traffic law enforcement. Several of these were interdependent, especially automated enforcement of misdemeanor traffic laws, electronic license plates, and controlled access to freeways. But while these technologies worked well together, there was a growing rumble of dissent. Many people believed that they were being denied their rightful access to roads that had been built with their taxes. Some also believed that the automated enforcement methods, which took photographs of vehicle occupants, were violating their right to privacy.

At the same time, traffic congestion had continued to increase during the nineties. Near the turn of the century, it was listed as the top concern by survey participants in all five major metropolitan areas in California. Because of a shrinking candidate pool and fierce competition among agencies for candidates, law enforcement agencies were experi-

encing increasing difficulty in filling traffic officer positions, which exacerbated congestion. An impasse developed between the demand for freer movement of people and goods and the demand that privacy rights be upheld.

Late in the 1990s, sophisticated technology and new legislation broke the impasse. Infrared imaging, which had previously been unsuitable for automated law enforcement, was improved significantly. The old technology could sense only "biological units," and often counted large dogs as humans. It was therefore useless for some enforcement applications, such as car-pool lanes. The new technology not only clearly distinguished humans, but identified vehicle occupants through biometric technology available only to authorized agencies, thus preserving privacy.

New laws were passed that expedited the construction of special toll roads, with tolls based on vehicle type and size, number of occupants or type of goods carried, and time of day/day of week. With these improvements in transportation systems management, California's rich and vibrant future was ensured.

POLICY CONSIDERATIONS

The policy considerations in this section are based on Scenario Three— Exploratory Mode. The first policies that should be pursued are those that sustain basic constitutional rights. Without these basic rights, the legal foundations of our society would be in jeopardy. Additionally, even if we could disregard the dangers of erosion of these rights, public support for new technological programs that deny those rights will not be forthcoming.

The second policy element that should be sought is that which encourages technological solutions to traffic law enforcement problems. As human resource costs rise, technology will become increasingly cost-efficient. At the same time, technology frees employees of mundane, routine tasks.

The third policy area of concern is human resources management. Every effort must be made to attract, train, and retain the most qualified police employees in order to maintain quality of services. Current equal employment opportunity efforts must also be maintained to ensure representation of the gender/ethnic balance of California's population.

The following criteria should be used in selecting and refining appropriate policies:

1. How much will it cost to implement the policy? Can sufficient funds be obtained?
2. What will be the political, institutional, and other non-dollar costs of implementing the policy?
3. How long will it take to fully implement the policy?
4. How powerful is the policy?
5. What are the long- and short-term benefits of the policy?
6. Does the policy fully address human behavior issues in implementing high-technology systems? (Stress, fear, intimidation)

Based on these criteria, all three of the policy areas discussed above should be pursued. Upholding rights guaranteed under the Constitution is the very foundation of police work. The costs may be incalculable, but the benefits and power of those rights are beyond price. Policies in this area should be established to ensure that the purposes of law enforcement are accomplished with minimal intrusion upon privacy and personal freedom of movement.

The second policy area, that of encouraging technological solutions to law enforcement problems, requires policies that mandate the most cost-efficient use of resources. Specific policies will need to be developed for each sub-area, such as information systems, automated enforcement, and computerized identification systems.

Human resources management (HRM) practices are the third policy key. Obtaining qualified personnel will ensure the efficacy of the two other policy areas. HRM practices themselves also embody basic constitutional rights.

Part Two

STRATEGIC MANAGEMENT

The purpose of this portion of the study is to develop a strategic management process that will include decision-making, planning, and policy considerations. Thus far, this study has addressed possible futures by projecting likely trends and events, conducting a cross-impact analysis as the basis for creating scenarios. The process provided insights into the relationships of sub-issues. These insights, in turn, help in understanding the situational dynamics and in formulating considerations for inclusion in the planning and policy making. The policies ultimately selected must be capable of impacting the issue and addressing the situation or environment, and they must be strategically focussed and timely.

The strategic plan developed in this section will describe the policy alternatives directed toward attaining the desired future state outlined in the exploratory mode scenario. The recommended course of action will be designed to enable intervention initiatives and policy changes to address the projected trends affecting technology applications in traffic law enforcement.

METHODOLOGY: STRATEGIC PLANNING

Strategic planning techniques enable us to estimate the long-term impact of present decisions, to plan the role of an organization a specific number of years in the future, and to develop the strategies and negotiate plans with critical stakeholders by which the organization may influence its future or adapt itself to the expected future. When augmented by futures research, contemporary strategic planning differs from traditional long-range planning in that it adds a special emphasis on discerning and understanding potential changes in the external environment, competitive conditions, threats, and opportunities. Modern strategic planning recognizes that organizations are shaped by outside forces as much as internal ones.

We begin with an analysis of the present situation. The situational audit used will consist of a WOTS-UP Analysis and Strategic Assumption Surfacing Technique (S.A.S.T.). WOTS-UP is the acronym for Weakness, Opportunities, Threats, and Strengths Underlying Planning, and assists us in determining whether the organization is capable of dealing with its environment. It is designed to aid in finding the best match between the environmental trends and internal capabilities. The first part of the analysis is an examination of the threats and opportunities presented by the environmental situation. Second, the organization's strengths and weaknesses are analyzed. The purpose of such an analysis is to provide information on distinctive competencies of the organization that are used to take advantage of the identified opportunities and avoid or minimize the threats.

A Strategic Assumption Surfacing Technique (S.A.S.T.) also contributes to the situation audit as a self-generated analysis of the significant stakeholders. The technique requires the performance of three tasks:

1. The identification of significant stakeholders;
2. Assigning assumptions that each would hold on the central issue; and
3. The preparation of a map, or graphic representation, of the degrees of certainty and importance of the previous assumptions.

The principal intent of S.A.S.T. is to emphasize the concept that the organization does not operate in a vacuum, that its policies have implications outside the organization, and that outsiders can impact policy choices and implementation.

WEAKNESSES, OPPORTUNITIES, THREATS, STRENGTHS UNDERLYING PLANNING (WOTS-UP) ANALYSIS

The Environment

The organization studied (the California Highway Patrol) is a Department within the Business, Transportation and Housing Agency. The Department has over 8,500 employees with approximately 5,770 uniformed members and an operating budget of almost $554 million for fiscal year 1989/90. The Highway Patrol operates nearly 2,000 enforcement vehicles along with 340 motorcycles. The CHP is responsible for providing patrol and traffic enforcement services for more than 97,000 miles of roadway including 7,788 miles of freeways and expressways. The Highway Patrol serves a population base of 27,000,000 with almost 19,000,000 licensed drivers. There are now almost 25,000,000 vehicles registered in California.

For budgetary purposes, the operations of the Highway Patrol are divided into four (4) major programs. The largest program addresses "Traffic Management," which has over $432 million budgeted for operations directly associated with the program. The objectives of the program, as defined by the Legislature, are to minimize deaths, injuries, and property losses due to traffic accidents; to minimize traffic delays to the motoring public; and to provide protection and assistance to the motoring public. Ground operations associated with this program ensure that the county roadway system and State highways under under CHP jurisdiction are provided patrol services.

The remaining three programs include registration and inspection, vehicle ownership security, and administration. The $51 million budgeted in support of these program elements provides

specific support for the conduct of commercial vehicle enforcement and regulation activities, vehicle theft prevention and recovery, and administrative support to assure the overall success of the various Departmental programs.

The Highway Patrol has established the management and regulation of traffic to achieve safe, lawful, and efficient use of the highway transportation system as its primary mission within the context of our democratic society.

A secondary mission is that:

The Department in its role as a major statewide law enforcement agency supports local law enforcement and stands ready to assist in emergencies exceeding local capabilities. Additionally, as a public service agency, the Department provides disaster and lifesaving assistance.

The objectives of the Highway Patrol are rather straightforward and consist of the following:

- *Accident Prevention — To minimize the loss of life, personal injury and property damage resulting from traffic accidents.*
- *Emergency Incident/ Traffic Management — To minimize exposure of the public to unsafe conditions resulting from emergency incidents, impediments and congestion.*
- *Law Enforcement — To minimize crime.*
- *Assistance — To assist other public agencies.*
- *Services — To maximize service to the public in need of aid or information* [1]

Trends – Opportunities and Threats

Five trends were identified in the first part of this study as those most likely to affect the issue of new technology impacts on traffic law enforcement. These trends will now be examined to determine what threats and opportunities they present.

1. Traffic congestion. Traffic moves at less than 35 miles per hour on freeways. The number of miles of freeways where congestion reaches this level presents a threat in several ways. Congestion threatens the State economically, a situation which in turn threatens the fiscal health of tax-supported enforcement agencies. Congestion also threatens the public image and perception of these agencies— if they cannot reduce congestion, they appear ineffective. Further, congestion threatens the ability of emer-

[1]California Highway Patrol Public Affairs, "Annual Report 1988"

gency responders, including traffic law enforcement agencies, to reach emergency incident scenes expeditiously.

Congestion presents a significant opportunity. If traffic law enforcement agencies, and government generally, can meet this challenge and mitigate congestion, they can expect strong positive public response.

2. Candidates qualified for employment as traffic law enforcement officers. Competition is keen among various police agencies for qualified employment candidates, and the pool of available personnel has been shrinking, largely due to the aging of the population. If this trend continues, agencies are threatened with unfilled positions, lowered employment standards, and reduced efficiency caused by less qualified employees. This threat is exacerbated by the increasing complexity of traffic law enforcement duties and concomitant training.

   There is a significant opportunity for the agency studied (California Highway Patrol) to increase flexibility in personnel intake practices; e.g., accepting lateral transfers, creation of a second training academy in Southern California, updated medical standards.

3. Hours of training required to become a traffic law enforcement officer. As mentioned above, the complexity of the job requires extended training. A further increase in training requirements threatens the organization economically and presents a greater barrier to potential new employees.

   The number of hours required for training could be reduced by incorporating computer interactive training/education.

4. Number of traffic operations centers (T.O.Cs.) in operation. These centers pose a minor threat to the Department, only in the sense that the CHP's public image may decline slightly if the California Department of Transportation assumes an overshadowing role in the TOC arena.

   These centers are a great opportunity to work cooperatively with all affected parties to maximize traffic throughput on the entire transportation system, with obvious major economic and environmental benefits.

5. Funding of traffic law enforcement. This trend is a chronic threat to the Department. Funding is based on vehicle registration fees, and competition with other co-funded

agencies is keen. Further, the current administration policy of fiscal conservancy adds to the threat.

Some minor opportunities exist in shifting programs to user-based funding, such as the recent legislation allowing police agencies to recover costs from drunk drivers who are involved in collisions.

Events — Opportunities and Threats

Five events were also identified in the first part of this study as the most likely to affect the impact of new technology on traffic law enforcement. These events will now be examined to determine the potential threats and opportunities that each presents to the issue area.

1. Automated enforcement of misdemeanor traffic violations is legalized. This event presents a minor threat in that it may be perceived as an erosion of individual legal rights.

   It is a tremendous opportunity in several ways. Automated enforcement would allow traffic to continue flowing while enforcement action is taken, as it would not be necessary to physically stop the violation vehicle. Thus, congestion would be reduced. Further, automated enforcement would facilitate action against all violators, and voluntary compliance with the law would increase. Total enforcement costs would also be reduced, as automation reduces labor costs. And uninterrupted traffic flows reduce pollution.

2. Telecommuting expands to include ten percent of the work force. This event presents no significant threats to the Department.

   It presents some opportunities externally, as it can be expected to reduce work-related travel. Internally, telecommuting at this level expands opportunities to attract a larger pool of applicants.

3. Right of access to freeways controlled. This event presents a great threat to the Department, as it is a significant step toward a police state and a severe restriction of individual rights to freedom of movement. It would be nearly impossible to enforce with current methods and resources.

   Controlled freeway access provides some opportunities by allowing enforcement agencies to optimize traffic flow, and to time-control the ingress/egress of certain types of vehicles and loads.

4. Electronic license plates are installed in ten percent of vehicles. This event presents no significant threat to the Department.

   It presents several opportunities. Electronic vehicle identification is already underway in Holland, where it is used for road pricing— highway tolls vary with the day/time and type of vehicle and load. It also has strong opportunity potential for vehicle registration, including ownership security. Additionally, it would be invaluable in compiling traffic statistics.

5. Computerized navigation systems are installed in ten percent of the vehicles. This event presents a slight threat to the Department, as drivers distracted by operating these systems may be involved in an increased number of collisions.

   It presents an opportunity externally in smoother traffic flows. Motorists will be able to select optimum vehicle routing, and spend less time looking for landmarks or direction signs. As an internal opportunity, police vehicles will be able to navigate quickly to unfamiliar emergency scenes.

Internal Capability Analysis

The internal capability analysis is an unbiased assessment and documentation of an organization's strategic strengths and weaknesses. It is an audit accomplished in a systematic fashion of the organization's capabilities. An effective strategy takes advantage of the organization's opportunities by employing its strengths and counters threats by avoiding, correcting, or compensating for weaknesses.

A representative sample of Highway Patrol managers were asked to rate the capability and adaptability of the Department anonymously and independent of the other respondents. Two separate rating forms were used (see appendixes D and E).

This assessment provided the basis for determining the current environment of the Department. Respondents were asked to rate each category from I (superior) to V (real cause for concern). The responses in each category were totaled and averaged, and the results are shown on the next page.

Organizational Capability

Staffing	3.2	Legislative Support	2.1
Technology	3.4	Executive Support	2.6
Equipment	3.3	Growth Potential	2.6
Facilities	3.4	Management Flexibility	3.3
Funding	3.1	Sworn/Non-sworn ratio	3.3
Calls for service	2.6	Salary Scale	2.8
Management Skills	2.6	Benefits	2.6
Supervisory Skills	2.6	Turnover Rate	2.4
Officer Skills	1.8	Community Support	2.1
Training	1.4	Sick Leave Rate	3.0
Attitudes	2.6	Morale	3.1
Image	1.8		

A review of the organization's capabilities indicates that the Highway Patrol managers surveyed view the Department's strengths and weaknesses as follows:

Strengths	**Weaknesses**
Training	Technology
Officer skills	Facilities
Image	Equipment
Community support	Management flexibility
Legislative support	Sworn/non-sworn ratio

Surveyed personnel indicated that the strength of the Highway Patrol rests with its people and the support they enjoy from the community and Legislature. The weaknesses identified generally focus on availability of appropriate technology, equipment, and facilities.

The major strength of the Highway Patrol is its training and the skills of its Officers. These two strengths should prove particularly beneficial in implementing change. Likewise, the widespread support the Department enjoys could also prove to be valuable in addressing the issue.

The weaknesses primarily dealt with "things." The availability of appropriate technology, equipment and facilities can be tied to the State Budget and the large decentralized nature of the Department. The Highway Patrol management was viewed as being conservative.

Capability Analysis— Part 2 (appendix F) focussed on the adaptability of the agency to make the changes necessary to deal with the issue of how the Highway Patrol will effectively implement new enforcement technologies. Organizational adaptability evaluated elements within the agency which reveal the type of strategy most suitable for policy implementation. The following analysis depicts the agency's level of adaptability to change. The respondents were asked to rate each category from I (Custodial— rejects change) to V (Flexible — seeks novel change).

The responses in each category were averaged and the ratings are as follows:

Mentality/Personality	2.1	Power Structure	1.9
Skills/Talents	2.3	Formal Structure	2.2
Knowledge/Education	2.4	Resources	2.9
Culture/Norms	2.8	Middle Management	3.1
Rewards/Incentives	2.6	Line Personnel	2.9

This change capability analysis suggests a conservative organization adaptable to minor change. Top management was viewed as rather conservative and reactive, adapting to minor change, definitely not seeking novel changes. The middle management of the Highway Patrol was seen as seeking and embracing familiar change. This latter point will be important for the implementation of any policy strategy intended to address the issue.

This WOTS-UP Analysis, coupled with the following S.A.S.T., will be used to provide direction for implementation of the strategic plan and situational environment for the transition plan.

STRATEGIC ASSUMPTION SURFACING TECHNIQUE

The Strategic Assumption Surfacing Technique (SAST) was conducted to identify stakeholders and to surface assumptions regarding stakeholder positions relevant to the issue. *"Stakeholder is defined as those entities, parties, actors, organizations, groups, individuals — internal and external to the organization— that affect and are affected by its policies."*[2] Therefore, stakeholders are those groups or individuals that are impacted by what you do, or are concerned about what you do, and are in turn able to impact you and your organization.

Stakeholders may also include unforeseen entities with potential for extreme negative impact, called "snaildarters" in reference to environmental concerns about an endangered species of fish— the snaildarter— that prevented the building of a major dam.

The stakeholders in this issue and the assumptions surfaced regarding their respective positions are as follows:

1. The automobile insurance industry, led in California by the American Automobile Association, State Farm Insurance, and Farmers Insurance. This industry should support uses of technology that reduce their risk exposure. However, the "club" organizations typically take a somewhat broader view, and may be expected to oppose technological applications that engender user costs, or that impinge on motorists' "rights." This group has strong legislative influence.
2. The trucking industry, notably the California Trucking Association. This group can be expected to oppose any restrictions on unencumbered movement of commercial vehicle traffic, and any measures that would cause increases in the costs of shipping goods. Has strong legislative influence. Potential snaildarter.
3. Environmentalists groups, primarily the Sierra Club. These groups will support technologies that reduce pollution of the environment, but are generally opposed to "development." Has moderate to strong legislative influence. Strong potential snaildarter.
4. Manufacturers and marketers of high-technology products. This group is strongly supportive of almost any application of new technology and can be counted on for cooperation in demonstration projects. Their legislative influence is not well established and depends on the company and sub-issue involved.

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[2]Ian I. Mitroff, Stakeholders of the Organizational Mind, (San Francisco, Jossey -Bass Publishing Company, 1981, p. 153.

5. The motoring public. Although somewhat difficult to classify, the motoring public has expressed a continuing concern about traffic congestion, consistently rating it as the number one problem in surveys taken in the major metropolitan areas. However, while the public demands a solution to the problem of congestion, they have been unwilling to bear the required costs—California's recent highway construction bond issue was soundly defeated.

6. The highway construction industry. Road builders as a group can be expected to strongly support any measures to increase the quantity of roads being built. However, they may disapprove of qualitative measures, such as applications of new technology that increase the capacity of existing roadways.

7. The tourism industry. This group may oppose technological applications to traffic law enforcement. Such technologies might be viewed as creating unnecessary barriers to tourism, in that tourists might find the technology unfamiliar and cumbersome.

8. Civil rights activists, notably the American Civil Liberties Union. This group may view the increased use of technology in law enforcement as "big-brotherism"—an increase in intrusion into individual civil rights. Because implementation of new technologies will require changes in current California law, civil rights activists have strong potential as a snaildarter.

9. Motor vehicle manufacturers. As an industry, manufacturers have generally dragged their feet in implementing safety features in their products. They can be expected to behave similarly regarding inclusion of new technology, unless it boosts sales or reduces manufacturing costs.

10. Consumer advocates. "Naderism" is still a viable force in this country, in that consumers and their advocacy groups have a strong influence on public opinion. They can be expected to support the application of technology in traffic law enforcement if a consumer benefit can be demonstrated; e.g., reduced traffic congestion, reduced environmental pollution, or lower transportation costs.

11. Police unions. Collective bargaining units of traffic law enforcement officers can affiliate with unions and can be viewed as such regarding their response to this issue. They can be expected to oppose measures which increase efficiency if those measures have the potential of reducing the police workforce required. These unions have historically had significant legislative influence on selected issues.

12. The California legislature. In the past, the legislature has been reluctant to provide traffic law enforcement agencies with new enforcement technology, especially if that technology is unpopular with motorists or is opposed by the trucking industry (e.g. radar).

13. Traffic law enforcement leaders. Historically, this group has been supportive of proven technological applications, but somewhat reluctant to take risks with new technology.

Strategic Assumption Surfacing Technique Plot

The next step of the SAST process is the plotting of assumptions to graphically portray their status and relationship. Assumptions are plotted with reference to importance and certainty. Importance means potential impact on the issue of the researcher's assumption about this stakeholder. Certainty means the degree of confidence that the assumption is correct. Certainty regarding the assumption is depicted vertically, with the top end of the scale being most certain and the bottom end of the scale least certain. Absolute certainty, plotted at the top of the scale, indicates 100 percent confidence that the assumption is correct. The vertical center of the plot indicates 50 percent confidence, the bottom indicates zero. The scale for plotting shows relative importance horizontally with the right end of the scale most important.

The plot is divided into four quadrants. The upper right is Quadrant I, in which assumptions are relatively certain and important. The assumptions in this quadrant are critical to this issue. In this quadrant, the motoring public and the California legislature are rated as most important and strong certainty, followed by the automobile insurance industry, rated as most important and moderate certainty. Also in the quadrant, and rated at important and more than 50 percent certainty, are the trucking industry, high technology manufacturers, the highway construction industry, the tourism industry, civil rights activists, motor vehicle manufacturers, and consumer advocates.

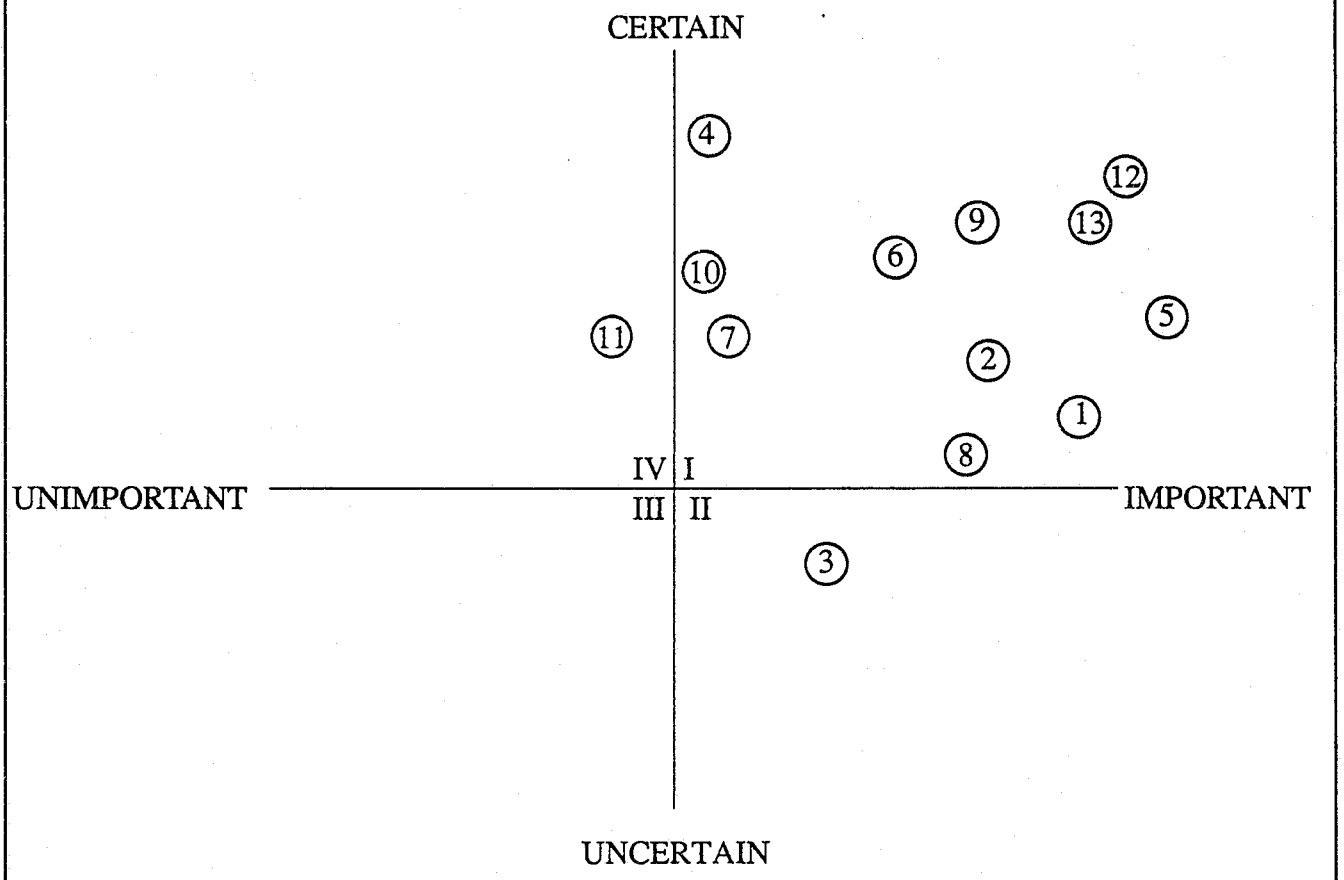
The lower right is Quadrant II, in which assumptions are important and less certain. This quadrant contains only environmentalists. Quadrant II deserves careful attention because it may contain stakeholders with strong potential as snaildarters.

The lower left is Quadrant III, in which assumptions are less certain and less important. No assumptions were included in this quadrant.

The upper left in Quadrant IV, in which assumptions are more certain but less important. This quadrant includes the police unions.

CHART 5

STRATEGIC ASSUMPTION PLOT



STAKEHOLDERS

1. Automobile insurance industry
2. Trucking industry
3. Environmentalists
4. High technology manufacturers
5. Motoring public
6. Highway construction industry
7. Tourism industry
8. Civil rights activists
9. Motor vehicle manufacturers
10. Consumer advocates
11. Police unions
12. California Legislature
13. Traffic law enforcement leaders

MODIFIED POLICY DELPHI

The main goal of the Modified Policy Delphi process is to identify and explore a variety of alternative strategies developed to address the issue. This permits the analysis of the practicability and desirability of each alternative, as well as limited exploration of its impacts on other relevant issues. The list of candidate strategies is then reduced to a manageable number of likely strategies for more complete analysis.

The Modified Policy Delphi process was conducted in a small group workshop setting, using selected members of the previous NGT panel. The following list of candidate strategies was developed using brainstorming techniques:

1. Develop high-technology enforcement applications at the University of California.
2. Pursue legislation to recodify selected traffic infractions as presumed to have been committed by the registered owner of the vehicle, thus eliminating the need to identify the driver of a violation vehicle (similar to the current process for registration/ parking violations).
3. Obtain cooperation of the trucking industry in development and implementation of high-technology in traffic law enforcement.
4. Obtain cooperation of environmentalist in reducing pollution through high-technology traffic law enforcement.
5. Obtain cooperation of civil rights activists in ensuring compliance with constitutional requirements.
6. Include highway construction industry representation in planning for changes in traffic law enforcement.
7. Encourage establishment of a high-technology implementation responsibility within top management of each affected law enforcement agency.
8. Ensure that motor vehicle manufacturers are fully advised of any required changes in vehicle design andare allowed opportunity for timely input.
9. Communicate full information on development and implementation of high-technology traffic law enforcement to consumer advocacy groups and seek their input.
10. Ensure that any new technology systems make allowances for tourists, casual users, and others who are unfamiliar with or infrequently use such systems.
11. Provide adequate training to all traffic law enforcement personnel required to interact with new technology systems.

12. Provide systems familiarization training to all law enforcement personnel.
13. Conduct media campaigns to ensure public acceptance of and familiarity with the new systems.
14. Ensure police unions are fully informed regarding system development and implementation.
15. Ensure full compatibility and integration of systems.
16. Ensure comprehensive training for affected law enforcement managers in systems management and administration.
17. Develop public/private partnerships between law enforcement agencies and high-technology companies. These partnerships would work together to develop and implement applications of new technologies in traffic law enforcement.
18. Form a coalition of representatives of the insurance industry, the motoring public, traffic law enforcement agencies, motor vehicle manufacturers, the highway construction industry, the trucking industry, civil rights activists, et al., to formulate policies for incorporation of new technologies in traffic law enforcement.
19. Legislative solution—passage of required changes in the law to develop and implement desired high-technology systems. Include required funding.

Subsequent to development of the list of alternatives, the Modified Policy Delphi group members used a Delphi Policy Rating Sheet to rate the overall practicability and desirability of each strategy (see appendix C). The individual ratings were summed and the final rating for each strategy was calculated. The top two alternatives were retained for further discussion and analysis to identify the advantages and disadvantages of each alternative strategy. The two strategies are listed below in order of their ratings.

Alternative 17: Develop public/private partnerships between law enforcement agencies and high-technology companies to develop and implement new traffic law enforcement technological systems. This alternative was favored for several reasons. It has already been proven feasible in speed enforcement, whereby a private contractor operates a photo/radar device in cooperation with local government. This alternative also provides great flexibility in project development, and can be tailored to meet local needs. Further, it is not fully dependent on the legislative process for funding and empowerment. Therefore, it should have an advantage in speed of response to perceived needs. Another advantage is that it does not require new taxes.

The advantages and disadvantages of this strategy were identified as follows:

	Advantages		Disadvantages
1.	Flexibility	1.	"Bounty" perception
2.	User-fee based	2.	Circumvents legislative process
3.	No new taxes	3.	Enforcement disparity between jurisdictions
4.	Timeliness		

Alternative 19: Legislative solution—passage of required changes in the law to develop and implement desired high-technology systems, including required funding. This alternative was viewed a desirable because it is consistent with historical governmental practice, and would be most likely to gain public acceptance. It would probably require establishment of an oversight/empowering body, similar to the current Office of Information Technology, to provide guidance and consistency. A major drawback of this solution is the glacial pace of legislative action.

The advantages and disadvantages of this strategy were identified as follows:

	Advantages		Disadvantages
1.	Legitimacy	1.	New taxes
2.	Public acceptance	2.	Slow implementation
3.	Statewide consistency		

ALTERNATIVE SELECTION

Alternative 19, Legislative solution, was selected for implementation. It ensures a consistent Statewide approach to implementation of new high-technology traffic law enforcement systems. Because key decisions will be made by elected representatives, stronger public acceptance and support can be expected. Further, the legislative approach will provide adequate funding for project development and spread the costs over time to minimize impact.

Alternative 17, public/private partnerships between law enforcement agencies and high-technology companies to develop and implement new traffic law enforcement technological systems was also selected for implementation in combination with alternative 19. This strategy allows great flexibility, shares costs of development between government and private industry, speeds up project delivery, and has a track record of previous success.

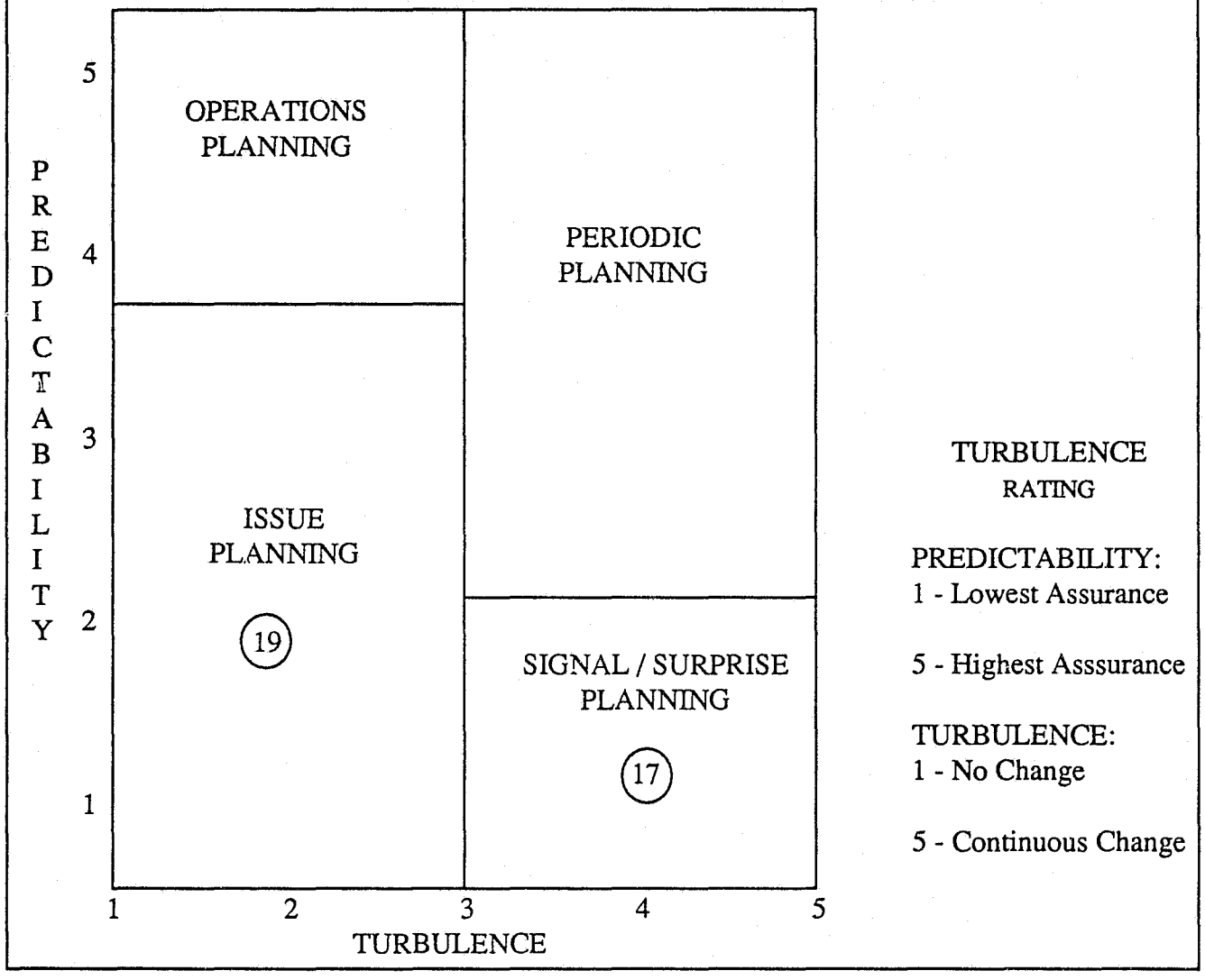
IMPLEMENTATION PLAN

After the particular alternative strategies are selected and a policy course established, an implementation plan must be developed. Two critical elements must be considered in developing the implementation plan — turbulence and predictability. A turbulence/predictability chart is shown below. Turbulence, defined as the number of changes expected to occur, ranges from no change (1) to continuous change (5). Predictability of the future ranges from a high degree of predictability (1) to total unpredictability (5). Using the chart as an aid to analysis, a determination can be made of the type of planning system that should be selected for use from the four basic planning systems: periodic, issue, operations, and signal/surprise.

Plotting the two alternatives on the chart (alternative 17 - Public/ private partnerships for new traffic law enforcements systems development, and alternative 19 — Legislative solution) indicates that a combination of issue planning and signal/surprise planning should be used. The legislature is less turbulent but somewhat unpredictable, so issue planning is appropriate for the component of the planning process dealing with the legislature. However, the entire field of high-technology is both turbulent and unpredictable, and so signal/surprise planning is best suited for that application.

CHART 6

PREDICTABILITY / TURBULENCE



STAKEHOLDER NEGOTIATION

A strategic plan depends for its successful implementation on acceptance and support of key stakeholders, which is accomplished through the stakeholders negotiation process. Key stakeholders and their positions relative to negotiation were identified as follows:

The Automobile Insurance Industry — the passive acceptance of the issue by this industry is important to its success.

The automobile insurance industry will negotiate on:

1. Measures that reduce traffic congestion
2. Measures that decrease risk exposure
3. Measures that enhance traffic safety

The automobile insurance industry will not negotiate on:

1. Measures that increase risk exposure
2. Measures that precipitate premium increases

The Trucking Industry — the passive acceptance of the issue by this industry is important to its success.

The trucking industry will negotiate on:

1. Measures that reduce traffic congestion
2. Measures that provide preferential treatment to heavy truck traffic
3. Measures that reduce the costs of transportation of goods
4. Decreased regulation of the trucking industry

The trucking industry will not negotiate on:

1. Measures that increase the costs of transportation goods
2. Further infringement on the "rights" of truckers

Environmentalists — passive acceptance by environmentalist groups (such as the Sierra Club) is important to the success of the issue.

Environmentalists will negotiate on:

1. Measures that reduce atmospheric pollution
2. Measures that increase the capacity of existing transportation systems

Environmentalists will not negotiate on:

1. Measures that increase pollution
2. Proposals for massive expansion of current traditional highway transportation facilities

High-Technology Manufacturers — the active support of this group is very important to the success of the issue.

High-technology manufacturers will negotiate on:

1. Measures to include high-technology systems in traffic law enforcement

High-technology manufacturers will not negotiate on:

1. Proposals to continue traffic law enforcement methods unchanged

The Motoring Public — passive acceptance by this group is critical to the success of the issue.

The motoring public will negotiate on:

1. Measures to reduce traffic congestion
2. Measures to increase capacity of existing transportation systems
3. Reasonable tax increases to pay for demonstrably more efficient systems
4. Measures to reduce atmospheric pollution

The motoring public will not negotiate on:

1. Substantial tax increases
2. Proposals for massive expansion of traditional highway systems
3. Unnecessary infringements on individual rights

The Highway Construction Industry — passive acceptance by this group is important to the success of the issue.

The highway construction industry will negotiate on:

1. Proposals to include new technology systems in new highway construction
2. Proposals to add new technology systems to existing roadways
3. Measures to increase capacity of existing transportation systems

The highway construction industry will not negotiate on:

1. Proposals to stop or greatly reduce construction of new highways

The Tourism Industry — passive acceptance by this group is important to the success of the issue.

The tourism industry will negotiate on:

1. Measures that reduce traffic congestion
2. Measures that reduce atmospheric pollution

The tourism industry will not negotiate on:

1. Proposals for systems that are not "user-friendly"

Civil Rights Activist Groups — passive acceptance of the issue by this group is critical to its success.

Civil rights activists will negotiate on:

1. Measures that reduce intrusion by law enforcement into individual privacy

Civil rights activists will not negotiate on:

1. Measures which infringe on individual privacy
2. Measures which unnecessarily restrict freedom of movement

Motor Vehicle Manufacturers — passive acceptance of the issue by this group is important to its success.

Motor vehicle manufacturers will negotiate on:

1. Measures to make vehicular travel more efficient or enjoyable
2. Measures that reduce atmospheric pollution
3. Measures that reduce congestion

Motor vehicle manufacturers will not negotiate on:

1. Measures that significantly increase manufacturing costs.

Consumer Advocates — passive acceptance of the issue by this group is important to its success.

Consumer advocates will negotiate on:

1. Measures that reduce traffic congestion
2. Measures that reduce atmospheric pollution
3. Measures that enhance traffic safety
4. Measures that increase capacity of existing transportation systems

Consumer advocates will not negotiate on:

1. Measures that detract from efficient travel by individuals
2. Measures that substantially increase transportation costs

Police Unions — passive acceptance of the issue by this group is important to its success.

Police unions will negotiate on:

1. Measures to improve the efficiency and effectiveness of enforcement systems

Police unions will not negotiate on:

1. Proposals to reduce the police workforce
2. Measures which degrade officer safety

The California Legislature — the active support of the issue by this group is critical to its success.

The California legislature will negotiate on:

1. Measures that increase capacity of existing transportation systems.
2. Measures that reduce traffic congestion
3. Measures that reduce atmospheric pollution
4. Measures that enhance traffic safety
5. Measures that increase efficiency and effectiveness of traffic law enforcement systems

The California legislature will not negotiate on:

1. Substantial tax increases
2. Measures that infringe unnecessarily on individual rights
3. Measures that significantly increase transportation costs

Traffic Law Enforcement Leaders — the active support and leadership of the issue by this group is crucial to its success.

Traffic law enforcement leaders will negotiate on:

1. Measures that increase the efficiency and effectiveness of traffic law enforcement systems
2. Measures that increase capacity of existing transportation systems
3. Measures that reduce traffic congestion

Traffic law enforcement leaders will not negotiate on:

1. Measures that degrade officer safety

Part Three

TRANSITION MANAGEMENT

Transition management is the process of moving the organization from the current state to the desired future state. The time interval between the current state and the desired future state is called the transition state. This is the time period when change is actually taking place. In managing the overall change process it is always important to (1) determine the major tasks and activities for the transition period, and (2) determine the structure and management mechanisms necessary to accomplish those tasks.

In this study, the stakeholder analysis identified the positions they are expected to hold regarding the issue and selected strategies. This part of the study will address the transition management necessary to achieve the desired future state. The steps involved will include (1) commitment planning, (2) a recommended management structure, and (3) a listing and description of methodologies to be used in support of implementation of the transition management plan.

COMMITMENT PLANNING

Even the best laid plans will not achieve the desired ends unless all entities essential to execution of the plan are committed to seeing it successfully implemented. The planner must carefully identify the key players for actualizing the plan. That is the purpose of the commitment plan. It also includes a strategy involving a subset of action plans to gain the commitment of those parties important to the success of the plan. The steps involved in developing a commitment plan include:

1. Identify the target individuals or group whose commitment is required to assure the desired change is realized.
2. Define the "critical mass" necessary to ensure the effectiveness of the change.
3. Develop a plan for getting the commitment of the "critical mass."
4. Create a monitoring system to assess the progress.[1]

Critical- Mass Analysis

The first step is to identify the "critical mass" of individuals or groups whose active commitment is necessary to ensure the successful implementation of the strategic plan to address the issue of incorporating selected new technologies into traffic law enforcement

[1]Richard Beckhard and Reuben T. Harris, Organizational Transitions, 93.

systems. The "critical mass" by definition consists of the individuals or groups whose active commitment is necessary to provide the energy for the desired change to occur. The idea of critical mass encompasses the concept of "stakeholder" as defined by Mitroff as including all those entities, parties, actors, organizations, groups, and individuals — internal and external to the organization — that affect and are affected by its policies.[2]

The purpose of identifying the stakeholders in this instance was to determine those likely to support the selected alternative strategies as well as those likely to oppose. This process was also used to identify critical-mass elements and to estimate their expected position regarding the issue and strategies.

The estimated current level of commitment of each entity in the critical mass is displayed in Chart 7. This chart also depicts the required level of commitment that must be reached by each entity in the critical mass for the plan to be successful. Finally, a recommended tactic for obtaining the required level of commitment will be presented for each entity in the critical mass.

The individuals or groups whose commitment is important to the success of the selected strategies are identified as follows:

1. The automobile insurance industry
2. The trucking industry
3. Environmentalists
4. High-technology manufacturers
5. The motoring public
6. The highway construction industry
7. The tourism industry
8. Civil rights activists groups
9. Motor vehicle manufacturers
10. Consumer advocacy groups
11. Police unions
12. The California legislature
13. Traffic law enforcement leaders

[2]Ian I. Mitroff, Stakeholders of the Organizational Mind, 4.

The next step in this process will be to estimate the current level of commitment of each of the above individuals or groups relative to the selected strategies. A Commitment Analysis Chart is shown as Chart 7. The current level of commitment is indicated by a (X), and the minimum level of commitment that is required for the change to occur is indicated by an (O). The arrow indicates the direction of movement necessary to obtain the required level of commitment, and it also implies the tactic to be used in obtaining the commitment. Four levels of commitment are depicted: (1) Block Change, (2) Let Change Happen, (3) Help Change Happen, (4) Make Change Happen.

CHART 7

COMMITMENT ANALYSIS

KEY PLAYER	Block Change	Let Change Happen	Help Change Happen	Make Change Happen
1. Automobile insurance industry	x →	o		
2. Trucking industry	x →	o		
3. Environmentalists		o ←	x	
4. High technology manufacturers			x-o	
5. Motoring public		x →	o	
6. Highway construction industry		x →	o	
7. Tourism industry		x →	o	
8. Civil rights activists	x →	o		
9. Motor vehicle manufacturers	x →		o	
10. Consumer advocates	x →	o		
11. Police unions	x →		o	
12. California Legislature		x →		o
13. Law enforcement leaders		x →		o

LEGEND
x = Current position
o = Desired position

The automobile insurance industry can be expected to initially oppose any measures that disturb the status quo. They are concerned with fiscal impacts of any new proposals, and new technologies in law enforcement may present particularly difficult situations for economic analysis.

This industry must be persuaded that the selected strategies will smooth traffic flows and enhance traffic safety, thus reducing their loss exposure rate, to convince them to move from a "block change" to a "let change happen" position.

The trucking industry can be anticipated to oppose any further regulation of their industry or any restrictions on the free movement of heavy trucks.

They must be convinced that reduced traffic congestion in and around the major metropolitan areas will speed delivery of goods. Further, smoother-flowing traffic will reduce wear-and-tear maintenance costs and reduce the accident involvement of trucks caused by stop-and-go traffic. In some instances, trucks may be given preferential treatment, such as special lane assignments or reduced tolls in off-peak hours.

This information must be presented in a manner to persuade the trucking industry to move from a "block change" position to a "let change happen" position.

Environmentalists have previously supported transportation systems management techniques such as car- and van-pooling, use of preferential lanes, and increased tolls to reduce congestion and concomitant atmospheric pollution. However, their support in a "help change happen" position may spark an emotional backlash reaction from a significant segment of the concerned populace. They must be tactfully persuaded to assume a lower-visibility position of "let change happen."

Manufacturers of high technology can be expected to take the position of "help change happen," because it is obviously in their strong economic interest. They should be encouraged to maintain this position and to work in cooperative efforts to implement the selected strategies.

The motoring public has decried traffic congestion as the primary problem in numerous recent surveys taken in the major metropolitan areas of California. They can be expected to assume a position of "let change happen," if economic impacts are significant.

They should be persuaded to move to a position of "help change happen" through a concerted media campaign. This campaign should focus on reduced traffic congestion,

smoother traffic flows, reduced atmospheric pollution, and reduced transportation costs of people and goods.

The highway construction industry may be anticipated to take a position of "let change happen" as new technologies are incorporated into new highway construction projects or existing facility rehabilitation.

They would be of greater assistance to the success of the implementation plan in a position of "help change happen." This position shift will be accomplished by discussions with this industry centering on benefits that accrue to their operations through improved transportation systems. Further, companies that embrace new technology systems for inclusion in their construction projects may enjoy an enhanced market position.

The tourism industry can be expected to take a position of "let change happen" if new traffic law enforcement systems are "user-friendly" in that they do not create frustration for the unfamiliar user.

They should be encouraged to take a position of "help change happen" by emphasizing the benefits of the new systems — cleaner air, reduced traffic congestion, and smoother traffic flows. This industry can be of great help by providing tourist information about new technology systems through their advertising campaigns.

Civil rights activist groups can be expected to take an initial position of "block change," viewing technology as "big-brotherism" intrusion on individual rights.

They must be convinced that individual rights will be zealously protected with no unnecessary infringements. Further, the new systems will enhance the individual right to freedom of movement by reducing traffic congestion. This group should be moved to a position of "let change happen."

Motor vehicle manufacturers have historically resisted government efforts to improve vehicle design, unless there was a clear relationship to increased profits. Therefore, this industry can be expected to assume a position of "block change."

They must be convinced to "help change happen." Incorporation of new technologies in their vehicle designs will improve their market position and will allow their vehicles to fully and immediately interface with the projected new systems.

Consumer advocates can be expected to initially oppose any measures that appear to increase the costs of new vehicles without immediate benefit and to assume a position of "block change."

They must be persuaded to move to a position of "let change happen." The long-term benefits to consumers in reduced travel time, fuel and maintenance cost reductions, and lower collision exposure rates more then offset initial costs of new technology systems.

The California legislature has historically been reluctant to provide traffic law enforcement with new technology, and they can be expected to assume a position of "let happen."

Legislative assistance is a key to successful implementation of the selected strategies. The legislature must be persuaded to move to the "make change happen" position.

Traffic congestion is analogous to coronary artery disease, in that it threatens to block the flow of goods and people that are the State's economic lifeblood. This argument must be presented in the strongest manner; convincing the legislature to pass enabling legislation and to fund implementation of new traffic law enforcement technological systems will not be easy.

Law enforcement leaders are currently in a "let change happen" position regarding implementation of new technologies for traffic law enforcement.

They must be persuaded to take the lead in this issue and to assume a position of "make change happen." Law enforcement leaders must be made to realize that demands for improved services with no significant increase in resources can be met only through technology. Traffic congestion exacerbates the already difficult access to emergency scenes by police and other emergency service providers. Additionally, atmospheric pollution is increasingly becoming a law enforcement issue and will be mitigated by implementation of the selected strategies. It is critical to their success as leaders that they take change in these strategies and ensure their successful implementation.

MANAGEMENT STRUCTURE

The crucial question at this juncture is what is the best structure to manage this transition state between the current state and the desired future state. The most appropriate management system and structure for the ambiguous transition state is the one that creates the least tension with the ongoing system and the most opportunity to facilitate and develop the new system.[3]

[3]Richard Beckhard and Reuben T. Harris, Organizational Transitions, 75.

In light of the above, the most appropriate temporary management structure for the transition state in this case is a "matrix" organization. Several organizations are to be included. The Office of Traffic Safety (OTS) within the Business, Transportation and Housing Agency currently has responsibility for administering all federal grants and the State's Highway Safety Plan. They will be the lead agency for this project, as they already have statewide responsibilities that encompass the State, county, and local government levels. They are also familiar with new technologies and with the conduct and evaluation of pilot demonstration projects.

The California Peace Officers' Association (CPOA) will represent police managers' views, as well as those of rank-and-file officers, and will be one of the linking pins to local government. They will also provide valuable input from a practical perspective, especially concerning human resources management.

The California Highway Patrol (CHP) will provide a statewide perspective on traffic law enforcement, and expertise in the real-world use of technologies. Further, the CHP has a legislative "key contact" program already in place that can be used to shape legislative opinion and initiate action.

The California Department of Transportation (Caltrans) will provide expertise on transportation systems design, especially regarding the inclusion of new technological traffic law enforcement systems. Caltrans is also the repository of massive historical data on every aspect of California's highway transportation system, which will be invaluable in planning.

The high-technology manufacturing industry will provide technical expertise regarding new and emergent technologies.

This project will be termed Technically Advanced, Less Intrusive Systems Management (TALISMAN). The standards for project implementation will be fully developed by the transition management team, but should include these basic policy guidelines for new systems:

1. No increase in atmospheric pollution; lower pollution is desirable
2. No increase in intrusion on individual rights to privacy and freedom of movement; lesser intrusion is desirable
3. No increase in basic costs of transportation to end users; lower cost is desirable
4. No increase in cost of traffic law enforcement services; lower cost is desirable
5. No increase in traffic congestion; lower congestion is desirable

RESPONSIBILITY CHARTING

One of the final steps in transition management planning involves the assigning of responsibility or action steps to key players. The actions or decisions necessary to carry out the plan are identified, and responsibility for accomplishment is assigned to the appropriate party. The assigned actions include: responsibility, approval, support, and inform. Responsibility charting clarifies the behavior that is required to implement the desired change, reduces ambiguity, and limits wasted energy and emotional reaction. Chart 8 is a Responsibility Chart depicting the assignments for bringing about the change desired as a result of this study.

LEGEND
A = Approval
I = Inform
R = Responsibility
S = Support

CHART 8
RESPONSIBILITIES

ACTORS

Decisions / Actions	OTS	CHP	CALTRANS	CPOA	High-tech Industry
Present / Explain Available / Emergent technologies	I	I	I	I	R
Select systems for proposed implementation	S	S	R	I	I
Obtain required legislative changes	S	R	S	S	I
Obtain funding	R	S	S	S	I
Install systems	I	I	R	I	S
Train personnel	S	R	I	S	I
Operate systems	I	R	S	I	I

CONCLUSIONS and RECOMMENDATIONS

The implementation of new technologies in any field raises many difficult questions. This is especially so in the field of law enforcement, where individual human rights, indeed even the right to live, are often at stake. These questions will encompass the deepest legal, political, and moral issues.

What new invasions of privacy will become technically possible? What are the consequences of such technologies for democracy and the unique American Bill of Rights? How must present criminal codes be changed to deal with previously unimaginable issues? Can the Constitution itself remain unchanged?

On one hand, what makes America special is its profound commitment to individual freedom. On the other hand, when social disorder reaches intolerable levels, citizens begin to demand the most punitive, most intrusive, most anti-democratic measures.

Only by beginning now to analyze future technological and social changes systematically can law enforcement become anything more than a series of too-little, too-late crash programs. By thinking these matters through in advance–jointly with other agencies of government–law enforcement officials can begin to influence the social and political policies that would prevent, not merely suppress, crime.

Only by exploring long-range options can we begin to define the limits of governmental power and individual rights. Only by thinking ahead will our law enforcement system be able to protect both American society and its constitutional rights.

For law enforcement agencies and civil libertarians alike, dedicated to preserving not only order but also democracy, it is essential to step into the future now.[1]

The challenge now is an obvious one–police managers must provide the catalytic leadership to forge the new public/private partnerships required for success in traffic law enforcement in the next decade. They must radically shift focus from thinking about continually expanding resources and funding requirements to thinking about efficient and effective applications of technology. And they must mold and shape the legislative process to meet future needs while preserving constitutional guarantees.

Executive management of the California Highway Patrol must recognize the need for focused, proactive planning in this arena. They must dedicate their full commitment to the implementation of new traffic law enforcement technologies. A top-level task force, including representatives of all the affected entities, should be established expeditiously to develop detailed, long-range strategic plans and specific action steps for pilot demonstration projects.

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[1]Alvin Toffler and Heidi Toffler, FBI Law Enforcement Bulletin, January 1990, pp. 2-5.

It is said that generals always try to fight their last war over again. This is what the French did in the 1930s when they built their immense and costly "Maginot Line." French generals, steeped in trench-warfare thinking, paid little attention to the weapons of the future–air power, highly mobile land forces, blitzkreig tactics. As a result, their guns were pointed in the wrong direction, and the Nazis swept across France in a few weeks.

The question facing law enforcement professionals is the same one that faced the French military; is law enforcement in America still fighting today's wars with yesterday's weapons?

To guarantee democracy's future in the dangerous decades to come, all the agencies that form part of the American justice system need to rethink their assumptions about tomorrow and to pool their findings. They must know that they can never get it "right" but also realize that the very act of asking the right question, or shaking people out of their mental lethargy, is essential to survival.[2]

This study was intended to stimulate thought and to provide a brief glimpse of alternative futures. While the scenarios contain a strong element of fantasy, any one of them is reachable from where we now stand. Some alternative futures are obviously much more desirable than others; we have the power to mold outcomes through our positions as police managers.

The current period of "Glasnost" and "Perestroika" in Russia has a strong reflection in this country. With the impending reductions in military spending, the time is ripe for some "restructuring" of our own. The formidable technological power of the U.S. military/ industrial complex can now be focussed on solutions to domestic problems, notably efficient movement of people and goods. A great window of opportunity is opening now for us to take action to ensure realization of the desired future— a future that is rich and vibrant with promise.

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[2]Alvin Toffler and Heidi Toffler, FBI Law Enforcement Bulletin, January 1990, pp. 2-5.

Candidate Trends

(Long list)

- Traffic congestion
- Available labor pool
- Cellular phone usage
- Vehicle size
- Expert systems (i.e. court trial by computer)
- Video conferencing
- Regionalization of government
- Number of miles of toll road
- Technology donated by private sector to government
- Public/privare cooperative ventures
- Need for enforcement
- Number of vehicles registered
- High technology development
- Drug-related crimes
- Video traffic surveillance
- Number of vehicles stolen
- Education and training of officers
- Number of computers in use
- CHP role in serving motorists
- Centralization of control
- Mandatory ridesharing
- Consolidation of law enforcement
- Car-pool lane violations
- Fee charged for law enforcement services
- Incentive for use of small airports

Candidate Trends *continued*

- Computer-related crimes
- Traffic operations centers implemented
- Accident severity
- Civilianization of police
- Police image
- Demand for law and order
- Return on investments of private business
- Flextime
- State adjusted gross income
- Funding of traffic law enforcement

Candidate Events

(Long list)

- Legalization of automated enforcement of misdemeanor traffic violations
- Recision of the "speed trap" law
- Smaller vehicles authorized to use car-pool lanes
- Electrification of roadways to provide motive power to vehicles
- Telecommuting by ten percent of the workforce
- Automatic vehicle locators
- Controlled access to freeway
- Mobile digital terminals in all police vehicles
- Separate truck lanes in urban areas
- Artificial intelligence for hazardous materials routing
- Special times for truck travel
- Automated traffic signal enforcement
- Electronic license plates
- Modified police personnel selection requirements
- "Super Trucks" legal
- Toll road pricing based on time of day and vehicle type
- Insurance fees used for law enforcement
- Blood alcohol ignition interlock on all vehicles
- Navigation systems in 10 percent of all vehicles
- Automated toll collections
- Driver license ignition interlock
- Fines for vehicle breakdown
- Vehicle ownership security system implemented statewide
- Proposition 13 "backlash"
- Ignition kill switch for pursued vehicles
- Automated car-pool lane enforcement
- "Super buses"

Modified Policy Delphi
Rating Sheet

FEASIBLILTY		
DF	Definitely Feasible	No hindrance to implementation, no R&D required, no political roadblocks, acceptable to public
PF	Possibly Feasible	Indication this is implementable, some R&D still required, further consideration to be given to political or public reaction
PI	Possibly Infeasible	Some indication unworkable, significant unanswered questions
DI	Definetely Infeasible	All indications are negative, unworkable, cannot be implemented

DESIRABILITY		
VD	Very Desirable	Will have positive effect and little or no negative effect, extremely beneficial, justifiable on its own merits
D	Desirable	Will have positive effect, negative effects minor, beneficial, justifi able as a by-product or in conjunction with other items
U	Undesirable	Will have negative effect, harmful, may be justified only as a by-product of a very desirable item
VD	Very Desirable	Will have a major negative effect, extremely harmful

ALTERNATIVES

Alternative #1 (Develop technology applications at University)

DF	PF	[PI]	DI
VD	D	[U]	VU

Alternative #2 (Recodify traffic violations)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #3 (Trucking industry cooperation)

DF	[PF]	PI	DI
VD	[D]	U	VU

Modified Policy Delphi Rating Sheet *continued*

Alternative #4 (Environmentalists' cooperation)

DF	[PF]	PI	DI
VD	D	[U]	VU

Alternative #5 (Civil rights activists' cooperation)

DF	[PF]	PI	DI
VD	D	[U]	VU

Alternative #6 (Highway construction industry representation)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #7 (Top management responsibility)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #8 (Motor vehicle manufacturers' input)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #9 (Communicate with consumer advocates)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #10 (Allow for casual users)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #11 (Train enforcement personnel)

[DF]	PF	PI	DI
VD	[D]	U	VU

Alternative #12 (Systems Familiarization)

[DF]	PF	PI	DI
VD	[D]	U	VU

Modified Policy Delphi Rating Sheet *continued*

Alternative #13 (Media campaign)

[DF]	PF	PI	DI
VD	[D]	U	VU

Alternative #14 (Inform police unions)

[DF]	PF	PI	DI
VD	[D]	U	VU

Alternative #15 (Integration of sustems)

DF	[PF]	PI	DI
VD	[D]	U	VU

Alternative #16 (Train enforcement managers)

[DF]	PF	PI	DI
VD	[D]	U	VU

Alternative #17 (Public/Private partnerships)

[DF]	PF	PI	DI
[VD]	D	U	VU

Alternative #18 (Coalition formulate policies)

DF	[PF]	PI	DI
VD	D	[U]	VU

Alternative #19 (Legislative solution)

[DF]	PF	PI	DI
[VD]	D	U	VU

Capability Analysis - Part 1

Instructions:
Evaluate each item, as appropriate, on the basis of the following criteria.

- I Superior, better than anyone else. Beyond present need.
- II Better than average. Suitable performance. No problems.
- III Average. Acceptable. Equal to competition. Not good, not bad.
- IV Problems here. Not as good as it should be. Deteriorating. Must be improved.
- V Real cause for concern. Situation bad. Crisis. Must take action.

Category	I	II	III	IV	V	Average
Staffing		4	3	24		3.2*
Technology		2	9	20		3.4*
Equipment		4	6	20		3.3*
Facilities			15	16		3.4*
Funding		4	15	4	1	3.1*
Calls for service		10	6	8		2.7
Management skills	1	10		12		2.6
Supervisory skills		10	3	12		2.6
Officer Skills	3	10	3			1.8•
Training	4	8	3			1.4•
Attitudes		4	12	12		3.1*
Image	2	14				1.8•
Legislative support	2	10	3	4		2.1
Executive support		10	3	12		2.6
Growth potential		12	3	8		2.6
Management flexibility		4	6	20		3.3*
Sworn/non-sworn ratio			18	12		3.3*
Salary scale		8	9	8		2.8
Benefits		10	9	4		2.6
Turn-over		10	12			2.4
Community support	2	8	9			2.1•
Sick leave rates		4	15	8		3.0*
Morale		6	6	16		3.1*

* The higher the score, the more cause for concern.
• The lower the score, the better the assessment.

Capability analysis - Part 2

Instructions:
Evaluate each item for your agency as to what type of activity it encourages.

I	Custodial - rejects change
II	Production - adapts to minor change
III	Marketing - seeks familiar changes
IV	Strategic - seeks related change
V	Flexible - seeks novel change

Category	I	II	III	IV	V	Average
Top management						
Mentality/personality	5		6	8		2.1*
Skills/talent	3	4	6	8		2.3*
Knowledge/Education	3	4	3	12		2.4
Organizational Climate						
Culture/norms		6	15	4		2.8•
Rewards/incentives		8	15			2.6
Power structure	4	4	9			1.9•
Organizational competence						
Structure		14	6			2.2*
Resources		6	12	8		2.9
Middle management		2	18	8		3.1•
Line personnel		8	9	4	5	2.9•

* The lower the score - rejects change
• The higher - more adaptabel - seeks change

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