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THE IMPACT ON THE CALIFORNIA HIGHWAY PATROL'S ROLE IN DEVELOPMENT AND IMPLEMENTATION OF INTELLIGENT VEHICLE HIGHWAY SYSTEM TECHNOLOGY BY THE YEAR 2002

BY

CHARLES W. CAMPBELL

JUNE 1993

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

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

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

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

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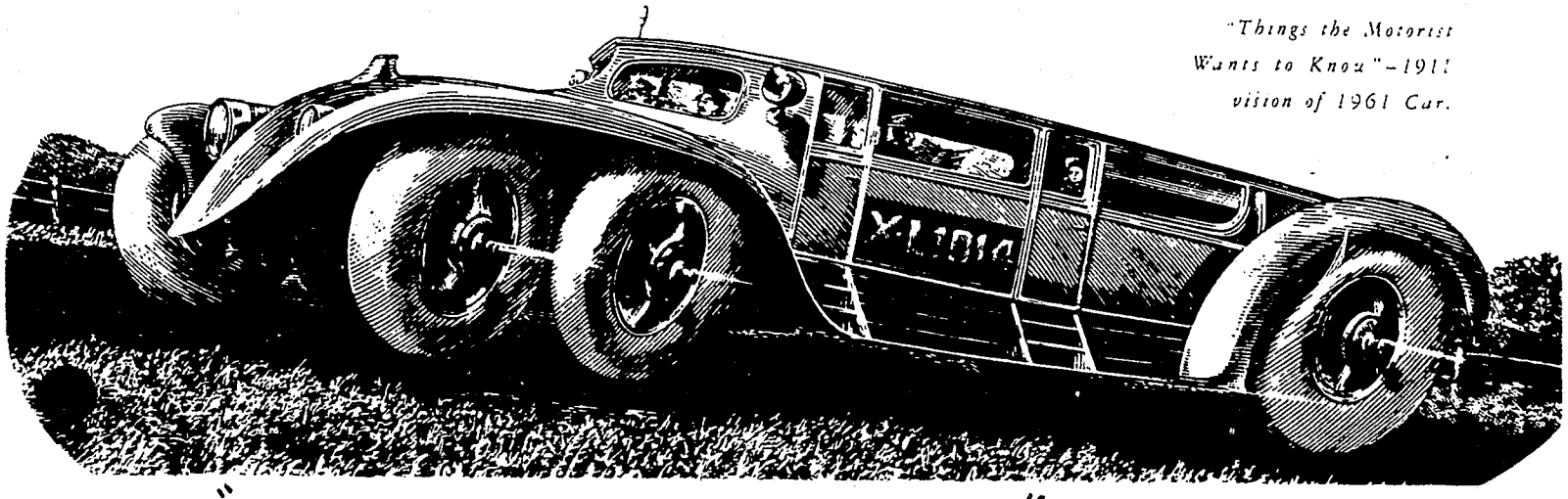

"Things the Motorist Wants to Know"–1911 vision of 1961 Car.

"Jules Verne would be amazed."

BY

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"... We have a strategy to unleash the creative genius of American technology. This technology took us to the Moon and now it must make travel to space economical and commonplace. And this genius built a network of highways, and now we must support and encourage advanced technologies of the whole field of transportation from magnetically levitated trains to intelligent vehicles and highways...."

President George Bush
March 8, 1990
The White House

"... Our vision also embraces research and technology. Public/private partnerships will make Intelligent Vehicle Highway Systems a workable reality. Smart cars and Smart highways offer genuine high-tech solutions to problems of mobility, congestion, air quality, and safety."

Secretary Samuel K. Skinner
U. S. Department of Transportation
February 14, 1991
New York City

CHAPTER ONE

INTRODUCTION

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INTRODUCTION

A. HISTORICAL PERSPECTIVE

Over the years, America's highways have been instrumental in facilitating the nation's economic prosperity as well as ensuring its internal security. Although it currently has an Interstate Highway System comprised of 44,600 miles, the network is rapidly becoming obsolete. In many instances, the system is no longer capable of handling increased traffic demands.(1)

Since the mid-1950's vehicle miles traveled on the country's highways have actually tripled, continuing to increase at a current 5% per year. From 1970 to 1985 vehicle numbers concurrently increased 63%. These trends have had significant negative impacts on interstate commuters where nearly two-thirds of peak hour travel is moving at less than 35 mph. In 1987 alone, one estimate put the cost of congestion for America's 25 largest cities at $42 billion.

Between 1950 and 1986, the U. S. population increased about 60% while the number of automobiles grew an additional 257%. In California, the state's population is expected to top 34.2 million by the turn of the century and exceed 35.3 million by 2005. This amounts to a 49% population gain in the past 35 years, qualifying California as one of the most populated states in the nation.(2)

Another significant trend facing transportation systems and managers by

the year 2000 is the doubling of drivers over age 55.(3)

Because of developing obstacles such as congestion, pollution, and highway violence, the automobile is losing its appeal to many Americans. Long perceived as the ultimate symbol of individual freedom, mobility, and fashion, it is now viewed in many instances as a necessary but tarnished burden. Citizens presently consider traffic a bigger threat to the country than crime, overpopulation, or unemployment.(4) Transportation planners and law enforcement agencies are thus confronted with growing traffic management challenges well into the next century. How they confront these challenges is dependent on many factors. One such is the technology issue, which shows considerable promise.

B. PRESENT CONDITIONS

There is no one, pat answer to reverse the nations ominous transportation trends. However, a group of technologies known as Intelligent Vehicle Highway Systems (IVHS) are considered realistic alternatives.(5) These technologies are direct descendants of aerospace research of the last two decades. Although they were not originally designed to be used for highway transportation, they have been found to have great adaptability for such use. IVHS is actually a family of technologies which may dramatically change the way we use our highways. First generation IVHS systems are with us now in varying stages throughout the world. They have been limited mainly to traffic control devices that monitor road conditions, meter access to freeways, provide rudimentary driver information, and to guidance systems based on dead-reckoning or Loran C. Future IVHS evolution may include driver vision enhancements,

collision avoidance devices, navigational electronics with input from the U. S. Global Positioning (satellite) System, and eventually adaptive cruise control systems built around inductive metal strips imbedded in highways. These systems would ultimately allow "hands-off" automated travel on many major highways.(6)

When considering future transportation solutions, laying more asphalt is obviously not the solution. Realistically speaking, an enabling concept such as IVHS clearly holds the most promise for transportation agencies and law enforcement. Although it has much to offer, it is not without its barriers. The three most formidable are lack of financing, difficulty of integrating and coordinating systems, and the complexity of setting technological standards.(7)

With the passage in 1991 of the Intermodal Surface Transportation Efficiency Act (ISTEA) by the federal government, unique decision making and funding opportunities have been presented to state and local officials in the realm of transportation. ISTEA is already putting money into IVHS projects nationwide. $660 million for smart car/highway research and development which is presently available to those who can justify the need.(8)

Highway engineers, public administrators, and traffic law enforcement managers are looking increasingly more into the future toward these developing technologies as solutions to America's transportation challenges. Their opinions are validated by supportive scientific data and unfolding developments in IVHS technology.

Recent increased utilization of more conventional technologies have already accounted for notable improvements in certain areas. As a direct result of the installation of airbags and emphasis on enforcement of seat belt and child restraint laws, California and the nation are experiencing their lowest death rates since federal officials first started tracking such statistics in 1921. In California, the death rate of 1.6 fatalities per 100 million miles driven is running 11% below the national average. This trend means the actual number of Americans expected to die on the nation's highways will dip below 40,000 by the end of 1992. This represents a 5% decline from the 41,462 deaths in 1991 and is the lowest since 1962. According to Marion Blakey, administrator of NHTSA, "its something we should celebrate! We're talking about the lowest fatality rate in history."(9) .This is just one example of how application and enforcement of simple technology systems can achieve a dramatic impact on highway fatalities.

C. PURPOSE OF THE STUDY

From the preceding discussion, it can be determined that traffic law enforcement managers in California have their special challenges within the transportation environment. Some departments such as the California Highway Patrol are already studying applicability of IVHS systems to their operations. The effectiveness and benefits of these systems, however, are still to be determined. It is the primary intent of this study to assist managers in identifying emerging trends and possible events in the realm of transportation and traffic management as well as realistic solutions to problems faced.

In developing the previous background information, an extensive literature search was conducted. This included review of future's file data, magazines, journals, newspapers, studies, books, and interviews. From this research, the emerging issue question was defined as it related to California law enforcement. The main focus of this study was originally intended to be, **"What impact will IVHS technology have on law enforcement by the year 2002?"** A "futures wheel" was created which illustrated and defined the breadth of this issue and its related subissues (see illustration 1). To give further definition to this project, three main subissues were also identified. They were:

1. **What impact will IVHS have on officer efficiency?**
2. **What impact will IVHS have on highway safety?**
3. **What implications will IVHS have for officer roles?**

D. SCOPE OF STUDY

After extensive study of IVHS and its implications to law enforcement, the original scope of this paper was judged too broad to deal with in a single document such as this. Therefore, the issue was further refined to explore the **impact on the California Highway Patrol's role in development and implementation of IVHS by the year 2002.** The subissues were retained as they have the same relevance to a single police agency as they do to all of state law enforcement.

As noted previously, IVHS in its early stages is already being experimented with by several transportation agencies throughout the

nation. Its effectiveness and impact on law enforcement are yet unknown. The scope of this study will deal with the impact on the CHP's role in acquiring and adapting to its use.

The study will also illustrate how forward thinking law enforcement managers can develop real time strategies for using IVHS technology in mitigating their growing traffic problems. The researcher will develop a normative scenario in the ensuing study which depicts how law enforcement and transportation planners can use IVHS to attack forecasted trends and events of a challenging, but heretofore uncertain transportation future.

In the following Chapter 2, Defining the Future, significant trends and events surrounding the impact on the CHP's role in acquiring IVHS technology will be forecast and discussed. They will be used to aid concerned police administrators in strategically planning for and managing future highway problems through the benefits of IVHS technology. It will allow them to be proactive rather than reactive, and also provide a model for other law enforcement agencies throughout the state.

FUTURES WHEEL

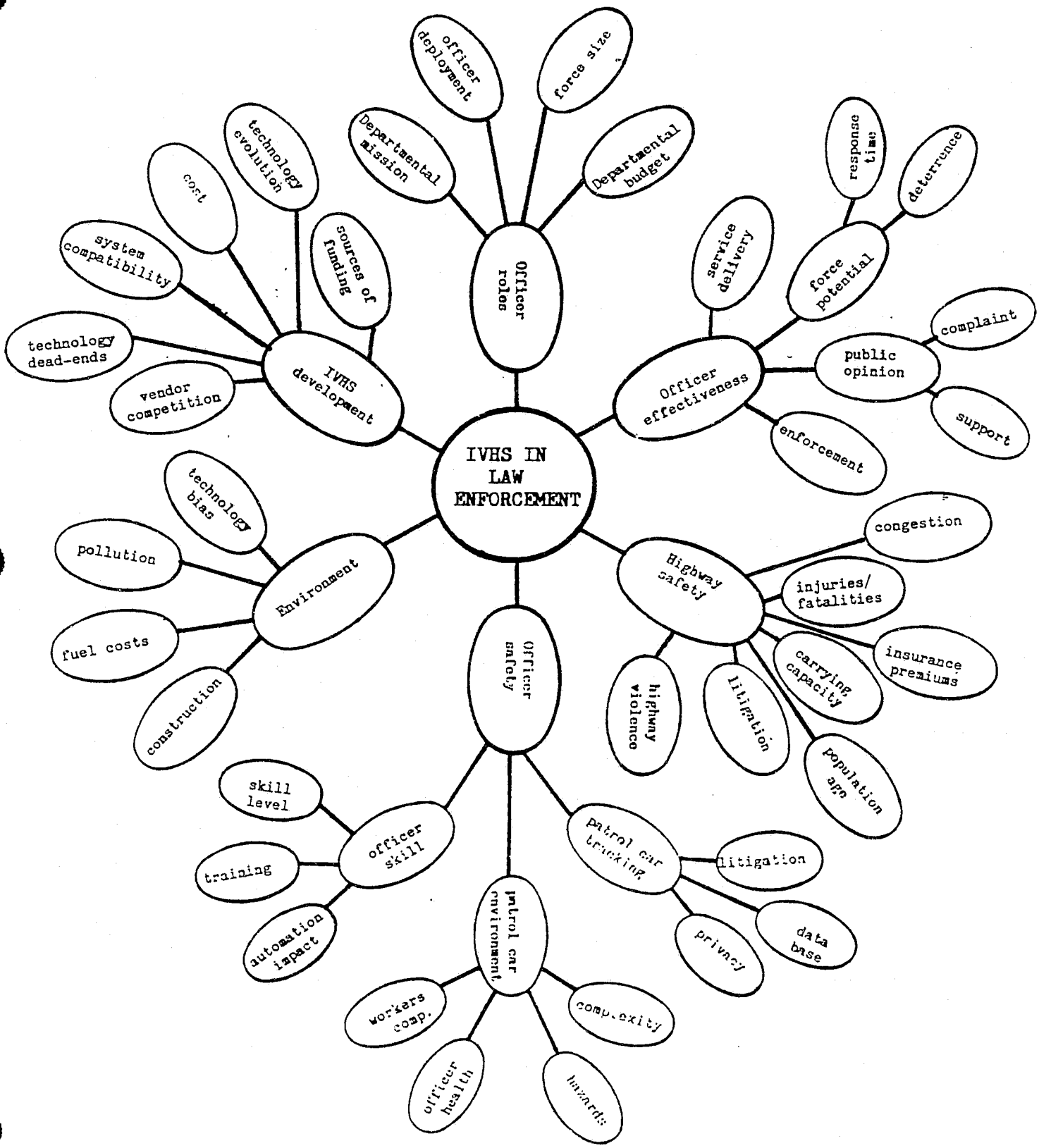


Illustration #1

CHAPTER TWO

FUTURES STUDY

CHAPTER TWO

FUTURES STUDY

A. DEFINING THE FUTURE

The purpose of this chapter will be to consider and explore possible future trends and events which might influence the development of IVHS systems in California and their impact on law enforcement. The examination will be supported by data gathered with a panel of state and county engineers and traffic law enforcement administrators. Care was given in choosing some members who had engineering backgrounds or experience with the automotive industry. The panel used the Nominal Group Technique (NGT) and a Cross Impact matrix system to identify relevant trends and events and then forecast possible future impacts on the primary issue. Scenarios were developed which forecasted three possible futures in Nominal (Exploratory), Normative, and Hypothetical modes. These scenarios will hopefully aid law enforcement agencies with their strategic planning processes downline and prevent reactive types of management.

At the present time, the California Highway Patrol as well as several other law enforcement agencies are studying "SMART" or IVHS technology for their patrol vehicles. The policy and scenario concepts offered by this study should aid them in planning and developing future successful systems.

B. EMERGING ISSUE SELECTION

As discussed in Chapter 1, the issue of the California Highway Patrol's role in the development and implementation of IVHS was deemed worthy of further study. It was selected as an issue because of its contemporary concern and it

will sooner or later have a direct application to other law enforcement agencies as well.

C. TREND AND EVENT DEVELOPMENT

Identification of relevant trends and events was accomplished using a panel of criteria selected people. Criteria included familiarity with transportation issues, management background, and/or general knowledge of law enforcement systems.

Panel members included the Director of the Ventura Air Quality Management District (VAQMD), three Cal Trans engineers including two who work directly with first generation IVHS projects, and the manager of Mike Curb Motorsports. Additionally, two CHP lieutenants, a CHP investigator and the supervisor of Ventura CHP's message and dispatch center also participated. Twenty (20) trend (Appendix A) and twenty-three (23) event (Appendix B) candidates were finally recorded.

D. TREND AND EVENT IDENTIFICATION

During the second portion of the development phase, criteria for final selection were discussed. Panelists were directed to chose trends and events which had the most significant implications or relevance to the emerging issue under study. They were again reminded of the 10 year timeline.

E. TREND DISTILLATION

Panel members initially identified 20 issue related trends and were requested to vote on the top ten. Criteria given in this step posed the question of how valuable the trends would be in understanding the potential of IVHS. A final vote was then taken and the top five trends for forecasting were selected.

Appendix A

Trend – Candidates

1. Efficiency of highway systems.
2. Impact of IVHS technology on the cost effectiveness of enforcement and transportation.
3. Impact of IVHS technology on commuter life-styles.
4. Impact of IVHS on law enforcement traffic management roles.
5. Competition of public/private entities for highway development funds.
6. IVHS demands for availability of radio bands.
7. Effects of technology on car pooling.
8. Tort liability and litigation costs.
9. Maintenance of highway systems.
10. Impact of highway accident experience on insurance costs.
11. Relevance of IVHS technology development and future breakthroughs.
12. Environmental impact acceptance of IVHS development.
13. IVHS impact on energy conservation.
14. Impacts of highway violence.
15. Contribution of technology to resolve long-standing highway system problems.
16. Health concerns relative to long-term exposure to technology.
17. Public acceptance of governmental intervention.
18. Law enforcement officer perception of privacy infringement by management.
19. Impact of IVHS relative to highway development costs.
20. Land development potential for highways to be considered for IVHS.

Trends were further assessed and prioritized based on their social, technological, economic, environmental and political significance.

Trend 1 Efficiency of Highway Systems (T-1)

The level to which the state's highways are being built and maintained.

Trend 2 - Law Enforcement Role Modification (T-2)

The degree to which law enforcement's mission and objectives are adjusted to meet changing demands.

Trend 3 - Tort Liability and Litigation (T-3)

The litigious nature of todays society and the degree to which it might exist in the future relative to IVHS development.

Trend 4 - Competition for IVHS Funding (T-4)

The level of competitiveness of IVHS purchasers for available funds.

Trend 5 - IVHS Development Costs (T-5)

The level of funds necessary to acquire and implement IVHS technology.

F. EVENT DISTILLATION

The panel forecast probable events based on the issue/sub-issue topics. They were requested to consider existing forecasts, historical experience, and their own judgements in the selection process. Based on a final vote from the panel in considering the original 23 events forecast, the five events most important to the issue were chosen.

Appendix B

Event - Candidates

1. Cost effective IVHS developed.
2. More restrictive air quality control measures legislated.
3. Less restrictive air quality control measures legislated.
4. Computer malfunction contributes to major highway collision.
5. Legislation passes prohibiting non-IVHS equipped vehicles from states highways.
6. Earthquake devastates a portion of the states IVHS system.
7. Protestors sabotage segment of IVHS system.
8. IVHS study validates technology.
9. Alternate transportation system adversely impacted by IVHS development.
10. Federal government legislates mandatory IVHS standards.
11. IVHS systems act funds IVHS technology.
12. Pro-technology President of U. S. elected.
13. Segment of public refuses IVHS technology.
14. Law enforcement officers strike because of a segment of IVHS technology.
15. Mileage death rate drops 50%.
16. Energy crisis occurs.
17. Class action suit filed because of IVHS "big brother" aspects.
18. Technological breakthrough revolutionizes data transmission.
19. Major recession stops IVHS development.
20. Technology eliminates police pursuits.
21. Major special event scheduled in large city.
22. Legislation enacted restricting IVHS use.
23. Air pollution hits all time low.

Event 1 – **Cost Effective IVHS Developed (E–1)**

A breakthrough in IVHS technology which would allow reasonably priced IVHS system upgrades and development.

Event 2 – **Federal Government Legislates Mandatory IVHS Standards (E–2)**

The National Highway Traffic Safety Administration enacts national IVHS standards relative to design, compatibility, and safety.

Event 3 – **Federal Legislation Funds Development of IVHS Systems (E–3)**

The U. S. Congress includes funds for IVHS development in future legislation.

Event 4 – **Computer Malfunction Contributes to Major Traffic Collision (E–4)**

A glitch in electronic vehicle guidance systems or in a Traffic Operations Center highway control mechanism causes a crisis in the form of a major highway disaster.

Event 5 – **Class Action Suit Filed For Vehicle Monitoring (E–5)**

The ACLU or police officer's union files suit on behalf of its constituents for intrusions into officer privacy with tracking devices.

G. FORECASTING

1. . Trend Forecasting

During this phase, the panel estimated "expected values" of the five main trends identified. These included past values (5 years ago) as well as estimates for 5 and 10 years in the future. Values for the 5 and 10 year futures were further broken out into both nominal (exploratory) and normative (desired or realistically attainable) modes. The secondary normative forecast depicted individual value judgements required for future goal development.

Table 1: Table provides results of trend forecasts. All values shown are panel medians.

Table 1

TREND EVALUATION

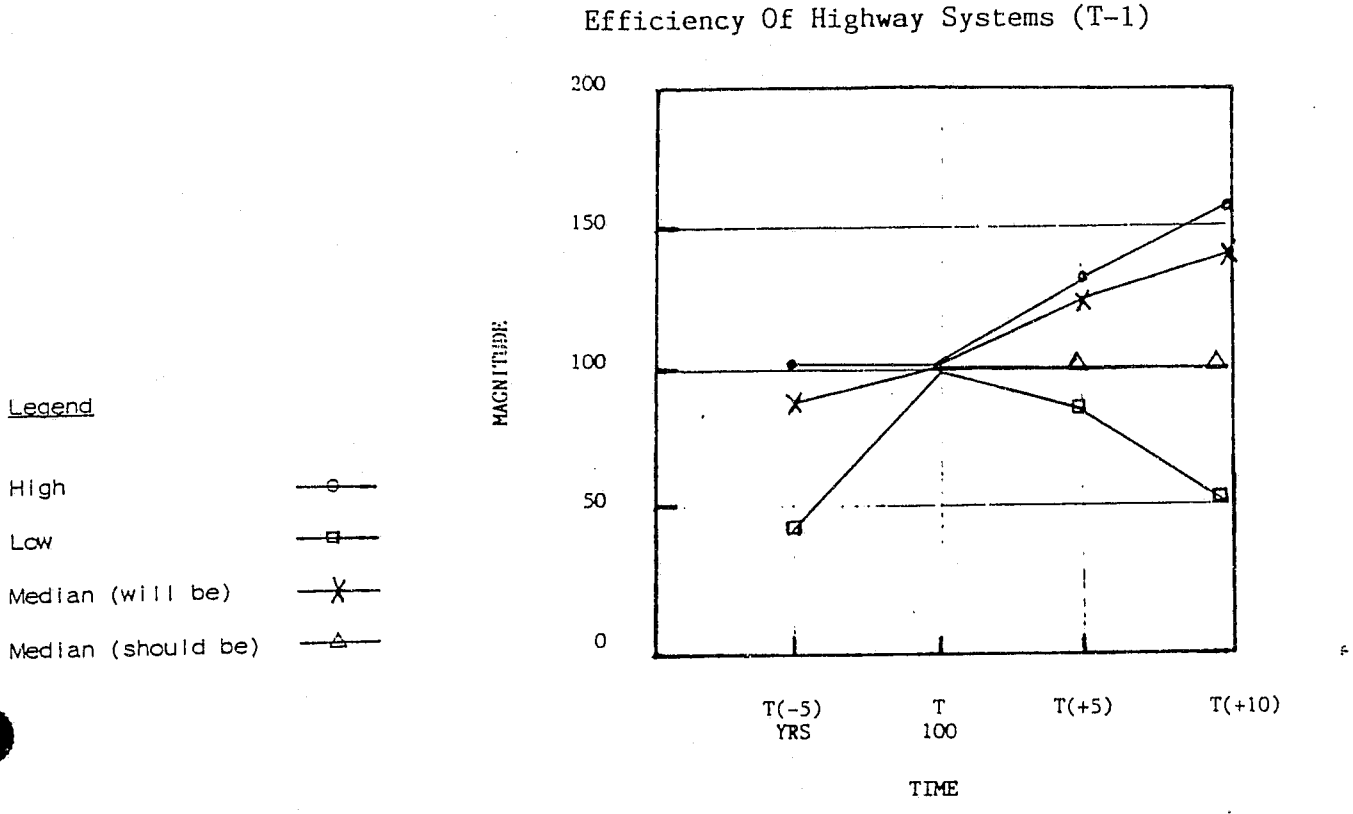
TREND STATEMENT		LEVEL OF THE TREND (today = 100)			
		5 Years Ago	Today	* 5 Years From Now	*10 Years From Now
EFFICIENCY OF HIGHWAY SYSTEMS	T-1	80	100	120 / 100	135 / 100
LAW ENFORCEMENT ROLE MODIFICATION	T-2	80	100	105 / 110	110 / 120
TORT LIABILITY AND LITIGATION	T-3	90	100	110 / 80	115 / 50
COMPETITION FOR IVHS FUNDING	T-4	80	100	110 / 80	120 / 90
IVHS DEVELOPMENT COSTS	T-5	80	100	120 / 100	140 / 100

* PANEL MEDIAN FORECASTS

N =9

WILL BE / SHOULD BE

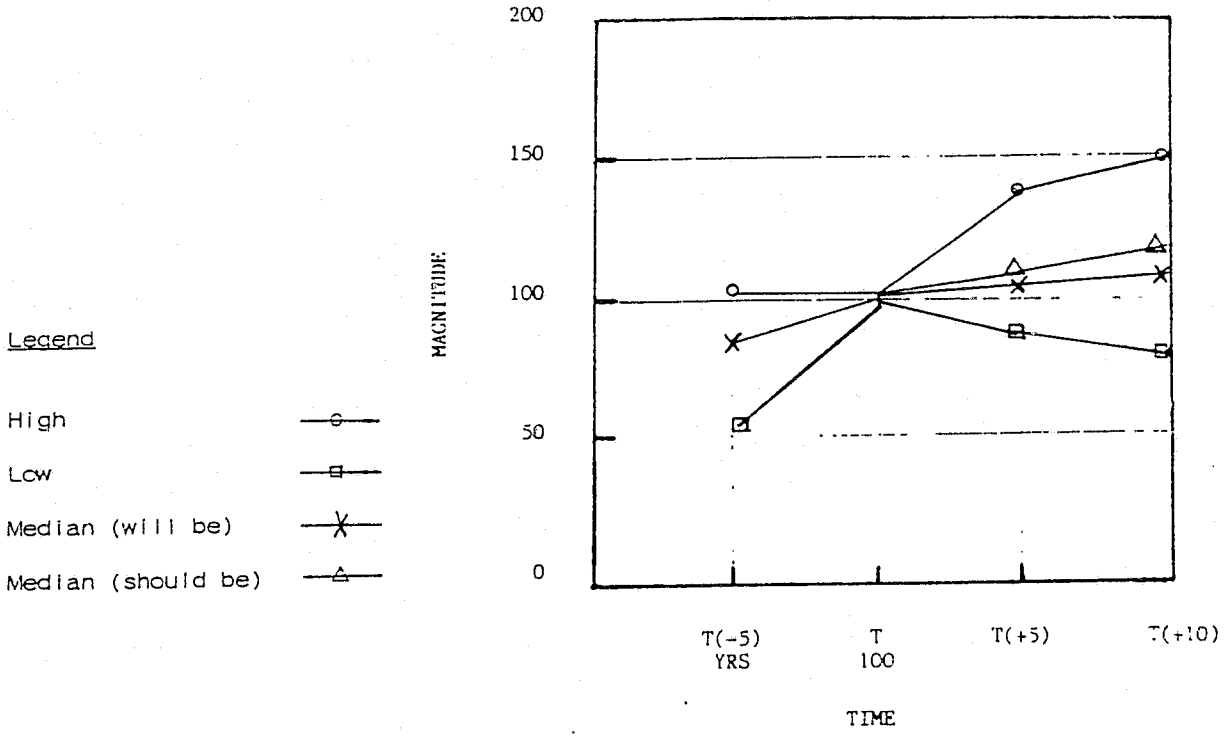
2. Trend Forecast Interpretation



Graph 1

Trend #1 forecast increased efficiency being built into future highways using IVHS technology. This direction can already be seen with the passage of federal legislation in the form of the Intermodal Surface Transportation Act of 1991. This bill alone allocates $660 million dollars for IVHS nationwide and underscores the importance that the government places in transportation infrastructure as well as this specific technology. The panel believed that this trend was strong and very likely to increase significantly within the next 5 to 10 years.

Law Enforcement Role Modification (T-2)

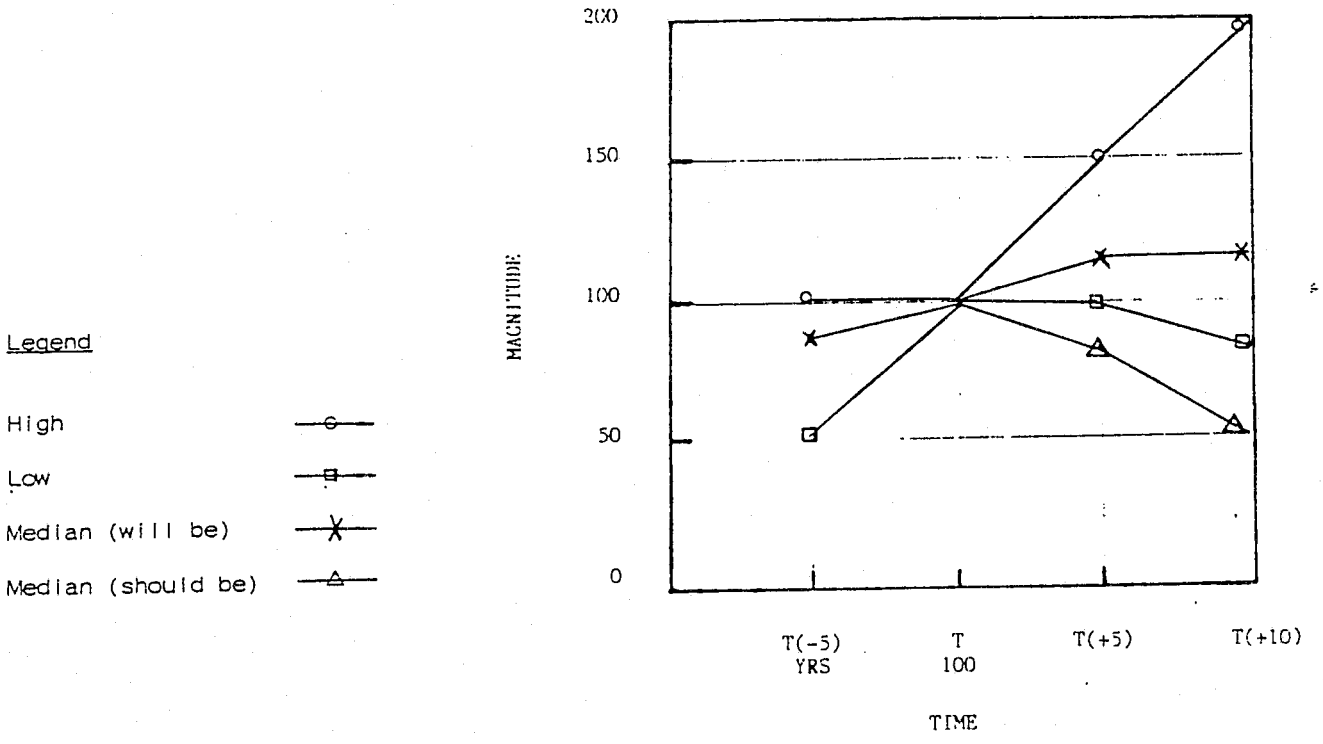


Graph 2

Trend #2 implied that with the incorporation of IVHS components, both in highway systems and patrol vehicles, that law enforcement roles would possibly need a change of emphasis and focus. Many examples of this pattern have been observed in the past when technology has been introduced into work environments. Panel members were in agreement that this trend would continue in the future in California law enforcement. If IVHS increases, the "should be" law enforcement future would be well served in making the best use of this technology. If IVHS reduces the need for a certain officer emphasis such as enforcement, the energies of that individual should

conceivably be redirected. Although the "should be" future was strongly agreed upon by the panel, they felt that the "will be" future would fall a little short of what it should be. This is not to say that forward thinking, proactive departments cannot develop strategic plans to fully utilize IVHS as well as achieve officer role effectiveness.

Tort Liability and Litigation (T-3)

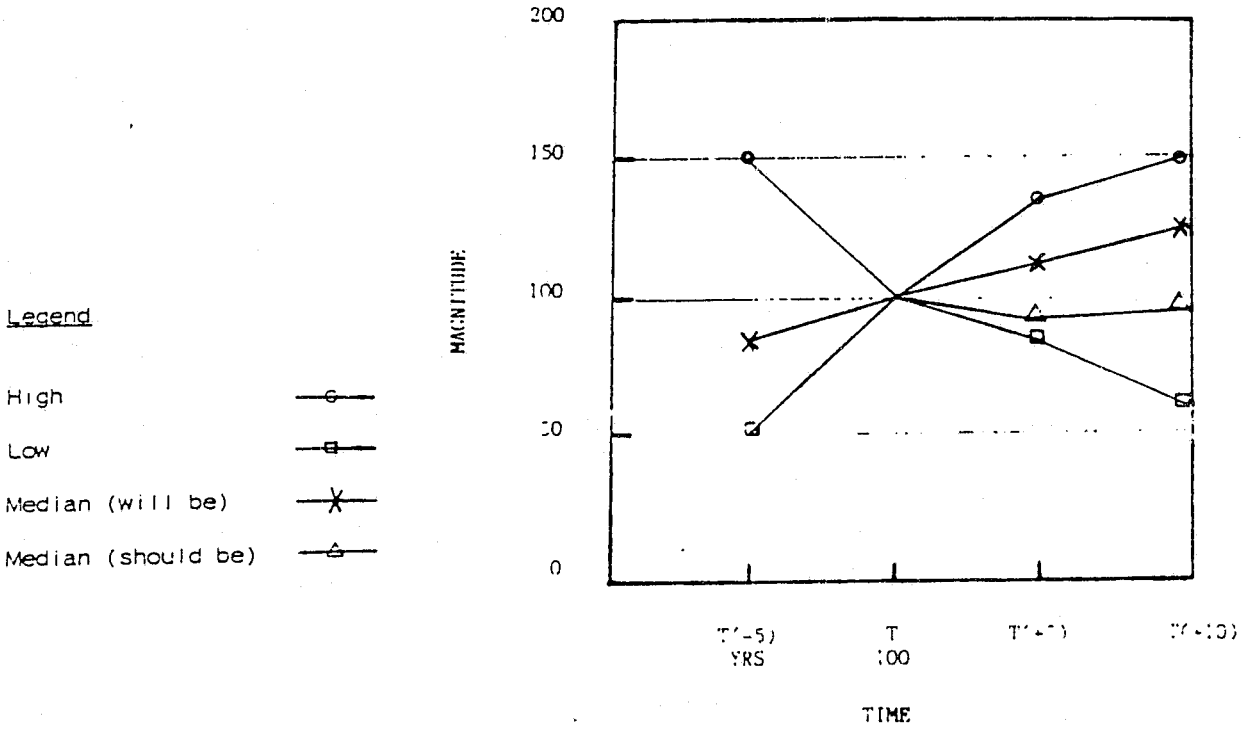


Graph 3

Trend #3 illustrated the future probability of increased tort liability and litigation as a result of IVHS implementation. It was a consensus among panel members that the best case or hoped for future would see an actual reduction in lawsuits within our society. However, given the gradual increase in this trend over the past

decade, it was forecast that the "will be" or nominal future would most likely see the trend increase in many areas. When analyzed in conjunction with the development, implementation, and operation of a complex technology such as IVHS it was agreed that it might be considerably vulnerable to attorney challenges of many types. Of those discussed, personal injury, privacy intrusion, and environmental issues were considered to be prime targets of the legal profession.

Competition For IVHS Funding (T-4)

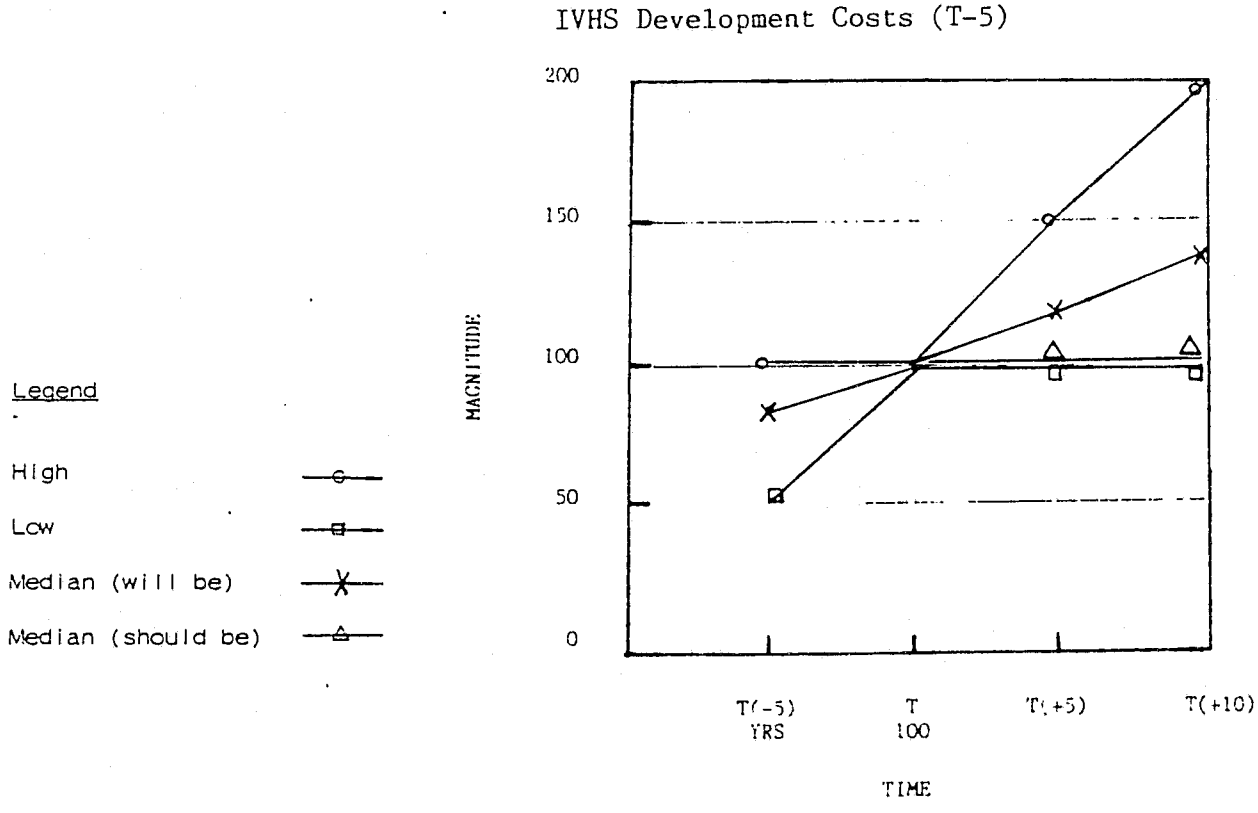


Graph 4

Trend #4 identified the competition of states, cities, and county governments for IVHS funding. Considering the high cost of most new technologies, especially one as complex and broad as IVHS, it was agreed by all panel members that alternate sources of financing would

need to be secured if the systems were to become a reality. Although most government entities have the legal prerogative to collect taxes, the revenues necessary to finance such costly systems would most assuredly require additional fiscal support. As the federal government and private industry are the most reasonable sources, states, counties, and cities across the nation will be vying for federal dollars and private industry alliances to meet their transportation challenges.

Although transportation planners would hope for a future that was not so dollar competitive, the panel forecast that the most likely future would see increased struggle beyond current levels for IVHS financing.



Graph 5

Closely related to Trend #4, Trend #5 depicted a significant cost increase for IVHS development in the "will be" future. The desired or "should be" future would hope for costs to be on a par with today's prices. However, the "will be" future appeared to be the most realistic forecast of the group in believing IVHS costs, such as other leading edge technologies, would continue to spiral upward. Justification for this belief was again based on past experiences with technology evolution. The expenses of research, testing, and development, were also noted as contributing factors in this assumption and were credited with probably driving prices to a very high level in the next 5 to 10 years.

3. Event Forecasting

The panel selected five events for forecasting. The first forecast was when the probability of occurrence event first exceeded zero. Subsequent forecasts were the probability of occurrence in 5 years and 10 years from now. No interval forecasts were attempted in this particular exercise. Finally, positive or negative impacts by the events on the primary issue were assessed and projected.

Table 2

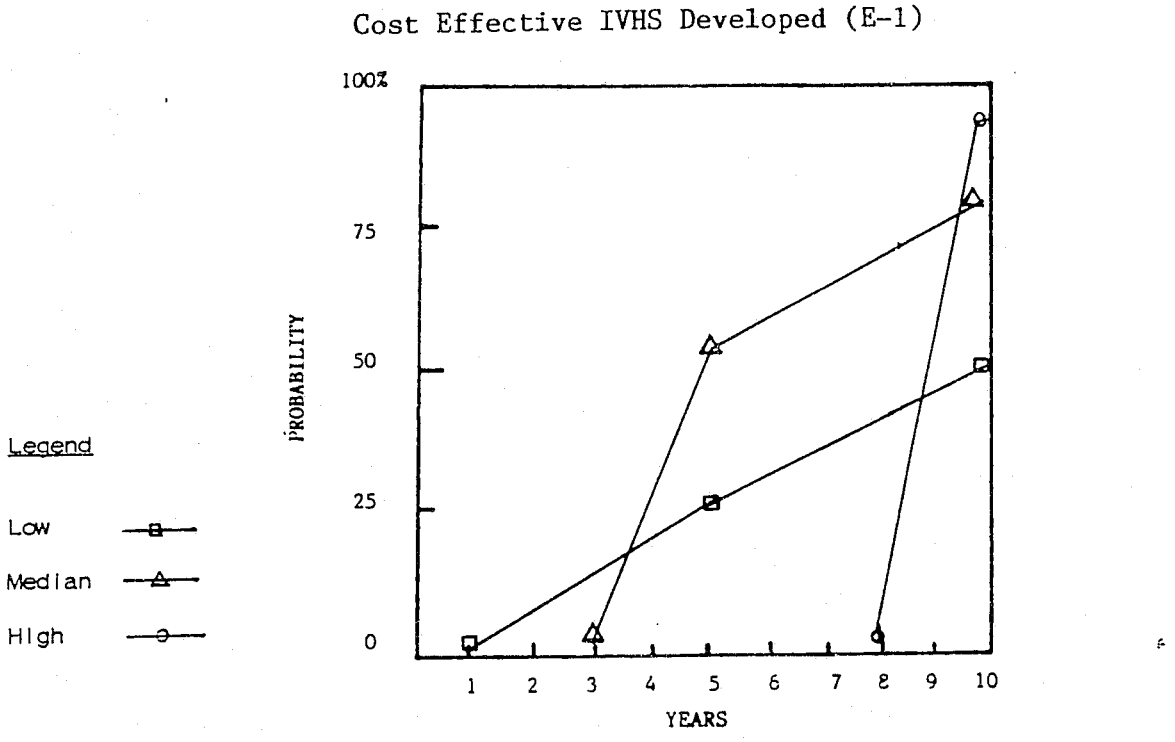
EVENT EVALUATION

	EVENT STATEMENT	YEARS UNTIL PROBABILITY FIRST EXCEEDS ZERO	* PROBABILITY		IMPACT ON THE ISSUE AREA IF THE EVENT OCCURRED	
			Five Years From Now (0-100)	Ten Years From Now (0-100)	Positive (0-10)	Negative (0-10)
1	COST EFFECTIVE IVHS DEVELOPED	3	50	80	10	0
2	FEDS LEGISLATE MANDATORY IVHS STANDARDS	2	60	80	8	0
3	FED. LEGISLATION FUNDS IVHS DEVELOPMENT	1	75	90	8	0
4	COMPUTER MALFUNCTION CAUSES MAJOR TRAFFIC COLLISION	4	50	65	0	9
5	CLASS ACTION SUIT FILED RE VEHICLE MONITORING	4	40	75	0	8

* PANEL MEDIAN FORECASTS

N=9

4. Event Forecast Interpretation

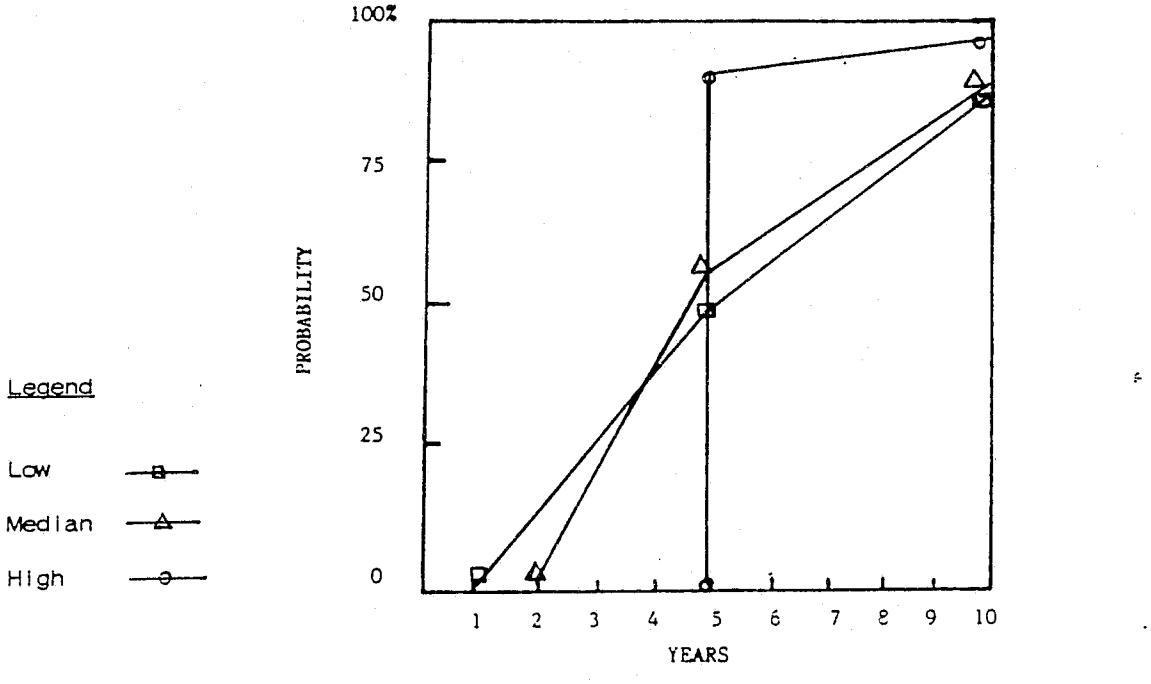


Graph 6

In the case of **Event #1**, the panel forecast that a technological breakthrough would occur which made IVHS systems more cost effective. They believed that with the current transfer of aerospace technology into the civilian sector, the event had a chance of occurring. Although this transition is an ongoing process, they felt that the "cost effective" aspect would have no chance of happening in the next 3 years. Once beyond that time frame, however, they believed it had at least a 50% chance within the next 5 years and a very good chance of 80% within the next ten. Interestingly enough, this event

promises the greatest positive impact on law enforcement if it occurs. This is understandable because the more affordable a system is, the more prone it is to be used in future transportation systems and patrol car fleets.

Legislation Of IVHS Standards (E-2)

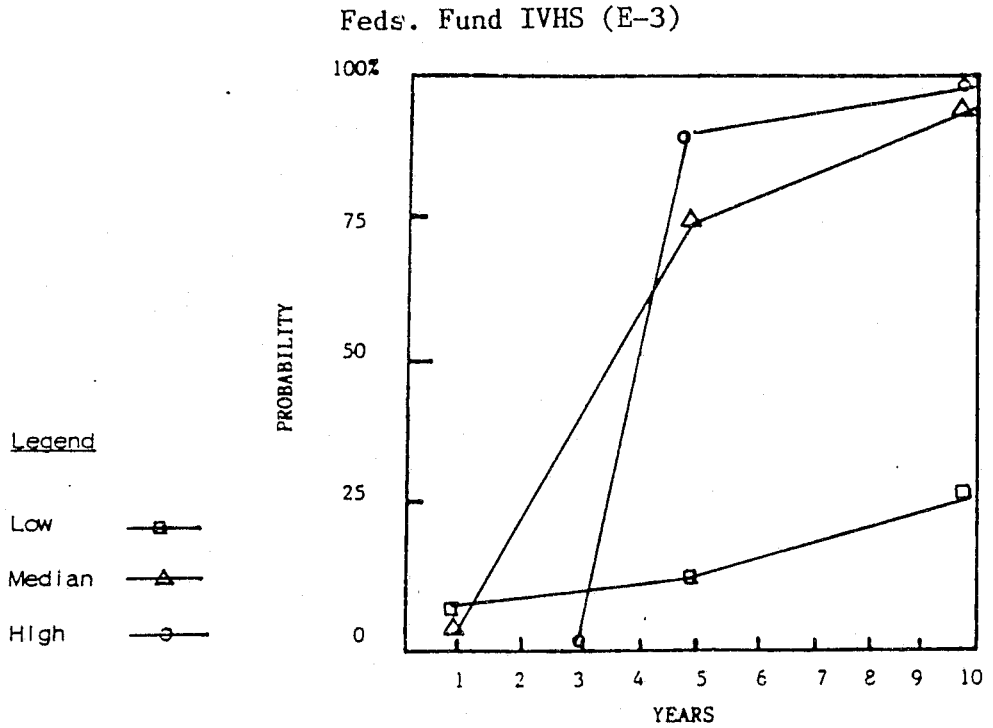


Graph 7

Event #2 is another instance which if it occurs, will further the acquisition and construction of IVHS enhanced transportation networks. Mandatory federal standards in the past have created safer R&D climates for hardware manufacturers. With agreed upon standards in place nationwide, IVHS component and system builders will be able to focus their products into agreed upon target zones without risking

large sums of money on technological explorations and possible dead-ends.

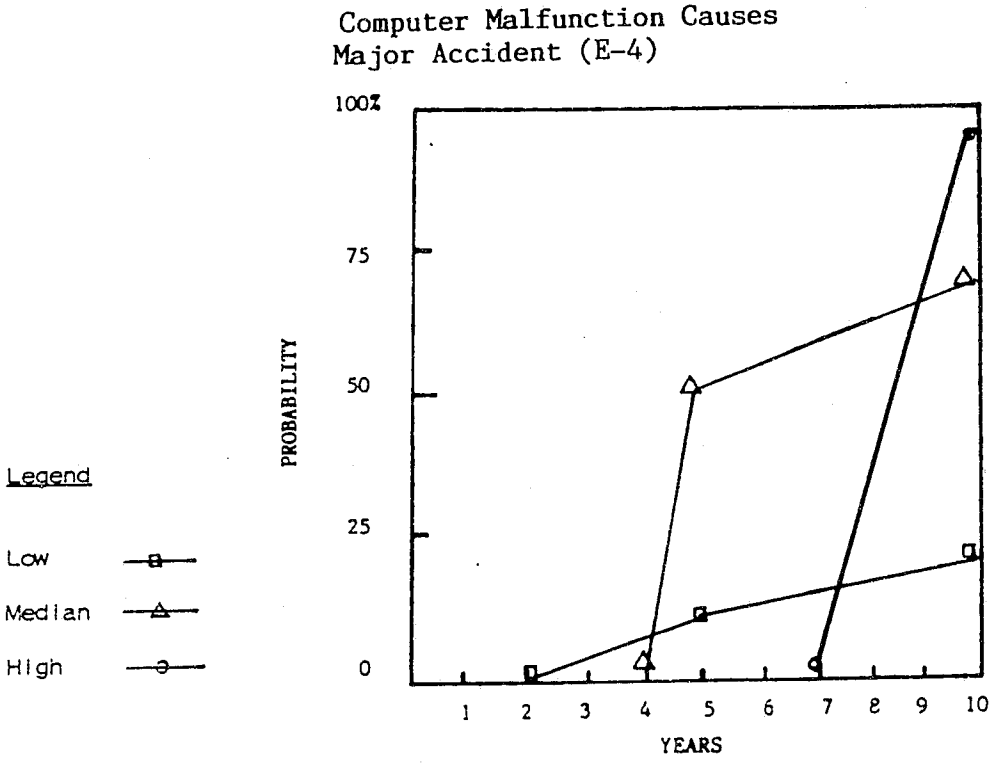
The panel believed this event would not occur within the next 2 years. However, given the present climate of national focus on highway infrastructure, they believed a 60% chance in 5 years and an 80% chance in ten were not unreasonable projections. In assessing its impact on the issue area, members felt the occurrence would have a considerable positive impact on law enforcement. Legislation of the type under study would also enhance the probability of Event #1 coming to pass.



Graph 8

Event #3 would be a windfall to state and local governments if it occurred and would have a dramatic positive impact on the issue under study. Panelists also believed that with the change in federal leadership, it would be no more than 1 year before the probability of occurrence actually exceeded zero. They also forecast a 75% likelihood of occurrence in 5 years and 90% in ten years. One reason the impact wasn't of the highest rating was the question of how much money would be appropriated over what period of time. Since IVHS development is a multifaceted, layered technology, they felt compelled to be conservative in assessing the degree of impact on the issue.

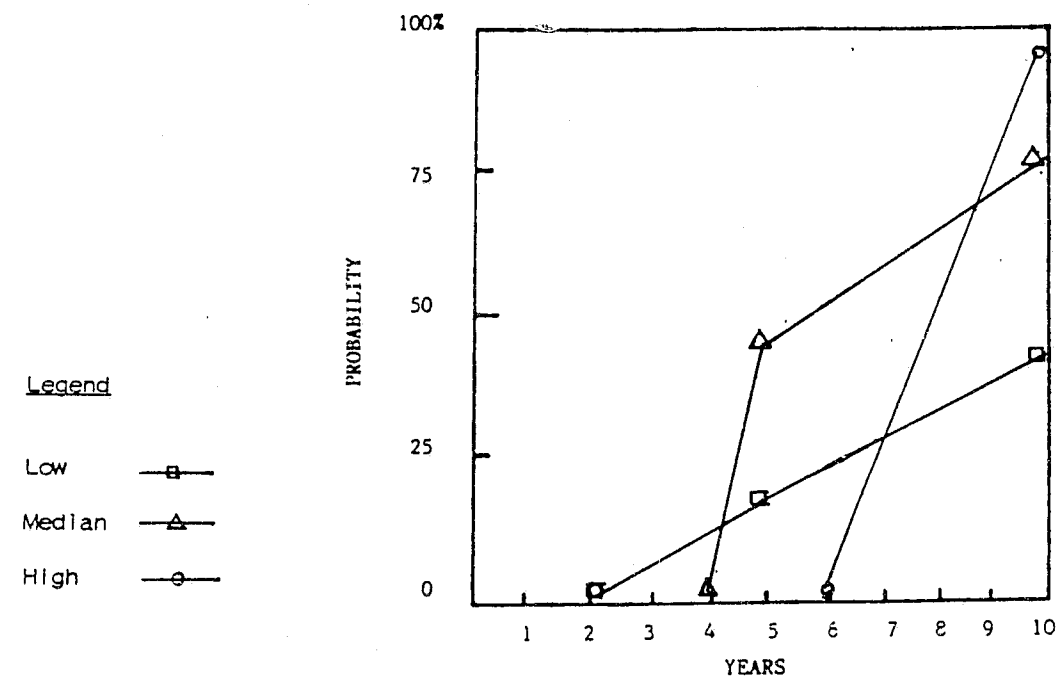
In **Event #4**, the forecasters believed that a major traffic collision would be caused by a malfunction in IVHS equipment in some future scenario. One instance discussed was a possible glitch in a computer system which failed to notify IVHS equipped vehicles of impending dangerous highway circumstances. The ensuing crash would also relate directly to Trend #3 in the sense that it would have a definite cross-impact.



Graph 9

In the case of Event #4, the panel felt that the probability an IVHS system malfunction might occur would probably not exceed zero for at least 4 years. This forecast was attributed to the fact that there are under ten IVHS testbed systems currently being tried out in the United States. It will take several more years of IVHS implementation into mainstream transportation infrastructure and at least one or more of the first three events to happen before the probability of such a system error becomes realistic. Members also rated future probability of occurrence at 50% in 5 years and 65% in 10 years. These more moderate forecasts are reflective of the previous discussion.

Class Action Suit Re
Vehicle Monitering (E-5)



Graph 10

Event #5, class action suit filed for vehicle monitoring, was also believed by forecasters to have no change of occurrence until 4 years from now. Again, the reasons given were similar to Event #4 in that it will probably require more IVHS development and implementation before the probability increases. This event was chosen for forecasting because of the severe negative impact it might have on the issue if it occurred. By identifying and assessing Event #5's impact on law enforcement, it will aid its managers in developing strategic plans to counter or mitigate it. The likelihood of this event occurring in 5 years was also rated low at 40%. It was rated higher in the next 10 years at 75%.

Table 3

BASIC CROSS-IMPACT EVALUATION

IMPACTING EVENT (ACTORS)		REACTORS *IMPACTED EVENT E-1	E-2	E-3	E-4	E-5		REACTORS *IMPACTED TRENDS T-1	T-2	T-3	T-4	T-5	ACTOR HITS
COST EFFECTIVE IVHS DEVELOPED	E 1		+50 / 6	+50 / 5	+60 / 4	+20 / 6		+50 / 5	+70 / 5	+30 / 5	+50 / 5	+50 / 5	9
FEDS MANDATE IVHS STANDARDS	E 2	+80 / 5		+70 / 2	+30 / 5	+10 / 5		+80 / 3	+70 / 5	+50 / 3	+80 / 2	+75 / 3	9
FEDS FUND IVHS DEVELOPMENT	E 3	+90 / 2	+90 / 2			+60 / 5		+25 / 4	+50 / 3		+60 / 5	+70 / 5	7
COMPUTER MALFUNCTION CAUSES COLLISION	E 4	+40 / 6		+50 / 10		+40 / 7		-10 / 7	+25 / 4	+80 / 6			6
CLASS ACTION SUIT RE VEH. MONITORING	E 5		+25 / 10	+50 / 5	+70 / 10			+25 / 5		+85 / 5			5
REACTOR HITS		3	3	4	3	4		5	4	4	3	3	

IMPACT SCALE

% probability / # years to occur

Legend

T 1 = Efficiency of highway systems.

T 2 = Law enforcement role modification.

T 3 = Tort liability and litigation.

T 4 = Competition for IVHS funding.

T 5 = IVHS development costs.

*PANEL MEDIAN FORECASTS

NG=9

H. CROSS IMPACT ANALYSIS

The cross impact analysis was the panel's final task. This process dealt with the projection of the impact of each forecasted event on the other events and trends. Impacts were noted as percentage changes (+ or -) relative to the original forecast, and depicted the maximum impact upon the comparative event or trends within the stated issue timeline. (Table 3 displays the cross impact analysis findings).

The number of "hits" in each row signified the most critical "actor" events. These events with the largest cumulative totals determined how great a change agent they were expected to be if they were to actually happen. Actor events which were given the most weight by the panel were expected to be the focal point for further policy development to make the events more likely or less likely to happen.

Reactor hits were also tabulated down each column. Similarly, those trends and events with the highest number were considered to be most likely to be influenced by the actual occurrence of a noted event.

As depicted in the Cross Impact matrix, **Event #1** (Cost effective IVHS developed), and **Event #2** (Feds mandate IVHS standards) were clearly the leading events identified as having the greatest probable impact on all other events and trends. These two events are the essence of IVHS technology becoming a reality. Their occurrence will notably impact Event #3 in that federal funding is more likely to be approved by the U. S. government if it is to be spent on an affordable technology with finite, technical parameters.

Event #3, which was weighted second as an actor hit, will further facilitate IVHS becoming an achievable transportation and law enforcement system.

The matrix was also used to judge the degree of reactiveness of events and trends. **Trend #1** which reflected the continuing development of the nations highway networks reacted with every single event. The most significant impact noted was its possible influence on **Event #2** regarding the federal development of IVHS standard guidelines. Its projected two year probability of occurrence also identified it as a major focus of policy development and strategic planning. Event #3 and #4 along with Trend #2 and Trend #3 were rated second with four reactor hits apiece. These issues should also be given close consideration for inclusion in policy and planning formulation. **Trend #2 and #3** both forecast significant possible reactions to law enforcement if IVHS becomes a major part of the state's transportation systems. For one thing, law enforcement managers will need to plan well in advance as to what new or adjusted roles their officers will play on future "smart" highways. Not only will roles change but departmental missions as well. To be prepared to adapt as well as to be able to integrate police operations into IVHS systems, proactive strategic planning will be essential for those who don't wish to be left out of the picture. Trend #3 (Tort liability) also speaks to the need for strong, decisive planning and policy development. Police unions as well as ACLU backed citizen privacy groups may be potential negative forces which departments and transportation agencies might be required to contend with. Litigation can be costly and create artificial barriers to IVHS system development. If the technology is to be used to its full potential, the implications of Trends #2 and #3 must be taken into account.

I. SCENARIOS

1. Scenario 1:

Exploratory (Nominal) Mode (None of the forecasted events occur).

"Major Metropolitan Highway Systems Under Siege." was the leading headline in the Los Angeles Times dated September 15, 2002. The article which described the increase in freeway congestion, traffic deaths, and decline in quality of highway environments over the last decade does not paint a very rosy picture for the future.

The Commissioner of the California Highway Patrol, Maurice Hannigan, has attributed much of the rise in traffic mayhem to increasing populations competing for commute space on already overcrowded freeways. Since 1955 vehicle miles traveled in the state have tripled and are currently increasing at 5% per year. In the state's major cities, two thirds of peak commute travel is moving less than 35 mph. Without a solution for congestion, Californians will be creeping down highways at an average speed of 11 mph in the near future. Regarding the upward population spiral, it is estimated at 34.2 million at the present time and should exceed 35.3 million by 2005. He also cited the propensity of most commuters to still drive alone to their destinations, ignoring more highway efficient car pools.

The president of the State Chamber of Commerce, Bob Bright also blamed new business within the state of continuing to cluster around major metropolitan areas, further exacerbating the problem.

Transportation planners for years have been lobbying the federal

government for relief. However, due to the national deficit as well as lingering effects of the recession in the mid '90's, funding for improved mechanisms such as IVHS have not been realized. Jim Cummings, the Director of CalTrans, has expressed his frustration at a state populace which has refused to vote for additional taxes to improve local highways and who also will not use congestion relief methods such as carpools. Police unions which include the California Association of Highway Patrolmen have continued to successfully fend off department attempts at electronic vehicle tracking/deployment devices in patrol vehicles. They have been supported in their struggle for officer rights by the American Civil Liberties Union.

2. Scenario 2:

Normative Mode (desired and attainable future in which forecasted events positively impact the issue).

"IVHS-Leading Edge Technology Saving America's Highways." This headline appeared in the Sacramento Bee dated July 14, 1997. IVHS, the "Buck Rogers" technology of the future has recently given new promise to sorely pressed transportation systems within California and the nation. Over the past five years, the efficiency and safety of many highways have been dramatically improved by the implementation of IVHS components and systems. Major metropolitan areas such as San Francisco and Los Angeles have been used as testbeds for new IVHS technology. This technology has been made possible by the Intermodal Surface Transportation Efficiency Act of 1991, recent federal legislation, and scientific breakthroughs allowing affordable equipment. The cost of IVHS is still relatively high, though competition within the field may soon bring costs within reach of local

governments. In the United State alone, there are presently 20 operational field tests underway or slated to begin soon. Federal spending on IVHS has used up $660 million to date, and is expected to soar as high as $2 billion through the end of the century.

To further enhance IVHS development, the National Highway Traffic Safety Administration has enacted technology standards into law. This will allow continuity and compatibility of IVHS components and systems nationwide and dramatically reduce costs of manufacturer research and development.

Due to promising downward trends in congestion and accident rates, the California Highway Patrol and local traffic police are reviewing their missions and deployment patterns. Emphasis is being shifted from enforcement to service orientations due to fewer errant drivers on IVHS controlled highways.

Although the future is bright, it is not without problems. Several traffic accidents have been attributed to minor malfunctions in automated IVHS systems. The legal profession has been quick to step in to defend the aggrieved motorists. However, the involved transportation agencies have been prepared for such eventualities due to futures oriented planning and have blunted the negative impacts of these suits with previously legislated protections on IVHS equipped thoroughfares.

3. <u>Scenario 3: Hypothetical Mode</u> (a "what if" future in which an unanticipated/wild card event occurs, changing the forecast of other actor events).

A doleful headline in the Los Angeles Times dated December 7, 1999 stated, "Nation Locked In Grip of Lowest Recession On Record; State Highways Big Losers! Despite the best efforts of President Bill Clinton, America is still immersed in an unprecedented financial gridlock. The nation's deficit has persistently maintained its ungainly size in the trillions of dollars despite many political attempts to reduce it. Special interest wrangling and citizen resistance to new taxes and social engineering have contributed significantly to the nation's financial malaise. Of the states which have suffered the greatest economic hardships, California is still attempting to cope with persistent illegal immigration and the financial vacuum created by the loss of many businesses over the past decade. Also impacting the state, if its leaner pocketbook weren't enough, is its overused highway system. Infrastructure repair and planned technological improvements have been significantly delayed while proposed IVHS improvements to mitigate pollution and traffic congestion are still too costly to be realistic alternatives. Although highways and the motor vehicle have been instrumental in facilitating the states prosperity, the highways themselves are showing signs of wear. The nations 44,600 miles of interstate are rapidly becoming obsolete. California has experienced a 49% population growth in the past 35 years, which now qualifies it as the most populous state in the nation. Future optimism is guarded despite federal legislation which has codified explicit IVHS transportation standards. The transportation ills of California and other large states may eventually be improved if more federal money for such projects is made available. Pay down on the national deficit may ultimately be the answer. To start this trend, Americans as a whole will have to "bite the financial bullet!"

J. POLICY DEVELOPMENT

During this phase, policies were developed by the author which would help mitigate the undesirable future depicted in the previous nominal scenario. Criteria were selected which considered the reasonable feasibility of IVHS development, its priority for government subsidization, and private industry's interest in research and development of the technology. Profit potential, being the life-source of the private sector, would also have to be achievable.

The policies chosen are as follows:

P-1 The Commissioner of the California Highway Patrol in partnership with the Director of Caltrans supports IVHS development on states highway systems.

P-2 California state legislature enacts 10 year IVHS strategic master plan.

P-3 California Peace Officers Association (CPOA) adopts policy to urge California Police Chiefs and Sheriffs' Associations to incorporate IVHS officer safety componentry into patrol car fleets.

1. Policy Impact

Policy impact estimates were derived through the cross-impact matrix (Table 4). The estimates are those of the author and not the nominal group.

Of the policies proposed, all three could have a major positive impact if Events #1, #2, and #3 were to occur. Although events #4 and #5 portend negative impacts, the overall results would tend to be positive and beneficial. The trends considered were another thing, again. Only Trend #1 was impacted positively by P-1 and P-2. This was in the realm of support of IVHS by law enforcement and the legislature and their correlation to increased

highway efficiency and modification of law enforcement roles. Trend #2 and Trend #3 were somewhat negatively impacted by P-1 and P-2 while none of the policies had an impact on Trends #4 and #5.

Table 4

Policy Cross Impact Table*

IMPACTING EVENT	IMPACTED EVENT					IMPACTED TRENDS				
	E-1	E-2	E-3	E-4	E-5	T-1	T-2	T-3	T-4	T-5
P-1 CHP/CALTRANS support IVHS systems	90	90	90	-30	-30	70	-10	-30	0	0
P-2 Calif. legislature enacts 10 year IVHS master plan	90	90	90	-30	-20	10	-15	-20	0	0
P-3 CPOA adopts policy urging Calif. law enforcement administrators to acquire IVHS technology	90	90	90	-40	-50	0	+10	-10	0	0

Legend

E-1 Cost effective IVHS developed
E-2 Legislation of IVHS standards
E-3 Feds fund IVHS
E-4 Computer malfunction causes major collision
E-5 Class action suit re vehicle monitoring

T-1 Efficiency of highway systems
T-2 Law enforcement role modification
T-3 Tort liability and litigation
T-4 Competition for IVHS funding
T-5 IVHS development costs

* Researcher estimate of + or - % probability impact of each policy upon median forecasts by year 2002.

K. SUMMARY

The data identified and analyzed in this article speaks directly to the original question posed at the beginning of the project; that is **"what will be the impact on the California Highway Patrol's role in development and implementation of IVHS technology by the year 2002?"** Sub-issues were also

identified as having a s nificant impact on the main issue. These asked the questions, "what aspects of IVHS would aid law enforcement managers to improve officer safety, effectiveness, and how would it impact highway injuries and fatalities?" It further questioned officer role evolution in light of IVHS implementation.

Most data developed by the research group pointed to dramatic positive benefits to law enforcement and society if IVHS technology were implemented. Major barriers identified were the need for common standards for construction, funding, and public acceptance of the changes. Although some IVHS technology is with us today, the actual time, downline, when major IVHS changes might first begin to occur will be driven by several factors. These include the saturation point of the current highway transportation system, public dissatisfaction with highway injuries, deaths and violent crime, and air pollution beyond the level of even minimal toleration.

As direct beneficiaries of IVHS technology, law enforcement could further influence the reduction of the mileage death rate, improve officer effectiveness through the use of "smart" highways and vehicles, and provide a safer vehicular environment for officers to perform their duties. Although negative trends and events such as public acceptance and possible law suits were noted, it was felt that the probability of these occurring would be minimized by effective government and law enforcement strategic planning.

In Chapter 3, the information developed from forecasting will be further studied from a strategic management perspective. Events and trends depicted in the normative scenario will be focused on to develop a strategic plan for

the implementation of IVHS technology within the California Highway Patrol. It will primarily deal with impacts on the CHP's role in acquiring this technology, as well as previously identified subissues. These included impacts on officer roles, safety, and effectiveness.

CHAPTER THREE

STRATEGIC MANAGEMENT

CHAPTER THREE

STRATEGIC MANAGEMENT

A. THE NEED

As noted in Chapter 1, highway injuries and fatalities are running high statewide. Equally disquieting is the concurrent increase of congestion pollution, and physical violence on urban streets as well as interstate freeway systems. Results of these trends are translating into a multitude of negative impacts on society as a whole. Of considerable note is the decline in quality of life and productivity for those who travel highways within major cities. Police agencies are challenged daily with incidents of violent street crimes which include shootings, vehicle assaults, and the like. Indirectly attributable to congestion, highway "car wars" are stimulated by pent up frustrations of irate, overcrowded motorists. In fact, the total force of the California Highway Patrol was increased 150 officers in 1989 by special legislation directly linked to the need for highway violence suppression.

The present climate now and in the future appears right for the implementation of new, innovative solutions. Providing more police officers is neither the answer nor any longer acceptable under today's fiscal belt tightening. Police managers and metropolitan communities nationwide are exploring future alternatives which include technological solutions rather than more costly officers and highways. Many police managers and transportation planners around the country are currently testing a relatively new family of technologies known as **IVHS, Intelligent Vehicle Highway Systems** as a long range fix.

As the lead traffic enforcement agency within California, the Highway Patrol is presently exploring IVHS answers to its future needs. However, it is still unsure of the benefits versus negative impacts this technology might bestow.

This brings us to the issue question of this study, **"What will be the impact on the California Highway Patrol's role in development and implementation of IVHS technology by the year 2002?"** The purpose of this chapter is to build upon the impacts, trends, and possible future IVHS applications within the state, and develop strategies to aid the California Highway Patrol and other law enforcement agencies in dealing with their highway related crimes. As a case in point it will propose a strategic plan for the California Highway Patrol to follow in acquiring and integrating IVHS into its daily operations.

B. MISSION STATEMENT

The mission of the California Highway Patrol is formulated within the philosophical framework of providing safety and service to the public.

In developing its mission statement, it will be bifurcated into two levels; a **"macro"** statement which formally expresses the broad mission and purpose of the Department; and a **"micro"** statement, which specifically defines an organizational function, activity, or program.

The "macro" mission statement of the CHP is : "To commit to the management of traffic for the safe, efficient, and lawful use of highways within its jurisdiction. It further commits to support local law enforcement and provide disaster and life saving assistance."

The "micro" mission statement of the CHP is: "To accomplish a reduction in the mileage death rate, highway violence, and abate congestion and pollution. To this end, the Department commits to a full exploration and implementation of IVHS technologies. It further commits to acting as a facilitating agent in fostering IVHS technology acquisition and implementation through out the state."

C. ENVIRONMENT ANALYSIS

For many years, California's motoring environment has been changing predominantly for the worse with more traffic, more accidents, and more crime. Although highway departments and traffic law enforcement managers are trying to counteract this trend with improved highway engineering, added enforcement, and better service delivery, their efforts are approaching the level of diminishing returns. To make conditions worse, the overall population of the state is continuing to grow at an alarming rate. The ratio of citizens to police officers is also on the rise with no end in sight. State and local governments are impaired more than ever by tight budgets, limiting their ability to field additional officers to contend with the growth. The climate now exists for a change away from more traditional methods of highway travel and enforcement to the technologically advanced, more cost effective and efficient promises of Intelligent Vehicle Highway Systems.

1. Social Environment

In a social sense, urban commuters have become totally frustrated with the congestion and pollution on today's freeway systems. Citizens are arming themselves at an alarming rate prior to driving through or into

high-risk metropolitan areas for fear of being attacked or victimized enroute.

a. Opportunities

Opportunities are more prevalent than ever before for police managers to justify the acquisition and integration of IVHS componentry into their patrol fleets. With the motoring public willing to consider most reasonable alternatives to improve their driving safety and comfort while reducing stress, police and highway administrators should find much community support in making this happen through IVHS.

b. Threats

Threats associated with this move will include privacy issues raised by officer unions due to electronic tracking of patrol vehicles. Furthermore, state and local governments which are still vulnerable targets of a litigious society will be open to possible increased lawsuits if IVHS systems malfunction. It is inevitable that a system glitch or catastrophe will sooner or later occur, injuring or possibly killing system users. Previous panel research forecast this event sometime within the next 5 to 10 years.

2. Technological Environment

a. Opportunities

Technologically, IVHS presents the **opportunity** to provide much needed relief to the community. Navigational aids, on-board computers, collision avoidance devices, SMART travel corridors, automatic vehicle identification and location systems are just a few IVHS components now available to state and local traffic management organizations. The IVHS concept not only involves drivers and their vehicles, but also includes law enforcement and

highway design people as integral parts of the IVHS team.

As an example, the Highway Patrol is presently engaged in a joint traffic management program with Cal Trans in major metropolitan areas throughout California. This program uses Traffic Operations Centers (T.O.C.'s) which electronically monitor traffic flow, congestion and accidents. They furthermore provide information to the news media and individual drivers via AM radio, of traffic delays and alternate routes. Cal Trans is also currently testing a first generation IVHS system known as Pathfinder on the I-10 Santa Monica Freeway. As the nerve center for Pathfinder, the Los Angeles TOC is one of the cornerstones of this project in which the CHP is an integral player and beneficiary. TOC's are just one example of the opportunities available to the Patrol in the infant IVHS field. It has already been proven in tests and in laboratories that IVHS can revolutionize our highway transportation systems.

b. Threats

Although IVHS technology has great promise, it is not without **threats** to successful implementation. First of all, it must be retrofitted into a rather complete, although not totally efficient highway system. The rapid pace of technological advancements, the possibility of developmental dead-ends (i.e. Sony Beta video), and also public skepticism of automated systems are further inhibitors of headlong progress.

3. Economic Environment

a. Opportunities

Several economic opportunities may ensure that IVHS will ultimately become operational. With mounting resistance by the public when it comes to increasing the size of government, police planners are looking more realistically at technological systems as force multipliers to provide needed remedies. State and federal governments are now viewing IVHS as a realistic, achievable alternative to the old method of more highways, more highway police. Although front end start up costs will be predictably high, long term payoffs should result from officer salary savings and reduced accident costs. The private sector, such as the insurance industry, may also be motivated to support and possibly help fund IVHS. Predicted savings with reduced injury and damage claims would be their incentives. Vehicle and commercial cargo security can also be enhanced by IVHS tracking systems.

b. Threats

When considering the ultimate costs of funding IVHS advancements, the **economic threats** to completion are some of the most formidable of all thus far considered. The best strategic planning in the world will be fruitless if the money is not there to pay for it. Technology doesn't come cheap, and with the present recession in full swing, police and highway managers alike are scratching to provide adequate services with leaner, more austere budgets. Help in this quarter doesn't appear to be near any time soon. Now as in the future, government budgets will be extremely vulnerable to recession, cyclic changes in business, and the fickleness of the taxpayer.

4. Natural Environment

a. Opportunities

Improved quality of this environment is implicit with any reduction in commute densities. The more congestion is scaled back, the more air pollution is expected to diminish. Although it is not a total panacea for air quality, IVHS will be a very positive step in the right direction. Some environmentalists who may have otherwise been against IVHS advancements might be realigned politically because of this reason.

b. Threats

Threats to environmental concerns were not specifically identified. Any that might be forecast would most likely be apparent in the political venue.

5. Political Environment

a. Opportunities

Political sentiment appears to be on the side of IVHS for the foreseeable future. As stated previously, many politicians and administrators view current trends as the change drivers or **opportunities** necessary to open the IVHS door and keep it open. With the federal government now studying IVHS systems capabilities, politicians will most certainly seek to influence future appropriation of highway funds to finance these systems. This single event would most assuredly put IVHS on the fast track for the future.

b. Threats

Threats to the political scenario can be forecast along the lines of environmentalist resistance to technological advancements.

Similar reactions can be expected from "not in my back yard" types or those who don't want the systems in their immediate neighborhoods. Although these two groups often reflect the minority position, they are usually comprised of very vociferous, educated people who don't take no for an answer. They are gaining daily in political clout. In fact, many extremists would have everyone back in horsedrawn buggies if they had their way. Although these groups may not ultimately rule the day, their opinions will be weighed heavily by vote sensitive politicians.

D. ORGANIZATIONAL CAPABILITY ANALYSIS

An assessment of the Highway Patrol's capability to engage in IVHS development reveals that it is well situated to do so. Its legislated authority over traffic law enforcement on all state freeways as well as many state highways makes it a potential prime benefactor by supporting and implementing this effort. It is also relevant for the Patrol to use its influence with other federal, state, and local government agencies to facilitate the development of IVHS cause because of the ultimate contributions to its mission.

1. Strengths

As it stands, the California Highway Patrol possesses many inherent **strengths** by virtue of its legal charter and mandate within the state. This authority is further supported by statutes contained in the California Vehicle Code. As a statewide traffic law enforcement department, the CHP is strategically situated to engage in and benefit from IVHS development. This is ensured because of its codified freeway authority and Traffic Operations Center coalition with the California Department of Transportation (CalTrans).

The Patrol also has an ongoing review of new technologies such as IVHS which may be relevant to its operations. It is engaged in planning for future acquisitions and enjoys a high degree of credibility and support from the state legislature and the Department of Finance. Previous successful experience in acquiring and using new technologies also implies strength. Examples include computer aided dispatch systems, automated citation writing devices, and a statewide management information system to name a few. An additional strength is its fairly stable source of funding from the state's Motor Vehicle Fund.

2. Weakness

A significant weakness in obtaining new technology is the Department's procurement process. Initially developed by state officials to ensure honesty and fairness in government purchases, it is an extremely time consuming, convoluted, and often a frustrating endeavor. Despite this challenge, good planning and enlistment of legislative support should mitigate some of the hurdles to be encountered. Along the same lines is the upwardly spiralling cost of new technologies. The Department has no intrinsic capability to influence these costs. However, using its reputation as a leading traffic law enforcement agency, it might indirectly persuade manufacturers to charge more reasonable prices for IVHS. Many companies would welcome the opportunity to showcase their products with the CHP. Another weakness to consider is opposition by the CHP officers union (CAHP) to vehicle tracking devices in patrol vehicles. This issue, though not insurmountable, will need to be addressed and negotiated to the satisfaction of all involved.

E. STAKEHOLDER ANALYSIS

To fully assess the intended effectiveness of the Highway Patrol's strategic plan for IVHS, one must first consider potential key stakeholders outside the Department. These stakeholders are people or organizations who will either be impacted by the Patrol's IVHS strategic action steps, will themselves have an impact on the plan, or at the very least, care in some way about it. Following is a list of perceived stakeholders and at least two to three assumptions held by that organization or individual.

- **Stakeholder #1 – Citizens of California** (most probably supportive)

  Assumptions

  a. want safe, uncongested, efficient highways.

  b. may resist higher taxes to fund IVHS.

  c. expect government to solve their traffic woes.

- **Stakeholder #2 – Business Community** (supportive)

  Assumptions

  a. believe more efficient, less stressful commuting will increase productivity and well being of their employees.

  b. believe that improved customer access to their locations will help their businesses.

- **Stakeholder #3 – Environmentalists** (most probably opposed)

  Assumptions

  a. will resist IVHS development in rural areas.

  b. will support clean air aspects of IVHS.

- **Stakeholder #4 – IVHS Manufacturers** (supportive)

  Assumptions

  a. stand to experience large profits and business growth.

b. are at financial risk if their R & D does not pay off.

c. are in an extremely competitive, volatile field.

- **Stakeholder #5 - Allied police agencies** (supportive)

  Assumptions

  a. may experience a drop in violent highway crime due to reduced congestion and driver frustration.

  b. will benefit from IVHS vehicle location systems regarding officer security and recovery of stolen vehicles.

- **Stakeholder #6 - Automobile industry** (supportive)

  Assumptions

  a. risk monetary losses if they do not develop accurate market analysis of IVHS directions.

  b. will ally themselves with government and IVHS manufacturers.

  c. stand to reap major profits if IVHS technology is implemented nationally.

- **Stakeholder #7 - American Civil Liberties Union (ACLU)** (opposed)

  Assumptions

  a. will resist vehicle monitoring systems as invasions of personal privacy.

  b. are human rights driven.

- **Stakeholder #8 - California Association of Highway Patrolmen (CAHP)-officer labor union** (mostly supportive)

  Assumptions

  a. will resist electronic monitoring of patrol vehicles for officer privacy reasons.

  b. will support CHP in acquiring IVHS systems which enhance officer safety.

- **Stakeholder #9 – Tow trucks/auto repair industries** (mostly supportive)

  Assumptions

  a. Believe IVHS will reduce profits as a result of improved highway safety.

  b. may be willing to consider new role in Freeway Service Patrols.

- **Stakeholder #10 – Federal Government** (supportive)

  Assumptions

  a. have shown previous support for funding experimental IVHS systems.

  b. would support legislation to create IVHS standards and funding (similar to Interstate Highway Plan).

- **Stakeholder #11 – Insurance Companies** (supportive)

  Assumptions

  a. can be expected to support IVHS advancements.

  b. believe they stand to profit from reduced traffic mishaps.

- **Stakeholder #12 – Anti-tax groups (Snaildarter #1)** (opposed)

  Assumptions

  a. will resist increases in taxes to fund IVHS.

  b. are believed to be politically savvy groups with a relentless nature on issues requiring additional taxes.

  c. unsympathetic to compromise.

- **Stakeholder #13 – Not In My Backyard types (Snaildarter #2)** (mostly opposed)

  Assumptions

  a. will resist any IVHS construction in their neighborhoods.

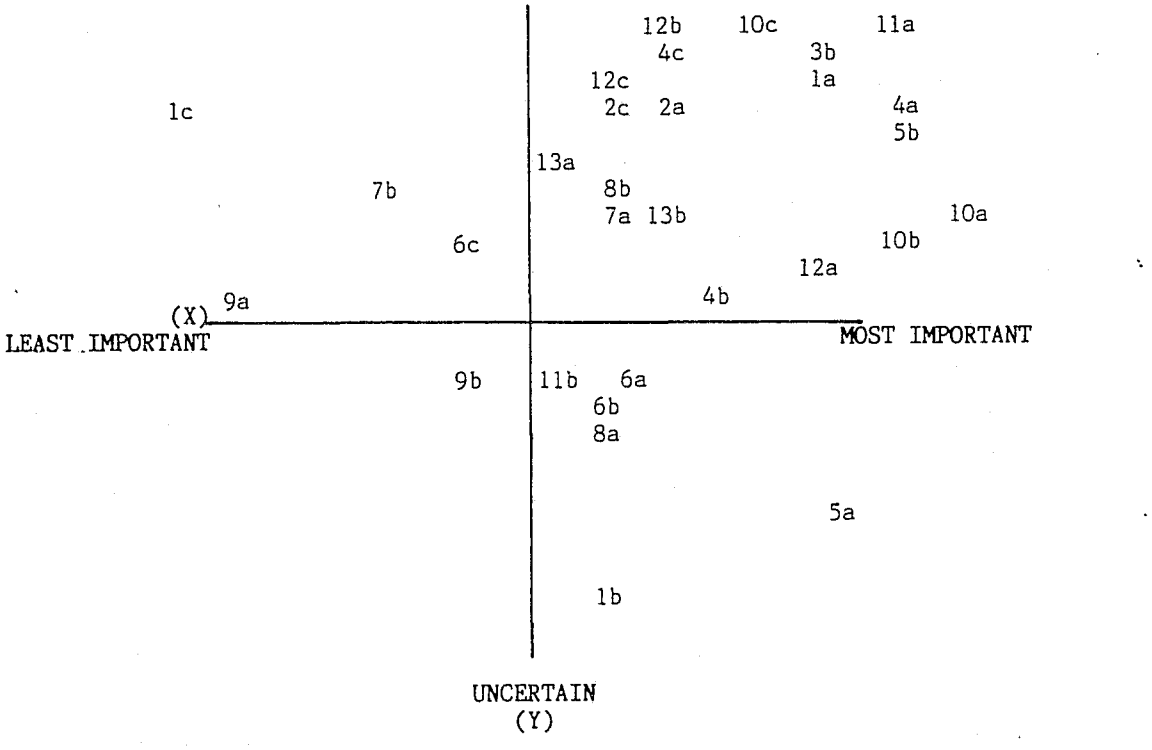
  b. may be sympathetic to negotiating compromises.

F. Strategic Assumption Map

To further appreciate the importance and certainty of these assumptions versus their opposite positions of uncertainty and lack of importance, the assumptions have been depicted on a mapping grid (see Appendix C).

STRATEGIC ASSUMPTION MAP

(APPENDIX C)



STAKEHOLDER LEGEND

1. Citizens of California
2. Business Community
3. Environmentalist
4. IVHS Manufacturers
5. Allied police agencies
6. Automobile industry
7. American Civil Liberties Union
8. California Assc. of Highway Patrolmen
9. Tow trucks/auto repair industry
10. Federal government
11. Insurance companies
12. Anti-tax groups
13. "Not In My Back Yard" groups

These positions have been plotted based on the most recent review of social, technological, environmental, economic, and political trends and events (STEEP analyses). Although they are mostly subjective in nature, the positions have been plotted on the grid based on perceived value to the individual stakeholders. Assumptions are reflected in Appendix D.

Appendix D

Stakeholder Assumptions

1a. Want safe highways (citizens)

1b. May resist new tax

1c. Expect government solutions

2a. Want stress free commute (business)

2b. Want customer access

3a. Resist rural IVHS (environmentalists)

3b. Support "green" IVHS

4a. Want profit (IVHS manufacturers)

4b. Need low risk

4c. Fear volatile technology

5a. Want less highway crime (allied law agencies)

5b. Expect technology benefits

6a. Risk development losses (auto industry)

6b. Will ally with government and IVHS tech. corps.

6c. Anticipate major profits

7a. Will resist vehicle monitoring (ACLU)

7b. Maintain extreme legal stances

8a. Will resist vehicle monitoring (CAHP-labor union)

8b. Support officer safety enhancements

9a. Risk long term losses (tow/auto repair industry)

9b. Want role in IVHS

10a. Will be largest IVHS funding source (federal government)

10b. Want highway standards

10c. Risk economic/political shift

11a. Support highway improvement (insurance companies)

11b. Will profit from reduced accidents

12a. Resist tax increases (anti-tax groups)

12b. Will relentlessly pursue reductions

12c. Seldom compromise

13a. Resist IVHS construction (NIMBYs)

13b. Sometimes negotiate in their best interests

G. **POLICY STATEMENTS** (ALTERNATIVE STRATEGIES)

Achievement of the California Highway Patrol's mission, goals, and objectives is based primarily on policies (strategies) developed for that purpose. In identifying and formulating a policy to incorporate IVHS systems and technologies into departmental plans and operations, a forecasting process known as the "Modified Policy Delphi" was used.

A panel of nine people from the Ventura CHP office were convened to act as Delphi panel members. Uniformed and nonuniformed, rank and file, supervision, and management were represented. The panel initially proposed nine policy alternatives for the Department to consider.

The three most realistic alternatives chosen, were as follows. The first two selections were the most favored by the group while the third was the most divergent or polarized.

1. The California Highway Patrol will explore IVHS availability and alternatives with known manufacturers. (49 votes).
2. The California Highway Patrol will commit to implement IVHS technology into its statewide operations. (47 votes).
3. The California Highway Patrol will explore development of IVHS systems with allied agencies. (30 votes).

A discussion was held regarding the pros and cons, arguments for and against, the three alternative policies. A re-vote was then taken. Policy #2 was the highest rated, with a total of 50 votes.

Several **assumptions** which are inherent in the development IVHS systems

must initially be considered before any strategy can be finalized.

First, IVHS is a family of technologies and not one item or system. Many manufacturers world wide are working on systems independently as well as in more well defined team efforts. For an agency such as the CHP to invest millions of dollars in IVHS technology will warrant serious study, deliberation, and community support beforehand.

Secondly, the Patrol will have to make some well educated decisions and focus its IVHS planning and implementation where it will provide the most benefits to its officers and the community. If these benefits which could conceivably be improvements in traffic flow or reduction in accidents are not identifiable or provable to the public early on, then future citizen support in the form of funding might not be realized. Public support and financing over the long haul is imperative. IVHS, like Rome, will not be built in a day.

The **third assumption** is that a completely functional, integrated IVHS system within the state will not and cannot be built by one organization. A total system will require a major partnership of private industries, the federal government, the California Department of Transportation, and the California Highway Patrol. Funding will have to be supported by the citizenry as well as the federal government over an extended period of time. IVHS technology has already been conceptualized by engineers in a series of future generations. Successful evolution and realization of these technological advancements are expected to unfold well into the next century.

In establishing the California Highway Patrol in its logical role as a primary player within IVHS, an analysis of the three most popular policies chosen to achieve this must be considered as well as stakeholder perceptions of each.

H. ALTERNATIVE POLICY ANALYSIS

1. Alternative Policy #1: California Highway Patrol Will Explore IVHS with Manufacturers.

The Commissioner would engage his Department in the study of IVHS technology and it's applicability to agency operations. He would direct his manager of Special Projects to develop a task force identifying all instances where IVHS might be used to improve departmental operations and maximize public safety and service.

a. Advantages

This policy is consistent with the Department's mission statement. It could take advantage of the Departments recognized position in traffic law enforcement when negotiating with IVHS builders, and possibly lead to them reducing costs. It gives the Highway Patrol the advantage of identifying where it wants to go with the technology, what benefits it hopes to realize from it, and how much it will cost.

b. Disadvantages

The policy in and of itself is only a half measure towards the goal of total systems acquisition and integration. It has the negative potential of becoming bogged down in a perpetual study mode without ever coming to total fruition. Because of the limited scope of this strategy, few stakeholders would be interested in direct

involvement or support. Costs of the technology also stand a chance of increasing over the long term.

c. Stakeholder Perceptions

Stakeholders such as IVHS manufacturers and the automobile industry would initially be supportive of these overtures by the Highway Patrol. However, with the eventual follow through of a purchase and implementation phase yet undetermined, they would most likely lose interest. Citizen highway users and taxpayers with the highest stake in IVHS development might also become disenchanted if nothing happens soon. Stakeholders such as insurance companies, the business community, and allied police agencies could also fall off of the support side due to protracted delays with the study.

2. Alternative Policy #2: California Highway Patrol Commits to Implementation of IVHS Technology in Department Operations.

This policy proposes research to identify current IVHS components and subsystems, determine their applicability to the Department's mission and patrol operations, and move to acquire and integrate them wherever feasible. This also would require a secondary but necessary emphasis on fostering IVHS acquisition within other police agencies throughout California. With all police agencies using the technology, law enforcement statewide would be more effective, and would provide safer working environments for its officers.

a. Advantages

The policy is consistent with the Department's mission statement and should be supported by the majority of the stakeholders. The motoring public and private businesses, in particular, are reaching maximum frustration levels in dealing with urban traffic problems.

These feelings will hopefully translate into pushes for improved highways and the willingness to fund the majority of the costs. As the largest traffic law enforcement agency in the state, the CHP stands much to gain in enhancing its service capability with IVHS technology.

b. Disadvantages

As in most large technology purchases, high costs are a factor. Where the CHP will obtain such money is still to be determined. The federal government, for one example, has previously funded such programs through grants. A second disadvantage is the potential difficulty in integrating and coordinating varied IVHS systems and components with those of other agencies. Care will need to be taken in standardizing what systems all departments will use, and ensuring they are compatible with future highway designs.

c. Stakeholder Perceptions

Caltrans will realistically be one of the primary stakeholders on the "support" side as they are a major builder of state highway infrastructure. Newer, intelligent highways will be the backbone of any IVHS system. The auto industry, electronics manufacturers, and the federal government will also be supportive of IVHS development, though available funding over the long term may seriously delay progress. Stakeholders who are expected to resist IVHS development include environmental groups. These people view most technological advancements as threats to the earth's integrity. Some may be swayed, however, with the promise of cleaner air as IVHS systems become operational and more effective. The American Civil Liberties Union can also be predicted to

challenge IVHS development along privacy and vehicle tracking lines. The California Association of Highway Patrolmen may also offer limited resistance where their represented officers are concerned.

3. Alternative Policy #3: California Highway Patrol Commits to Explore Development of IVHS with Allied Agencies.

With this policy, the Commissioner would enlist not only state agencies in IVHS planning, but also include allied police agencies as well. This policy could be initially pursued in meetings with California Chief's and California Sheriff's Associations. It would strive to develop a statewide law enforcement master plan for IVHS acquisition and implementation. Planning future technology developments in a unified fashion would ensure compatibility of systems. Not only could different departments work better together, but the public they serve would also benefit due to increased effectiveness.

a. Advantages

This policy is also consistent with the Department's mission statement. As noted above, it would enlist broad based support from other police agencies in planning for future IVHS technology interfaces. Although individual departments might think a certain IVHS component is right for their operations, prior master plan agreement would inform them of possible conflict or lack of compatibility with other police agencies or highway systems themselves. Operating in technological isolation is counterproductive in these complex times. Another advantage would be reduced costs due to larger purchases. If departments buy larger quantities of hardware and IVHS systems collectively, they stand a

good chance of negotiating a lower overall price. Stakeholders such as citizen taxpayers, the business community, and the federal government will also be more inclined to support such an approach. The plan offers long term savings to police agencies and taxpayers.

b. Disadvantages

This policy, similar to policy #1, would be better developed as a segment or action step of policy #2. Implementation of IVHS within the CHP will require many approaches including this policy. It would also require much popular support from the two main police chief/sheriff groups within the state. These groups are sometimes a contentious bunch with parochial views of their individual positions in the law enforcement community. To sway these two organizations would be a major challenge to the Commissioner.

c. Stakeholder Perceptions

As stated previously, the Commissioner's proposal to enlist allied agency agreement on IVHS systems acquisitions is a significant hurdle. Stakeholders such as the automobile industry and IVHS manufacturers may very well prefer to divide and conquer, cutting deals wherever possible for higher profits. Pushing their own systems independent of their competition will be a prime consideration. On the other hand, anti-tax groups, citizens, and insurance companies will support the best service for the most reasonable price.

The second policy, therefore, would be the best one to direct the CHP in implementation of IVHS technology within its patrol force. This policy will take into full account the backing of many

formidable stakeholders. Public sentiment, support, and adequate funding are the most critical factors if SMART highways are to become a reality. With proper strategic planning, the California Highway Patrol should be able to ride along on the IVHS wave to a safer more productive police force on a smarter, more efficient highway system.

I. IMPLEMENTATION PLAN

Following is a matrix which details a plan to implement the chosen policy. Areas of critical importance which have been addressed in the plan include action steps, those responsible for carrying them out, resources, and time frames within which the action steps need to occur. An ongoing system of feedback through Departmental chain-of-command will ensure appropriate follow-up and control.

IVHS strategic plan page 1

CHAPTER FOUR

TRANSITION MANAGEMENT

CHAPTER FOUR

TRANSITION MANAGEMENT

A. EQUATION FOR CHANGE

The following chapter is a transition management plan for the implementation of **IVHS (Intelligent Vehicle Highway Systems)** technology within the California Highway Patrol. To understand the Department's need for change relevant to this issue, a brief review of the total IVHS concept, and the critical players within the field is necessary.

IVHS is a family of technologies (SMART highways and SMART vehicles) in their initial generation of development. They are believed to contain far reaching solutions to problems such as traffic congestion, vehicular accidents, air pollution, and highway crime, just to name a few. Lead agencies involved in IVHS development include state and local highway departments, the automobile industry, electronics firms, and government entities from the federal level on down.

Being the primary and largest traffic law enforcement agency within the state, the Highway Patrol can realistically improve its operational efficiency and highway safety by integrating usable components of IVHS into its operations. A strategy has been developed in Chapter 3 which will allow it to commit to the implementation of this technology and integrate it wherever and whenever operationally and financially feasible. The CHP has already made a preliminary analysis of IVHS aspects which may have relevance to its needs. It has even begun a few limited tests of components. The change process toward IVHS, then, has actually begun. Based on public dissatisfaction with

alarming levels of congestion, air pollution, and mayhem still prevalent on the state's highways, the likelihood that this change will find support within the Department as well as from the citizens and taxpayers is very good. The chances are further supported by the existence of clear or Departmental strategic goals such as a commitment to lowering the mileage death rate. The perception within the key groups defined previously that IVHS is a significant action step to achieve improvement rounds out the equation necessary for successful change. Over the long term, IVHS promises to save countless lives, reduce congestion, improve the environment, and better commuter productivity once they arrive at work. The problems to be faced by change leaders and managers will be the difficult hurdles of high front end costs and disproportionately slow initial returns on investment. Over the long haul, IVHS concepts on drawing boards are strung into the future in a series of improving generations. As the technology evolves and is integrated into the national highway network, situations should become better. Once more IVHS systems fall into place, highway environments should improve concurrently. A critical factor in the ultimate success of the programs will be public financial support and acceptance.

B. COMMITMENT STRATEGY DEVELOPMENT

1. Critical Mass

The development of a commitment strategy is the initial stage of a successful transition management plan. To start with, several critical action steps devised to secure support of key subsystems are necessary to guarantee proper strategy development and attainment. The first step will require identifying people or groups who can ensure that the change occurs. This is also known as the Critical Mass and represents the minimum number of people who, if they support the change it will be a success; and who, if they are against the

change, it will fail. These people may be chosen from a group of stakeholders previously identified in the Department's strategic plan. However, critical mass actors may also be identified and acquired from any group or constituency, formal or informal, whose position is critical and necessary to make the intended change happen.

Applying the above definitions to the Highway Patrol's commitment to implement IVHS technology within its Department, the following critical mass actors were perceived as the most important for successful transition.

a. Commissioner - California Highway Patrol

b. Assistant Commissioner - Staff Operations

c. State Legislative Analyst

d. Director - California Department of Transportation (Caltrans)

e. Secretary - Business, Transportation and Housing Agency

f. Director - California Association of Highway Patrolmen (CAHP)

The second task in developing a commitment strategy is to design relevant action steps for its achievement. These may include such techniques for supporting the change as problem finding and information/education activities to raise awareness levels of critical players. Forced mechanisms for collaboration must also be considered while changing reward systems to positively reinforce the transition will further ensure success.

2. Commitment Charting

The following Commitment Chart, Table 5, depicts the critical mass actors necessary for change. Also included is a projected assessment of each individual's commitment toward the CHP acquiring IVHS, and a subjective forecast of the minimum commitment level needed from each person to make the change a success. A brief analysis and discussion of the actor's current

position, and what will be necessary in the way of intervention strategies to achieve a successful transition has also been provided.

TABLE 5
COMMITMENT CHART

ACTORS	BLOCK CHANGE	LET CHANGE HAPPEN	HELP CHANGE HAPPEN	MAKE CHANGE HAPPEN
a. COMMISSIONER-CHP			O <———	X
b. ASST. COMM. STAFF-CHP		X ———	———>	O
c. STATE LEG. ANALYST	X ———	> O		
d. DIRECTOR-CALTRANS		X ———	> O	
e. SECRETARY-BUSINESS, TRANSP. & HOUSING AGENCY	X ———	> O		
f. DIRECTOR CAHP	X ———	> O		

X = present position
O = desired position

a. Commissioner - California Highway Patrol

The current Commissioner, Maurice J. Hannigan, is a Highway Patrol member who has spent the entirety of his career with the Department. He was chosen in the mid 1980's to lead the organization by former Governor Deukmajian and reconfirmed by Governor Pete Wilson.

Commissioner Hannigan was selected for many good reasons, one of which was his vision in defining the future direction of the organization. He has made the reduction of the mileage death rate a primary target of his administration and has taken aggressive strategic steps in pursuing this goal. By virtue of his responsibility combined with the goals he has set for the Department, he is definitely situated in the "make change happen" position. Considering the

protracted high costs of implementing IVHS into patrol operations, the cause will require a relentless, credible champion such as the Commissioner. Due to the potential increases in the Department's budget over an extended period of time to get IVHS off the ground, a battle to secure funding will need to be waged. Struggles of this nature are fought more behind the scenes than they are in the eyes of the public. The Commissioner will need to marshal political support from the Director of Business, Transportation, and Housing Agency (BTHA) as well as the State Department of Finance and the legislature. The Commissioner's experience, clout, and political savvy in Sacramento should allow him reasonable success. To facilitate the best transition possible, he would be wise in voluntarily shifting his commitment level to the "help change happen" state. By doing this and developing a "line-management hierarchy" as the change management structure, the project would have a high probability of success.

b. Assistant Commissioner Staff – CHP

The Assistant Commissioner, Staff, has the responsibility of overseeing staff side sections of the Department which include training, budgeting, personnel, fleet operations, equipment procurement, etc. He is an obvious "let change happen" individual since he takes direction straight from the Commissioner. However, considering his key role in the Department, it would be a wise choice for the Commissioner to appoint him as the **Transition Manager** for IVHS development and shift him directly into the "make change happen" mode. With this additional "power", the Assistant Commissioner will be an effective change manager. He can act as a center for resources, support, and direction in leading the IVHS transition plan. He enjoys a good reputation, is politically in tune with current and future budget and resource details, and

has a firm understanding of all business angles, both departmental and political. By delegating the lead role to this individual, the Commissioner can take a more active but less visible role behind the scenes in defeating political obstacles to IVHS implementation. It will further allow him to devote more of his time to running the Department.

c. State Legislative Analyst

The individual who occupies this position works directly for the elected members of the state legislature. He/she studies all proposals for increased expenditures by state agencies and also audits existing resource allocations. Considering this person's job description, it must be assumed that they will be in a "block change" frame of mind unless a justified reason for increased expenditures is put forth. The legislative analyst's concurrence and positive recommendation to the Senate and Assembly is crucial in obtaining any new budget allocations, such as those which will be sought for IVHS.

To change this individual to the "let change happen" stance is the best that can be hoped for, and will require in-depth, detailed justification for why IVHS should be allowed. Although these individuals can be sold more by facts and figures, the Commissioner will need to work behind the scenes through key legislators known to strongly support CHP operations to ensure legislative support. Success in this venue will ultimately be based on raising the awareness level of the analyst while forcing a necessary degree of collaboration through his/her superiors in the legislature. By agreeing to support IVHS funding measures, the legislative analyst should be able to deliver a majority of the legislature in voting for future budget proposals.

d. Director – California Department of Transportation (CalTrans)

At the present time, CalTrans is the primary state agency committed to development and implementation of IVHS transportation systems. In conjunction with the federal government and private industry, it is in the current stages of building several IVHS "test bed" projects, statewide. The chief executive of this organization, therefore, is charged with the tasks of making IVHS happen. In this sense, he/she will find it in the best interests of CalTrans to assist the Highway Patrol in integrating into the system. From the CalTrans perspective, they would be categorized initially in the "let change happen" position. However, with very minimal persuasion by the Highway Patrol Commissioner, the Director should easily be convinced to take a more active role in making IVHS integration for the Highway Patrol happen. With CalTrans building a "SMART railroad" so to speak, it will be a significant help to their overall goals to help the CHP develop a fleet of cars to run on the IVHS "tracks". Besides delivering the entire weight of a critical and dynamic agency such as CalTrans, the Director will also be influential in providing technical support in the form of liaison with key electronics and automobile manufacturers. Ultimately, the CHP Commissioner must assure the Director of the benefits to both agencies. The Director will also be able to focus the political clout of his organization to help deliver the legislative votes necessary to facilitate change.

e. Secretary – Business, Transportation, & Housing Agency

This person is a cabinet level appointee chosen by the Governor, to manage some of the largest and most complex Departments in California. These include the Highway Patrol, CalTrans and Department of Motor Vehicles to name the most sizeable. Without this key person's commitment (which is ultimately the

Governors buy-off) no new major project funding can take place. The criticality of this person's role is underscored even more by the fact that he is at the top of the appropriations pyramid for both CHP and CalTrans. His position, similar to the legislative analyst with the legislature, would be to block any appropriation which would further strain the state's budget. To move the Secretary's commitment to the "let change happen" stage is paramount to the success of IVHS.

This will have to be approached from several angles by the Department heads of both CHP and CalTrans. The justification will need to be ironclad and identify specific benefits and financial returns to the state. It must also be made clear to this person in the most diplomatic of terms, that failure to support improvements within such a distressed transportation environment might be perceived by the public as a lack of concern by the Governor and his administration. The fact that CalTrans has presently been given a green light for experimental IVHS bodes well for the Highway Patrol being allowed future inclusion also.

f. Director - California Association of Highway Patrolmen (CAHP)

The director of the CAHP (patrolmen's union) will be at a "block change" commitment level for any component of IVHS which infringes on officer privacy or other perceived employee rights. One such aspect of IVHS technology which is being incorporated into current test projects is vehicle tracking devices. These devices allow dispatch centers and TOC's to electronically spot and track any vehicle which has the device. Most future IVHS vehicles will have this capability built into their on-board navigation and tracking computer.

To move the CAHP into the "let change happen" mode, a very detailed education and awareness raising program must be initiated with its Director and chief executives. Key players for the Department will include the Commissioner as well as his staff in the Office of Employee Relations. Beneficial aspects of the tracking issue such as increased officer security and safety must be sold as advantages to the Department as a whole. To sweeten the pot, the Department may also have to negotiate and provide future employee contractual concessions or reward systems as a further incentive. Without union support, the majority of the Department's workforce--the intended users of IVHS technology--will be opposed to it. With the needed backing of the union Director in delivering the support of the rank and file, a critical barrier in the transitional phase to IVHS will be overcome.

C. TRANSITION MANAGEMENT STRUCTURE

Transition management deals with getting people and organizations through the neutral zone of change; from the way things were to the future state of how we want things to be. To successfully navigate through the transitional phase, a separate management structure appropriate to the unique work at hand must be constructed and empowered to make change happen the way it was originally intended.

To accomplish this, the Commissioner would be well served if he chose a line-management hierarchy approach. This method assigns project management responsibility as an additional piece of work to an executive already within the upper command structure. This enriches this person's job while it ensures the successful transition to a new approach. In the instance of a technology transition such as IVHS which cuts across the entire organization, this method should provide the best opportunity for success. The project manager ideally

suited for the leader of the transition team would be the Assistant Commissioner, Staff. He has the clout to mobilize necessary resources, enjoys respect within, as well as outside of the Department, and has the proven ability to oversee and manage a project of this magnitude. This choice will also free the Commissioner to devote more needed attention to running the Department. Considering the broad scope and considerable amount of time and people necessary for a successful conclusion, an assistant project manager such as the Commander, Office of Research and Planning would be an important move. This individual oversees the majority of the Department's research projects as well as new equipment acquisition. The key to having these persons at the head of the transitional management structure is that they are organizationally situated to deal with fiscal, political and technical issues as well as those of a planning or administrative bent. They are in strategic positions to ensure successful change factors such as extensive study and testing prior to procurement, setting up good communications with all critical mass actors, and transmission of the clear visions and goals of IVHS technology to all within the organization. Great emphasis should also be placed on the potential rewards IVHS offers all officers. Necessary issues which also need to be addressed are the assessment of the Department's readiness in shifting to a new technology and helping it let go of comfortable but time consuming past practices. Capitalization on the opportunities to experiment and innovate with various IVHS technologies during this phase will also help departmental personnel commit to a new way of conducting business.

The project manager should chose the remainder of his team from disciplines which can effectively address fiscal, legal, and personnel issues as well as political and technological. Once the team is identified, a change meeting

should be held to formally chart responsibilities of the members to help guide their direction. This is a very useful tool in kicking off a transition plan and allows members to set goals, develop action steps, and ultimately define who does what and who is accountable for individual tasks. At least one member of the team should be identified as a person who is responsible for decisions or actions occurring. This is crucial to the success of the transition team and in this instance, should be the project manager. With the team fully assigned and deployed to their specific tasks, the transition should be a success. The end result of its planning and collaboration should ultimately lead the way to a productive future for CHP operations.

D. IMPLEMENTATION TECHNOLOGIES

The last phase in the process of transition management is to develop technologies and techniques to support it. Because the transition being contemplated involves many critical mass actors and key players outside of the Highway Patrol, the project manager must ensure that enough attention is focused in this direction. Resistance to change is a systemic barrier in most change situations. When a critical and sensitive factor such as cost is included in the equation, a considerable amount of resistance from politicians and taxpayer representatives can be predicted. Particular care must be placed in identifying people and barriers both internally and externally, who may oppose the intended change. Strategies and goals to overcome them must be developed as a countermeasure. Good networks of communication must be created and used to further facilitate passage through the neutral zone.

Technologies which will be used in the transition process are as follows:

Responsibility Charting –

As stated when discussing the development of a transition management structure, this process will graphically depict and define roles, responsibilities, and decision making authorities of the team. It will clarify expected behavior needed to create the necessary change and reduce ambiguity. Following is such a proposed chart for use by the CHP.

Table 6

Responsibility Chart

	Actors					
Decision/Action	#1	#2	#3	#4	#5	#6
Develop mission statement	A	R	I	I	A	S
Form transition management team	A	R	-	-	I	S
Prepare research paper - IVHS information report	A	R	I	I	I	I
Team building workshops	I	R	-	S	-	S
Prepare budget change proposal	A	R	A	-	A	-
Develop memos of understanding	R	S	I	A	A	-
Lobby plan (state legislature)	R	I	A	I	A	-
Progress reporting	A	R	I	I	I	I

Actors

1. Commissioner - CHP
2. Assistant Commissioner, Staff (implementation manager)
3. State Legislative Analyst
4. Director - Caltrans
5. Secretary - Business, Transportation, Housing
6. Director - CAHP

Legend

R = Responsibility (not necessarily authority
A = Approval (right to veto)
S = Support (commit resources toward)
I = Inform (to be consulted)
- = Irrelevant to this item

Goal Setting Meetings –

Also related previously, these types of meetings are chaired by the project manager and will define who is responsible for what, who is accountable to who, and what the role expectations of each transition team member will be. They are opportunities for the project manager to reinforce his vision of the IVHS issue and for team members to provide updates and feedback on progress.

Team Building Workshops –

These meetings should include project team members as well as selected representatives of key power groups. This will assist Department members in letting go of the old ways of doing things and accepting the new.

Role Modeling –

This measure involves using visible leader behavior to support the type and direction of change. It sets the tone and example for the Department to follow and should at least include the Commissioner and the two project managers. The use of appropriate symbols and language in this process will also be helpful in shaping the political dynamics of the transition.

Education/Training –

These techniques should be used by Department Division and station Commanders to motivate change and raise awareness levels of their personnel. Groups whose commitment is especially important such as the union represented officer establishment should be specifically targeted. Explaining the necessity for change and its resultant benefits will go a long way towards winning support. The education process will also help flagging morale in Department systems which are hurting because of change or phase out.

Conflict Management and Resolution –

This issue also needs to be a priority concern of the project team as well as managers throughout the organization. It will redirect and cope with negative energy such as anxiety and threats which can be counter productive to the IVHS transition. Any change will result in a certain amount of conflict or ambiguity. Taking a proactive approach to prepare for and correct negative forces will help considerably.

Neutral Zone Management –

The entire thrust of this transition management plan deals with preparing the Department for, and managing the "neutral zone". This zone is the gap of uncertainty and unrest created within an organization when it shifts one or more of its operating mechanisms from a pre-change state to a future desired state. The first step in managing it is to acknowledge its existence and using it as an opportunity for a constructive transition. Raising employee awareness of this natural slump in energy and direction will help them deal with it more positively. Continued support and encouragement to bridge this period will be a very important responsibility of all project members, managers, and supervisors.

Communication and Information Systems –

People within the organization must be kept apprised of changes and their necessity, to alleviate anxiety and resistance. The clear vision of the future state of IVHS must be communicated directly throughout the entire Department to help facilitate commitment of departmental employees to a new beginning. These mechanisms must be clearly constructed and used by project

members as well as chief executives to mute miscommunications through the grapevine. The best rumor control system is a well working, timely communication and information network.

Reward Systems –

Another technique in helping the change process is to ensure the internal reward system is alive and well. The recognition of heroes and champions of the transition effort will reinforce its positive aspects. Milestone recognition can also be woven into this process to further bolster the carrot over the stick approach to an orderly, effective transition. Coupling the celebration of pivotal or benchmark achievements towards IVHS acquisition with visible rewards for those responsible should have a very positive effect. These recognized events should help employees uncouple from the past and prepare and look forward to the future.

Treatment of Hurting Systems –

With every progressive step forward in an organization, there are certain losses in some segments of the operation. They either receive less management attention, less funding, or are targeted for eventual phase out. These systems and especially those people within them deserve special attention to reduce anxiety and ensure them of their rightful place in the new order or future state. The transition manager should ensure through awareness raising meetings that this concern is addressed. All Department managers should be prepared to deal with it at their particular level.

Forced Collaboration –

Although this is a tactic which should be used only in extreme instances, it has its necessary place in a transition management structure. It is a tool which can be used by the Commissioner, or more appropriately by the project manager or his staff to force compliance of necessary changes critical to transition change. This may be a necessary mechanism both internally as well as outside the Department.

Evaluation and Feedback –

Closely aligned, but distinctly different from communication and information systems, is a method for evaluation and feedback of transition progress. Within this system, the project manager (Assistant Commissioner, Staff) would be responsible for making regular, monthly reports on the status of implementation to the Commissioner of the CHP. To mitigate any anxieties that the intended transition to IVHS technology might incur, reports should also be made available to critical mass actors as well as rank and file members within the Department. Furthermore, this process will allow the project manager to deal with any unintended results of the transition, allowing necessary corrective actions to be taken in a timely manner.

Considerations –

The transition management plan depicted in this paper offers a transition framework to facilitate IVHS acquisition within the California Highway Patrol. It identifies potential key players who can make IVHS a reality and provides suggestions for those chosen as a project team to bridge the neutral zone of uncertainty and possible internal anxiety. As stated, the communication of a clear future state vision by the Commissioner plus active interdepartmental

communication and feedback systems will strengthen transition efforts. The plan takes a proactive approach towards the purchase and implementation of IVHS technology systems within the Department and will hopefully help the organization avoid the six most common pitfalls to successful transition:

1. **Clarity** – unclear directions and incentives.
2. **Commitment** – lack of motivation and inappropriate values. Lack of performance recognition or resources.
3. **Communication** – inadequate or total lack of information with faulty or no feedback loops.
4. **Control** – no adaptiveness to unexpected; moving too fast; mixed signals.
5. **Coalitions** – alienated groups; negative or unbalanced influence systems. No negotiation or conflict resolution mechanisms.
6. **Creativity** – stuck in the past; no incentive for innovation; creativity suppressed.

CHAPTER FIVE

CONCLUSIONS/RECOMMENDATIONS

CHAPTER FIVE

CONCLUSIONS/RECOMMENDATIONS

A. CONCLUSIONS

The scope of this study has been "What Impact Will IVHS Technology Have On Law Enforcement By the Year 2002?" For the sake of defining such a broad issue within all of law enforcement, the California Highway Patrol was chosen as a model agency or case-in-point because of its lead role and mission within the traffic management spectrum. This further allowed the researcher to develop specific strategic plans and transitional strategies to make an uncertain future more manageable for police administrators. The plans and strategies suggested in the previous chapters are adaptable to all law enforcement agencies with missions which include traffic law enforcement or traffic management responsibilities.

The impact of intelligent vehicles and intelligent highway systems becomes quite evident when the forecasted trends and events in Chapter 2 are considered. Using Event #3 as a prime example, it is expected that the federal government will enact legislation funding national transportation systems which include IVHS as an integral component. Research panel members contributing to this study believed that the probability of this occurring within the next 5 years was 75%, while it increased to an almost certain 90% in 10 years. The increasing probability can be seen as this study is being concluded with the beginnings of the Bill Clinton presidency. Plans are underway to revitalize America's highway infrastructure as this is written and transportation managers throughout the nation are posturing to take full advantage when it occurs. Law enforcement administrators, likewise, stand to reap significant positive benefits in the savings of lives, congestion,

officer safety, and departmental effectiveness. These expected benefits speak directly to the three sub-issue questions in the study which are, "what impact will IVHS have on officer roles, officer effectiveness, and officer safety." Similar events forecast by the panel which implied a positive impact on law enforcement were Event #1, the development of cost effective IVHS systems, and Event #2, enactment of federal standards to ensure consistency and compatibility of emerging technologies. If the forecasts are accurate, they have an above 50% chance within 5 years and a probable 80% chance within 10 years of occurrence. If these three events fall into place as forecast, IVHS will definitely take its position among the other technological cornerstones of our society.

To capitalize on this emerging technology, law enforcement would be well served to develop policies similar to those reflected in this study. As a recommended course of action for the California Highway Patrol, policies were formulated to take full advantage of forecasted trends and events having the highest probability of occurring and which implied the greatest benefits to the Department. Additionally, they have been crafted to minimize impacts of negative events such as possible law suits because of privacy issues or IVHS system failures. The policies chosen included joining in partnership with the California Department of Transportation to develop IVHS systems on state highways; enactment of a master plan for IVHS development; and engaging California Chiefs and California Sheriffs Associations in adopting IVHS acquisition plans for their respective departments.

The strategic planning phase of this research dealt specifically with how the Highway Patrol and possibly other departments could capitalize on the emerging

IVHS issue. To achieve its mission to reduce traffic related injuries and deaths, and to provide service to the public, several strategies were formulated which dealt with this issue. The commitment of the CHP to acquire and incorporate IVHS technology within its enforcement and patrol operations was the recommended strategy of a panel of experts associated with this research.

The positive implications of the above strategies were improved officer work environments, reduced traffic congestion and accidents, and enhanced public service capability. Equipped with a well structured strategic plan, other department managers will be capable of proactively managing the future, adapting it to meet their needs, or influencing it to mitigate undesirable outcomes.

In guiding their agencies to where they want them to be in the best possible future, law enforcement executives will need to consider ways and means of making the transition as smooth and uneventful as possible. Using sound management techniques to successfully bridge periods of uncertainty will most assuredly help in this endeavor. Resistance to change is an inherent human reaction which can derail even the best laid plans if not taken into account. To this end, the development of well structured transitional plans will ensure success. Being very forthright in explaining the rewards promised by IVHS to all those affected by it will also lend positive weight to its achievement.

B. RECOMMENDATIONS

Due to the tremendous scope and implied benefits of IVHS to law enforcement as well as many layers of society, this issue is worthy of future study. One

aspect which was not explored in-depth, but which will be a significant factor in future IVHS development will be strategies for funding. Because of its high up-front costs, police managers will need to take a hard look at shared investment methods, grants, and future federal entitlements to make IVHS a reality within their organizations. They will also need to become educated in all aspects of this technology as well as staying on top of its rapid evolution. In this particular situation, to delay will cost more money with reduced possibilities of implementation downline. Forward looking police managers will be competing for every last dollar of available money to enhance their patrol operations. Proactive managers will need to strategically plan to the best of their abilities to successfully manage the future of IVHS within law enforcement. As noted by former U. S. Department of Transportation Secretary Samuel Skinner, "Public/private partnerships will make Intelligent Vehicle Highway Systems a reality. Smart cars and smart highways offer genuine high-tech solutions to problems of mobility, congestion, air quality, and safety." To this end, it is the researchers profound opinion that IVHS will deliver future benefits to law enforcement and the citizens of this country, of a magnitude greater than present day motor vehicle, railroad, and air travel. It is up to the planners to make the most of this emerging technology in the interests of their respective departments.

Endnotes

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