WHAT IMPACT WILL SATELLITE TECHNOLOGY HAVE ON CALIFORNIA LAW ENFORCEMENT BY THE YEAR 2000?

by

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

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

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

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

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EXECUTIVE SUMMARY

Since the first launching of the satellite Sputnik 1 on October 4, 1957, and the many hundreds that have followed, the California Law Enforcement community has not reacted to benefit from their potential applications to police work.

There is evidence that law enforcement can begin to reap many of these benefits, economically, in the near future. Shuttle flights and rockets are launching whole series of satellites just in the past few months. They form networks that serve as eyes and ears, gathering data that could easily help solve crimes and reveal solutions to everyday police problems. Consequently, its becomes imperative to the entire population of California, that meaningful policy be developed toward police utilization of satellite technology.

In this project, a strategic plan is developed that includes futures scenarios, which are reflective of both hard and soft projections. The scenarios help reveal the possible future impact of trends, and potential events, as they were uncovered by a panel of knowledgeable professionals.

The strategic plan includes an exploring of the present world and situation. It identifies key stakeholders in developing the desireable and feasible policy alternatives. The policy selected, and its phased implementation, are explained.

The method chosen was to form a committee whose members are selected by the San Diego County Police Chiefs (including the County Sheriff), whose purpose is to research the benefits of contracting satellite technology services as a group, for regional applications. An example of such services, would be to contract with television networks utilizing communications satellites to provide direct broadcasting of training materials to police agencies.

The final portion of the paper is to help make the strategic plan work by implementing an organizational transition plan to ensure long-term viability in a changing environment.

The author envisions a natural blending of the technological genius of space scientists, private industry, local/state/federal government, and the local residents to implement a strategic plan resulting in a safer environment and quality of life.

B A C K G R O U N D

TELECOMMUNICATIONS PROSPECTS

Much of what has become commonplace and what is being projected for the near future in the world of satellite technology is already being utilized, or is scheduled for use soon, by business, education centers, or the military. However, law enforcement in the U.S. is not positioned in the mainstream of such technological advances. Only in a few areas has law enforcement begun to establish a foothold in this communication technology. Yet the use of satellites could dramatically change their ability to impact and curb crime.

Author William Burrows (1986) wrote in his book about space espionage and national security, titled Deep Black, forecasting the possibilities:

> U.S. space reconnaissance and surveillance in the twenty-first century and beyond will have a mission that is extraordinarily complex from a technical standpoint, but rather straightforward where their mandate is concerned. They will be responsible for seeing and hearing everything of importance to the national security everywhere on earth and in space, day and night, regardless of the weather...
>
> Drawing upon his own experience from the 1970s, William Colby has peered into the future and concluded that such "science fiction" capabilities as "constant visual surveillance of all areas of the globe despite weather, darkness, or camouflage" and "instant translation of electrical messages and oral transmission anywhere in the world" are "well within the possibility of development." Given the extreme sensitivity of the

> subject, the former director of Central Intelligence's prediction is suitably nonspecific, but it is nevertheless on the mark...
>
> American scientists and engineers are now in the process of designing various stages of a complex but highly responsive electronic shell that is to enclose and describe the sphere on which we live. The planet and the space surrounding it are becoming encapsulated by whole networks of orbital devices whose eyes, ears, and silicon brains gather information in endless streams and then route it to super computers for instantaneous processing and analysis--for a kind of portrait of what is happening on planet Earth painted electronically in real time.

For a few years, the FBI has been utilizing satellites for communications and, most recently, for teleconferencing nationwide training. Their network is called Law Enforcement Satellite Television Network (LETSN). California P.O.S.T. (Commission on Peace Officer Standards and Training) is currently reviewing a proposal to establish a satellite broadcast service for law enforcement in California. Although ambitious, these programs only scratch the surface of what satellite technology could be doing for law enforcement.

Consider, for instance, that the Russians have sold, via a broker, a satellite photo to the San Diego Union newspaper recently. The photo pinpoints the location of ships, aircraft, and even nuclear storage sites within San Diego County (Gibbons: A-6). According to the broker representative in New York, the Russians can make available photographs with a 5-meter resolution, easily allowing the recognition of a vehicle. What could law enforcement do with a photo with that extent of detail?

Until recently, the federal government's policy was to restrict non-military U.S. satellite imagery or resolution to 30 meters. This policy was changed to allow U.S. satellite and space business firms to compete with world commerce. Space scientists have stated that U.S. spy satellites have the ability to count the golf balls on a golf course (Logsdon: 85) or the pickets on a picket fence (Stewart: 72). How many homicide teams would appreciate having photos of the activity in a remote area where homicide victims are being dumped (for instance, the Green River killings, or a similar series in San Diego County with at least 40 suspected victims)? Or consider the value of photographs to investigators in the Pacific Beach area in San Diego where a seven-year-old girl disappeared one sunny afternoon as she walked 10 blocks from her parents home to Campland on Mission Bay. Unable to solve the case after several months, a San Diego Police Department task force had to disband in frustration. As a last resort they tried a psychic without any success. The F.B.I. were not able to come up with any good leads either (Petrillo: B-8). Are the leads to the solutions of crimes orbiting above us in some foreign or U.S. satellite, or possibly stored in some agency archive shrouded in the cloak of secrecy? Satellite communication systems can also help law enforcement not only to track criminal vehicles, but also to monitor a fleet of police cars and trucks within an area. To improve their performance, it seems logical and feasible for law enforcement agencies in this country to take

advantage of modern satellite technology

LANDSAT, or earth-observation satellites equipped with earth sensors that pick up different wavelengths of sunlight reflected from the earth's surface and/or detect heat radiated from it, have many law enforcement applications. They can even detect objects beneath the ground surface. Just recently, the U.S. Border Patrol has begun using a sophisticated helicopter capable of flying high enough not to be detected at night, but equipped with heat-sensing devices to detect humans on the ground. Camouflaged or buried decaying bodies can also be detected by heat sensing equipment. A private firm named EOSAT, in Maryland, utilizes LANDSAT satellites that can identify the skid marks on an airport runway (Stewart: 72). If a parked car has been recently moved, the former parking spot can be detected. What would these capabilities mean for locating missing persons or dead bodies in remote areas (allowing for preservation of evidence and limiting the amount of activity needed to be checked out between the time of death and discovery of the victim)? How about the detection of forest fires or an arsonist's location?

By highlighting the water content of foliage (through combining and comparing the narrow spectra of wavelengths), illegal crops and illegal diversion of water can be detected. Pollution of our waters can be easily observed (Stewart: 72), as well as earthquake faults, potentially dangerous heat-building volcanoes, or tidal waves, allowing for early

detection and warnings. The impact of pending disasters can be minimized through early identification and preparation allowing law enforcement the needed time.

Increasingly, law enforcement operations will benefit from multiple uses of navigation satellites. The March 7, 1986, issue of USA TODAY applauded the Geostar satellite:

> You're lost in the woods. Or on the high seas. Then you pull a card out of your wallet, aim it at the sky and learn in half a second--via satellite--exactly where you are.
>
> A trucker in Nebraska, with a full load of frozen fish, suddenly has refrigerator failure. He sends an urgent message through an orbiting satellite to headquarters in Omaha. His dispatcher sends help. None of this is science fiction. It's the realization of a dream; nationwide satellite-based location/message service called Geostar:

Emergency locator beams are already being successfully experimented by accident-prone race-car drivers racing across remote areas such as Africa (Logsdon: 103). Special weather satellites monitor emergency beams. Currently, a multi-national effort is underway to create a satellite system known as SARSAT to respond to global calls for help within one hour (Logsdon: 103).

A recent launch of a Navstar Global Positioning System (GPS) will tell the U.S. and allied forces their location to within a few feet anywhere on earth. The system has two channels, and one channel will be made available to the public--foreign, domestic, military or civilian--to use. The latter channel will have accuracy to within 300 feet while the military one, requiring encryption devices to decode, will have

accuracy to within 50 feet.

A hybrid system combining the Geostar and ground-based systems will be able to accurately track police vehicles, a rigged decoy, and/or suspect vehicles. Mobile communications satellites could add two-way voice communications. Recently, a firm located in Sorrento Valley area of San Diego , known as QUALCOMM, Inc., has sold 7,400 of its communication terminals to various trucking companies located countrywide. Its OmniTRAC system allows these firms to send and receive messages from its drivers using a satellite orbiting in the sky "roughly south of Texas." It costs the firms about $60 to $80 per month per truck. Transmission to delivery takes about one minute, with QUALCOMM guaranteeing delivery within five minutes. Initially, the truck drivers resisted the implementation of H. G. Orwell's 1984 "Big Brother ". Their resistance waned as they began to realize that they were making more money by eliminating frequent stops to telephone the dispatchers to update their status (Rose: E-2). Now the trucking firms know immediately when their trucks are empty, or about to be emptied, so they can schedule the next load. Could this system be applied to tracking drug smuggling vehicles or aircraft? Some experts say that it might be a technical problem because the receiver's antennae have to be fully exposed for accurate tracking.

NAVSTAR satellites will be able to fix a car's location, which can be displayed on a television screen against a

backdrop of maps showing freeways and streets. The screen can be mounted on the dashboard. One system allows a cursor, or mark, to remain in the center of the screen showing the car's position while the electronic map turns and adjusts so that the street ahead of the driver always points toward the top of the display. The map can show the destination and the shortest route to it. A touch of a button can change the scale of the map to seven different magnifications; from the largest, which shows a 41,000-mile Interstate Highway System, to the smallest, a street in your neighborhood (Logsdon: 129). Add artificial intelligence and expert systems with crime analysis data, and a police officer responding to a burglary call may be looking at possible suspects living nearby as their residences are flashed on the screen.The maps on the TV screen will be digital, allowing for constant update by computer as to optimum routes, crime analysis data, location of parolees/probationers, crime activity sites, etc. This will enable the handling of emergencies and allow for dispatching of the nearest available police units

NAVSTAR receivers are expected to be produced soon in the size of king-size cigarette packs, as opposed to their current typewriter-size (Logsdon: 117). Overcrowding of jails and prisons with non-violent or minimum-security prisoners may be alleviated with these receivers. Prisoners could be placed on home detention and their movements monitored by non-removable, strapped-on electronic devices.

Communication satellites eventually will make available, to as many as 250,000 subscribers per satellite, a practical pocket phone, at a per-call cost of 20 cents, allowing them to reach any point in the hemisphere. Safety will be its primary feature. It will provide the elderly, and those in need of emergency services, the capability to reach police or medical help, with the simple press of a single button. This should be welcomed by law-abiding citizens, but the criminals may indeed feel the "Big Brother" syndrome (because their illegal activities are so quickly detected). Police tactical operations certainly could operate more smoothly and safely with their availability.

The concept of a "Dick Tracy watch" will someday become reality. It will allow the wearer to beam a message to anywhere in the world or receive a short message such as "call home" and the phone number. Pager systems will be global.

Optical systems are increasingly perfected to allow real-time viewing of activity. Geosynchronous satellites (satellites that appear stationary because they orbit at 22,000 feet and cruise at the speed of the earth's rotation) allow a system to stare constantly at a fixed location. A recent shuttle launch had an experiment to see if the military could benefit from human observers in space. Troop movements and terrorist training activities can easily be observed through optical systems according to experts.

One day, optical systems will be applied toward

alleviating or detecting traffic flow problems and gridlock. Twenty-four-hour photographing of a region could provide photos of all surface street vehicle accidents and minimize investigation times, hopefully decreasing court-contested cases. They could offer clues to hit-and-run suspects or discourage drivers from fleeing the scene of an accident. Auto theft could be curbed, especially where large semi-van vehicles are taken (32% of vehicle thefts are trucks and buses in San Diego County). Combining satellite technology and the future development of electronic license plates should dramatically impact auto theft crime.

The aforementioned applications and projected developments of satellite technology are certainly only a small representation of their potential use to law enforcement. We will only be limited by our imaginations, economics, and the speed of technological innovation (for additional background information see Appendix).

HISTORICAL PERSPECTIVE

Our first surveillance from the skies came from aircraft and balloon-held cameras. In the thirties, the blimps became popular and had many advantages over aircraft. They can fly low and hover quietly. They don't need the long airstrip that other aircraft do and they can stay aloft for days, using very little fuel.

Blimps were used in World War I and World War II to surveil for German submarines that harassed British and

American convoys. Out of the approximately 250 American blimps built for this purpose none were ever lost to the enemy while escorting ships or patrolling the coasts (Farnham: 66). Blimps, or dirigibles, lost some of their appeal after some tragic accidents, having to do with the volatile gas utilized in them.

The next reconnaissance, or surveillance, skytool made its debut in 1956, the U-2 American spy plane. This midnight-black plane with its graceful, long, tapering wings flew at an altitude of 15 miles over Russia, recording activity far below with its cameras, unseen or heard by those below. Next came the "manta-shaped" SR-71s, popularly known as Blackbirds, which can fly at four times the speed of sound--faster than the proverbial speeding bullet--and photograph up to one hundred thousand square miles an hour from altitudes well above one hundred thousand feet" (Burrows: 19).

The launching of Sputnik I in 1957 introduced the first of what was to become very capable and diverse surveillance technology. In May 1988, the U.S. Department of Commerce report, **Space Commerce: An Industry Assessment** indicated the limitlesss capabilities. By the year 2000, the space communications business is expected to rise to $77 billion (Goldman: 58).

What are the drawbacks for law enforcement? Simply stated, satellites cost money, lots of money. Can law enforcement afford satellite technology? Recent satellites sent into orbit cost from $65 million to $500 million. The federal government

is only willing to spend about $4 billion on the current drug war (Kennedy: 17), which could limit funding of programs. Ditches and fences are far cheaper to construct to deter drug smuggling along the border, although satellites may create less resentment by foreign governments.

Rapid advancement of technology can make current satellites obsolete. Also, the average life span of a satellite in orbit is about five years, unless repaired via a shuttle mission. Finally, there is a risk that the launch may fail and then become too expensive to try again.

There is the issue of which agency, or agencies, will pay for a law enforcement satellite and provide leadership in its operation and applications. Which regions would be able to benefit from its use? Will the American Civil Liberties Union (ACLU) raise a 4th-amendment issue about right to privacy? What would the maintenance or operation cost? Who will have the power to set the priorities as to its uses?

Aircraft with unique capabilities can sometimes perform similar functions as satellites. The U-2 and SR-71 surveillance aircraft offer some of the advantages of satellite surveillance and sensing devices, but without scynchronous capabilities, it would be a hit-and-miss operation.

Helicopters equipped with sophisticated technology are easily spotted and limited in scope as to airtime and distance covered. Platform-borne aircraft equipped with radar, and sufficient in number to be rotated to cover a 24-hour period,

would exceed the costs of most satellites and be less effective (Kennedy: 1,17). Drug war blimps, costing 18 million dollars each, are equipped with radar and tethered to the ground by long cables. They use radar, allowing them to see into Mexico for 150 miles, and are expected to be effective in spotting low-flying aircraft illegally entering the U.S.

Another type of dirigible, called an airship, is being built at the cost of $170 million under a Department of Defense contract. The craft, named YEZ-2A, will be 425 feet long and equipped with the latest proven satellite technology. It will serve as a sentry and surveillance/reconnaissance craft for the U.S. Navy, the Coast Guard, the Air Force and civilian police agencies. This largest-ever airship will be nearly invisible to radar since it is made of non-metal substances. It will have a crew of 15 and can hover at 10,000 feet.The crew would not need oxygen masks at that altitude The airship can remain aloft indefinitely because it can be refueled in the air. Such an airship might serve as an economic alternative to satellites and meet law enforcement needs in many areas.

PURPOSE OF STUDY

This study will focus on the utilization of satellite technology in law enforcement. It will examine where we have been in the past, where we are now, and where we are most likely to be in the next ten years when it comes to such technological advances. Will law enforcement be able to afford the cost of satellite technology by the year 2000? Will

international politics hamper or restrict the use of the technology? How would the technology be managed or shared in more than one jurisdiction? These issues will be projected into the future, and a strategic plan will be developed to prepare San Diego County law enforcement agencies accordingly.

Another product of this study will be a transition plan for implementation of policy whereby satellite technology can be utilized in a county region, such as San Diego County.

There are four parts to this study. The first objective involves the application of futures methodology relative to the use of satellite communication technology within California law enforcement agencies. This encompasses a study and factoring of the principal issue and side issues, utilizing modern futures research methodologies. As a result, three possible scenarios have been developed.

The second objective was to develop a strategic plan and management of that process for implementating satellite technology within the state's law enforcement agencies.

The third objective was to develop a transition management plan that guides the regional agencies through the change. Finally, conclusions and recommendations are offered.

O B J E C T I V E O N E

STATEMENT

The issue is stated as, **"What impact will satellite technology have on California Law Enforcement by the year 2000?"**

In order to better focus and frame the scope of the study, the main issue will be analyzed in light of past, present, and future-emerging issues, and related subissues.

An emerging issue is defined as " A future situation which will be influenced by forces external to the organization and whose outcomes will significantly impact the organization" (P.O.S.T.). Research and prediction methods help participants to identify and examine emerging trends and issues, and generate alternative future scenarios for a model society within a region, as well as a model law enforcement structure, based on available data.

The following criteria was used for the identification of the subissues: 1. Relevance or importance to the main issue; 2. Of personal interest; 3. Sufficiently inter-related to each other; and 4. Probability to the study.

The past, present, and future subissues were identified

through interviews, review of literature, scanning, and personal analysis (see Appendix).

METHODS: IDENTIFICATION

The following methodologies were utilized to gather information and measure its relevance to the main issue:

1. Scanning, which was a process of researching books, periodicals, news media articles, government publications, informative newsletters from space-related organizations and associations, journals. It is important while scanning to look for information that is not only relevant to the main issue, but can have real potential impact on the future of that issue.

2. Personal interviews, which involved communicating with those persons who have knowledge and expertise in the subject under study. The interviews were by telephone and they were guided by a standard format.

3. Personal reflection, whereby personal experience was utilized in the scanning process to consider what applications exist now and in the future for law enforcement.

4. Modified conventional delphi, was a group process where there was no face-to-face meeting, but set up to get experts to help trim the number of candidate trends and events for study; this covered the first of two rounds. During the second round, they further clarified them (trends and events) and weighed the impact or interactions the events had on other events and trends. A final set of five trends and events resulted from the first round. In the second round the group was required to make forecasts regarding past, nominal (desired and obtainable) future and normative future. The second round included a cross-impact analysis.

5. Future scenarios were developed after the modified conventional delphi exercises. All data gathered was reviewed, and three scenarios reflective of both hard and soft projections were developed. The scenarios provided a way of making forecasts happen in full view of their causes. They provided the framework within which it was possible to systematically and rigorously ask the vital questions, especially "what if" questions.

METHODS: IMPLEMENTATION

Scanning. The scanning process began several months back (11/88) as pertinent articles were collected from various newspapers and magazine articles. Further scanning research took place in the San Diego City Library, the San Diego State University Library, the University of California at San Diego (UCSD) General Library and its science and engineering library. Space-related clubs and organizations were contacted by phone and requested to send informative literature on satellite technology. The P.O.S.T. librarian was contacted and she forwarded names of articles and books as suggested scanning materials.

Based on the scanning results, subissues began to emerge that were pertinent to the future of the main issue. Contact with my research advisor, Dr. Harris, led to several suggestions of other sources which were pursued. This process developed future-related subissues that were related to the main issue. The subissues were chosen based on their interrelationships with past and emerging subissues (described earlier). Significant trends, potentially important to the key issue, were discovered during this process.

A "futures wheel" (Chart I) was used to further flush out the sub-issues and trends. It is a graphic representation, and it gives some sense of the dynamics over time and a way to look at particular levels of inquiry. Not only did this

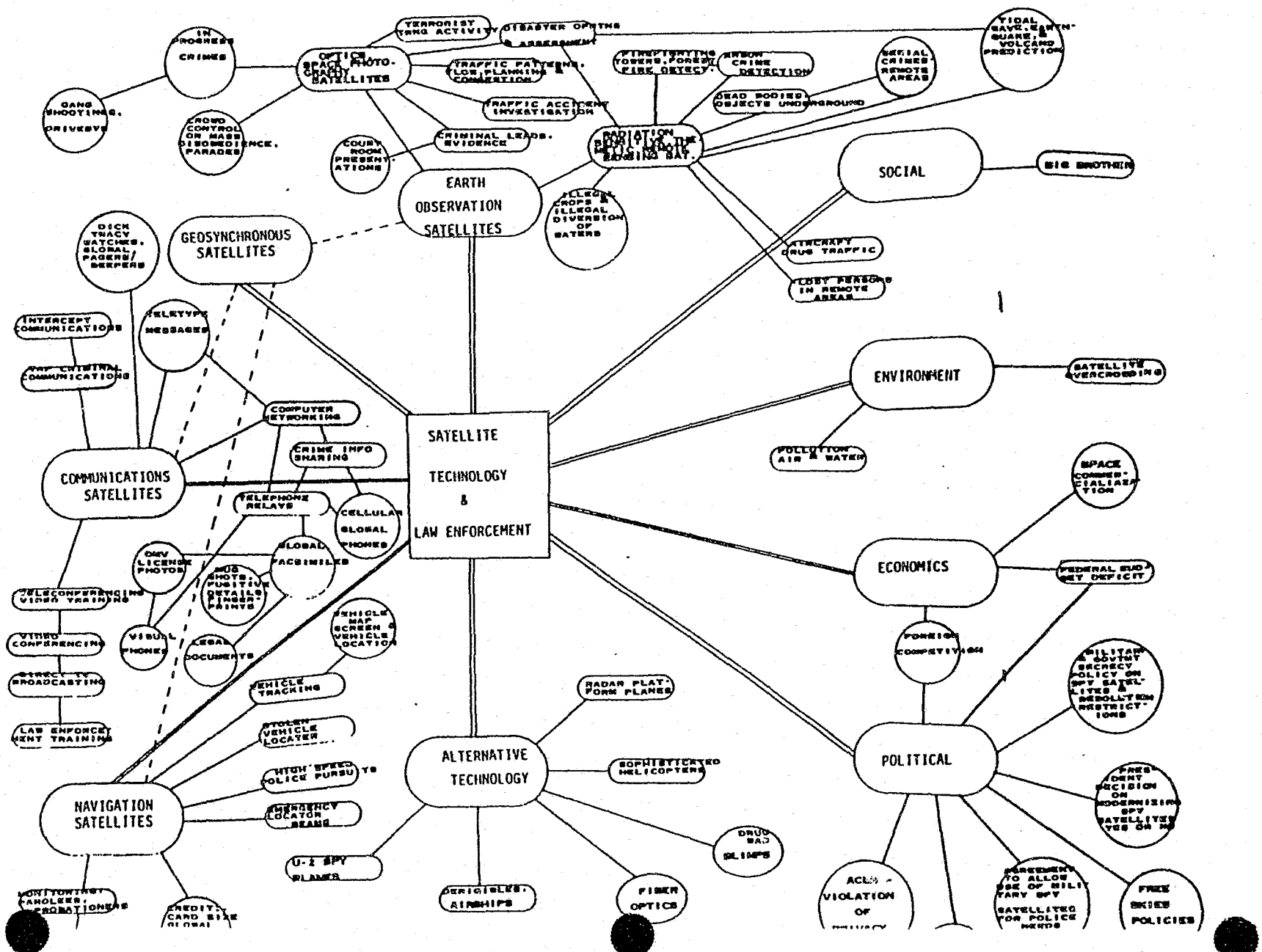
technique help further define the issue, it produced 64 subissues to be considered in future policy development efforts relating to space communications technology and law enforcement. In creating the "futures wheel", STEEP-related headings were utilized to connect the trends to the environment and to strengthen the trend definitions (Social, Technological, Economical, Environmental, and Polictical = STEEP).

Personal Interviews were conducted with 20 space scientists and knowledgeable authorities throughout the country, primarily by telephone due to their various locations. Scientists at NASA, the Jet Propulsion Lab, Hughes Aircraft Company, EOSAT, Airship Industries, Inc., Carnegie Endowment for International Peace, Spot Image Corporation, and others, were contacted. Several space-business executives were interviewed and two congressional representatives were consulted.

The interviews were conducted with a set of standard questions designed to elicit information relating to future trends and events that may impact the main issure. A common response was that almost all had never thought of satellite technology's application to law enforcement needs. The interviews were very informative and laid the groundwork for the modified delphi process.

Personal Analysis. Analysis by the investigator was used to incorporate personal experience from 15 years in law

"FUTURES WHEEL"



(CHART I)

enforcement into the scanning process. It was applied to what exists now and in the future for law enforcement relative to satellite technology.

Modified Conventional Delphi. A panel was utilized to review the distilled list of trends (32) and events (13). This method was chosen because of the logistics of trying to get experts and knowledgeable persons in this field at one location. Twenty-one panel members were originally selected and all were "faxed" a package of materials that described the process, listing background on the issue, candidate trends and events, evaluation forms, and instructions. Five of the original 21 selected members eventually responded and participated. An additional six panel members were added from the San Diego area who had expertise in electronics, satellite communications, aircraft, and/or law enforcement. The final group of eleven represented a broad spectrum of experience and expertise to insure a broad and resourceful panel. The responses were tabulated and reviewed by the investigator for any possible gross misunderstandings.

A tally of the panel's selection was distilled into these five most important trends:

T-1 Computer networking between law enforcement/criminal justice agencies world-wide for purposes of sharing crime information.

T-2 Teleconferencing/video conferencing and direct TV broadcast to provide training for law enforcement personnel.

T-3 Detection and prediction of potential disasters such as earthquakes, volcanic eruptions, forest fires and tidal waves.

T-4 Global transmission through telephone relays of mug shots, fingerprints, legal documents used to process personnel.

T-5 Assist in disaster operations and assessment.

The five most important **events** selected:

E-1 California Supreme Court or U.S. Supreme Court rules satellite technology utilized by the police is unconstitutional

E-2 Budget deficit declared too high to allow for any additional funding of the Nation's space programs

E-3 ACLU attacks use of satellite technology as a violation of the -4th amendment rights protecting invasion of privacy

E-4 Federal government's secrecy policy restricts civilian satellite technology use

E-5 Decision made by Federal government not to modernize the Nation's satellite systems (particularly military spy satellites)

Next the panel evaluated the key trend candidates on a trend evaluation form by forecasting the level of each of the trends five years ago, today, and ten years into the future. By doing so they projected the direction and velocity of the trends.

The group was told that "will be" was the idea of no intervening events to affect the continuing trend during the next ten years. "Should be" was to be considered desireable intervening events over the next ten years. Chart II represents the "mean" result of the entire panel in regards to

(CHART II)

TREND EVALUATION FORM

Subgroup: _____

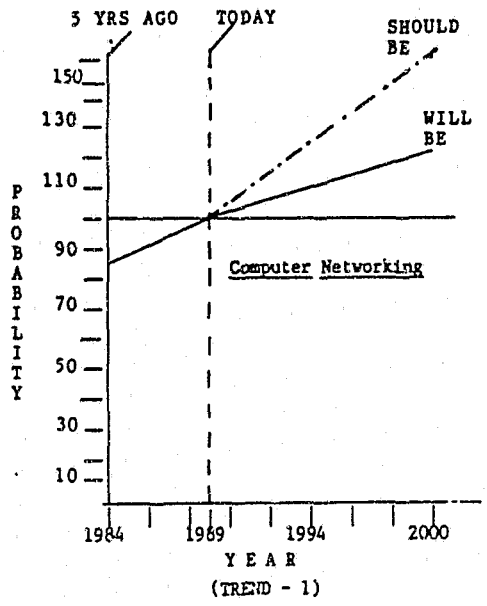
TREND STATEMENT		LEVEL OF THE TREND (Ratio: Today = 100)			
		5 Years Ago	Today	"Will be" in 10 Years	"Should be" in 10 Years
COMPUTER NETWORKING BETWEEN LAW ENFORCEMENT/ CRIMINAL JUSTICE AGENCIES WORLD-WIDE FOR THE PURPOSES OF SHARING CRIME INFORMATION		85	**100**	120	160
TELECONFERENCING/VIDEO CONFERENCING AND DIRECT TV BROADCAST TO PROVIDE TRAINING FOR LAW ENFORCEMENT PERSONNEL		50	**100**	150	150
DETECTION AND PREDICTION OF POTENTIAL DISASTERS SUCH AS EARTHQUAKES, VOLCANIC ERUPTIONS, FOREST FIRES AND TIDAL WAVES		70	**100**	150	170
GLOBAL TRANSMISSION THROUGH TELEPHONE RELAYS OF MUG SHOTS, FINGERPRINTS, LEGAL DOCUMENTS FOR PROCESSING		50	**100**	160	160
ASSIST IN DISASTER OPERATIONS AND ASSESSMENT		85	**100**	140	160

Form 4.2

the five most important trends.

The group, for instance, in Trend-I (computer networking) projected for five years ago that the trend was about 85% of what it is today, and that in ten years it will be 20% more. They believed it should be 60% more (see chart III).

(CHART III)



Noteworthy is that one strong competitor for communications satellites will be the optic fiber industry which is stringing out optic fiber systems around the world.

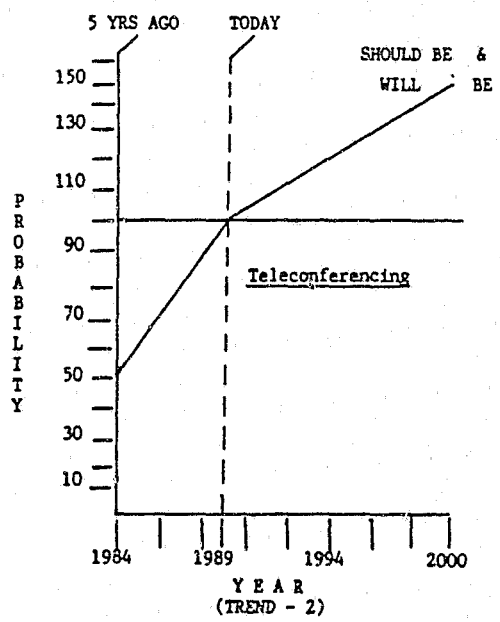
There is an exemplary effort being made in the San Diego County region to network and share criminal justice information, primarily through a system called A.R.J.I.S. (Automated Regional Justice System). This system allows local criminal justice agencies to share and input into the same data-base. In addition, through the same terminals at each jurisdiction's location, state and national computers are accessible. The F.B.I. is now utilizing satellite systems to transmit criminal records.

As the world's economy become more interdependent and global communication needs become paramount, so will the need for law enforcement to share criminal information to combat global criminals who ignore borders (including terrorists). The

number of incidents of criminal activity occurring across borders, especially between the U.S. and Mexico, have increased dramatically in the past decade. Congressional reprsentatives from Southern California rate the border problem as the number one key issue. They are desperately looking for solutions and international cooperation in an effort to control the situation(Ragan: B-1, B-8). Worldwide computer networking and sharing information regarding known international criminals and criminal activity is an important trend.

The panel recognized that "teleconferencing" and direct TV broadcasting has been underutilized in the past and is an area where law enforcement could benefit by utilizing this technology for training. They estimated that the trend was only 50% of today's level and that it should be 50% more by the year 2000. Also, they projected that it would be at that level by then (see CHART IV).

(CHART IV)



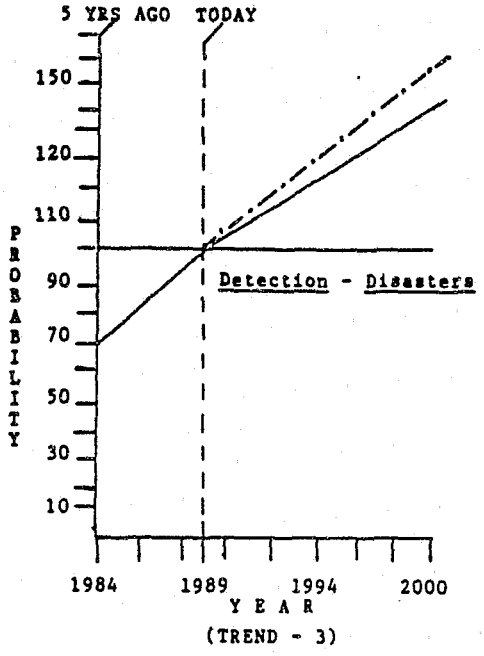
P.O.S.T. has conducted a broadcasting experiment via satellite and received positive responses from law enforcement agencies. They are in the process of making a proposal to conduct a pilot program using satellite technology to distribute instructional materials/training. Local law enforcement agencies need only make a modest invest-

ment in receiving equipment to benefit from the broadcasts. Due to the confidentiality of some of the training information, local agencies will have to eventually obtain a dedicated line with an encrypted system, a system yet to be devised.

A special consultant and television supervisor with the California Highway Patrol was hired by P.O.S.T. to research and identify the best methods and type of technology to make video training tapes available to law enforcement. He recommended distribution of video training tapes through satellite broadcasting, emphasizing that satellite broadcasts cost approximately 10% of what distribution of hard copies cost.

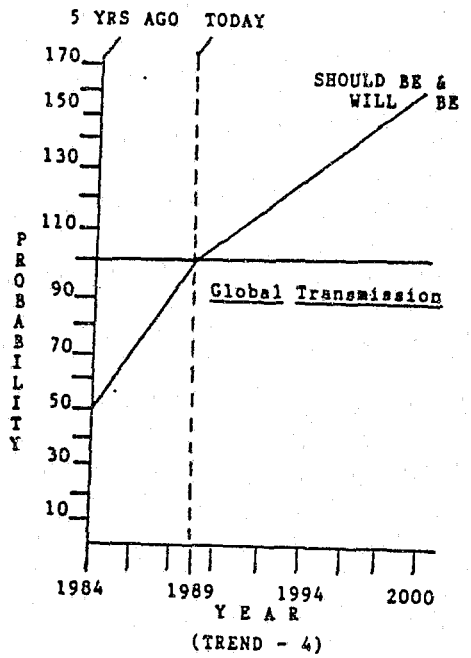
The panel rated "disasters" as the third most important trend where satellite technology will be utilized to aid law enforcement. LANDSAT or earth resources satellites are utilized to detect and identify life-threat-

(CHART V)



(TREND - 3)

(CHART VI)



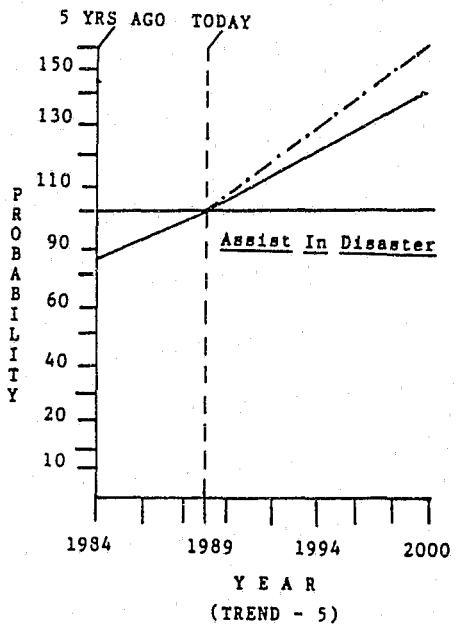
(TREND - 4)

ening or crop-endangered conditions. The panel recognizes improvement from where we stood five years ago (70% of today) and believe we will improve 50% over the next ten years, but wish that it would be 70% more (Chart V).

Electronic sensors are far superior to human eyesight. LANDSAT satellites can help scientists to learn to identify earthquake faults, predict snowmelt, spot icebergs, predict water and food shortages, predict probable migration routes of locust swarms, and other pending disasters described in the trend statement.

The panel chose "global transmissions through telephone relays" from communication satellites as the fourth-highest trend. Possibly the panel may have been influenced by the facsimile rage. No doubt quality "faxing" of mug shots, fingerprints, and driver license photo, good enough to stand up in court, is imminent. Global faxing can speed up law enforcement's efficiency and tremendously aid fugitive apprehension efforts, as well as eliminate innocent persons as suspects. International criminal suspects and terrorists will find it much more difficult to travel incognito. The panel felt that the trend had

(CHART VII)



doubled in the last five years with a "will be" and "should be" trend increase of 60% predicted (chart VI).

The final trend has to do with assisting in "disaster operations and assessment." The panel did not believe much progress has been made in the last five years, showing only an increase of 15%, expecting it to be 40% more within ten years. They would like to see it 60% higher in ten years.

The U.S., Europe, and Japan are planning a joint effort over the next 15 years to place into orbit earth-viewing platform spacecraft to study the complex processes in the environment. This 15 to 30 billion-dollar program will study and analyze factors in the environment that are negatively affecting agriculture, energy, and the quality of life on Earth. They will study the greenhouse effect, the depletion of the ozone, deforestation in tropical zones such as the Amazon, and desertification (Covault: 18-19). Japan is planning to build and launch several satellites to monitor and warn of pending disasters that frequently affect them. As the nations around the world increase their knowledge of earth's environment and the number of earth-viewing sensors, they undoubtedly will be able to assist in assessment of major disasters and rescue/recovery operations.

The panel was next given an **event** evaluation questionaire to rate the interval probabilities (the first year that the event exceeds zero) and the cumulative probabilities (that the event will occur by 1995, the year 2000). The panel was

instructed to use a scale of zero to one hundred. They next projected the net impact on the main issue area, then on law enforcement (utilizing a scale of ±10). They were directed to rely on their own individual background and experience to project the perceived impact of each event on the issue and law enforcement.

For instance, the group projected the probability of E-1 (courts ruling police use of satellite technology as unconstitutional) first exceeding "0" to be 1994 (mean average). They projected a cumulative probability of 53% by 1995 and 74% by the year 2000. Further, it was projected to have a significantly different impact on the issue and law enforcement (+4. +10). If the courts ruled use of satellite technology unconstitutional, the ruling would most probably be narrow in scope and only apply to areas where there was suspected unreasonable invasion of privacy.

E-2 (budget deficit too high to allow for any additional funding of the nation's space program) was rated to first exceed zero by the year 1990. Of course, as the news media informs us almost daily, the budget is a primary concern for all politicians (Ragan: B-1, B-8). Drastic cuts are being debated and proposed daily, although which government programs will be impacted is yet to be decided. The panel felt that there was only a 50% chance of this happening by 1995, but an increasing probability of 72% by the year 2000. The panel varied from minus 5 to plus ten on the events net impact on the

issue. A similar variation occurred regarding the net impact on law enforcement, with the average being close to plus three.

It is reasonable to say that there are enough satellites orbiting earth right now to assist adequately the needs of law enforcement, although their technology may not be made available to law enforcement agencies. Also, other countries that do not have the deficit problem, such as Japan or the European nations, could provide the research technology.

E-3 (ACLU attacks use of satellite technology as a violation of the 4th-amendment right protecting against invasion of privacy) was judged to first appear in 1995, with a low probability of 45% and a much higher probability of 63% by the year 2000. The net impact on the issue was rated a plus 2, and on law enforcement, a plus 4.

ACLU frequently polices law enforcement tactics, and with the residual impact of H. G. Well's 1984 still lingering, this could become a highly emotional issue. Space and satellite technology is expected by many experts to become international because it is so expensive for any one nation. There seems to be little likelihood that the ACLU will be able to curtail many of the benefits that law enforcement will reap from space technology. There has long been a "open skies" policy accepted by the nations of the world, although this was not considered the case when Gary Powers was shot down over Russia in his sophisticated U-2 spy plane. The "open skies" policy came about around 1963, when both the United States and Russia had become

too dependent on satellite technology, considering their benefits to outweigh the risks (Burrows: 141-151).

E-4 (federal government's secrecy policy restricts civilian satellite technology use) was projected to first exceed zero in 1990. Many view the government's continued effort to keep secret its military satellite capabilities and purposes as ludicrous and damaging to potential benefits from this technology (Covault: 18-19). The panel saw the probability as less than 30 percent and the average was fifty-two by the year 1995, with a fifteen-percent increase (to 67%) by the year 2000. Its net impact on the issue area was rated plus three, with plus two on the impact on law enforcement.

E-5 (decision made by federal government not to modernize the nation's satellite systems, particularly spy satellites) was expected to exceed zero by 1991. The probability of this event happening by 1995 was 35%, and 55% by the year 2000. Its net impact on the issue area was rated a plus 6 and a plus 8 on its impact on law enforcement.

Although recent news articles reveal that President Bush might not support President Reagan's promise last year to go ahead with the modernization, Senate resistance to such an idea should prevent any change in policy. The Senate made improving satellites a condition for its approving the treaty eliminating medium-range missiles.

Cross-Impact Analysis. This technique was utilized to minimize serious errors in forecasting by taking into account

the dynamic interrelationships among the trends and events being projected. For instance, the question is asked, "What if

CROSS-IMPACT EVALUATION FORM

PROBABILITY IN %		EVENTS					TRENDS		
		E 1	E 2	E 3	E 4	E 5	T 1	T 2	T 3
E 1	74	X	NONE	TO 25%	NONE	NONE	DEC 10%	NONE	NONE
E 2	72	NONE	X	NONE	NONE	TO 90%	DEC 5%	NONE	DEC 25%
E 3	63	TO 85%	NONE	X	NONE	NONE	NONE	NONE	NONE
E 4	67	NONE	NONE	DEC 10%	X	NONE	DEC 8%	DEC 10%	NONE
E 5	55	NONE	TO 55%	NONE	NONE	X	DEC 10%	DEC 10%	DEC 20%

IF THIS EVENT OCCURRED — THESE WOULD BE THE RESULTANT IMPACTS BY THE YEAR 2000

INC=INCREASE DEC=DECREASE

REACTOR	1	1	2	0	1	4	2	2

	%
Event 1 - Courts rule satellite technology unscontitutional.	74
Event 2 - Budget deficit declared too high.....	72
Event 3 - ACLU attacks satellite technology.....	63
Event 4 - Federal government's secrecy policy.....	67
Event 5 - Federal government won't modernize satellites.....	55

Trend 1 - Computer networking between law enforcement....
Trend 2 - Teleconferencing between law enforcement....
Trend 3 - Detection/prediction of disasters....

(CHART VIII)

E-1 (Courts ruling police use of satellite technology

unconstitutional) occurred? How would it affect the probability of occurrence in each of the other four events and impact the top three trends. Some events have an interrelationship and are affected. Others will be unaffected and are considered "uncoupled." The lesson learned here is that events should not be considered in isolation, and important trends that significantly impact the issue may be affected by future events.

In completing the matrix on chart VIII, the panel was asked "If Event One actually occurred, what would the new probability of Event Two be at the moment of greatest impact? The second column represents the group's consensus as to the probability of the event occurring by the year 2000.

The events are listed both vertically and horizontally on the chart. The three most significant trends are listed horizontally along the top. Events cannot impact themselves, so those boxes are lined out. For the event-to-trend sections on the chart, the panel was asked (FAXed materials): "If E1 happened, how great a change, if any, would it have on the trend "one" projection at the point of greatest impact? The above two questions are applied to complete the process for each cross-impact section (event-to-event and event-to-trend).

For example, the group consensus projected that if E-1 (courts ruling police use of satellite technology unconstitutional) occurred, it would decrease the probability of E-3 (ACLU attacks satellite technology as a violation of the

4th amendment) occurring to 25%, versus its former projection (63%). Again, if E-1 occurs, it would change T-1 (computer networking) by a minus 10 percent. What is being measured here for the event and the trend are the direct impacts only, not the indirect.

Reviewing the cross-impact matrix, we can highlight some of the more important relationships. For example, the event of a budget deficit (E-2) causing the government to stop funding space programs would significantly impact the probability (and increase it by 18%) of event 5 (federal government refusing to modernize satellites). On the other hand, if E-5 occurred, it would decrease the chances of E-2 occurring from 72% to 55 percent. Looking at E-1 again, if the courts declared police use of satellite technology unconstitutional, then the probability of (E-3), or the ACLU attacking satellite technology as a violation of the constitution, would diminish to 55% (versus 74%). E-5 would impact all three trends by decreasing them, because of lack of modernization. The occurrence of E-2 would decrease two of the three trends significantly, but not T2 (probably because communications satellites are so abundant).

One last bit of information that can be distilled from the cross-impact matrix is the determination of the "actor" and the "reactor" events. The actor events are determined by counting each hit (increase or decrease -- none or no effects are not counted) in each row of the matrix. The more hits there are,

the more important the event is as a cause of change in the issue being explored.

The actor events should become the primary targets for policy action. The reactor events are next determined by counting the number of hits for each column. The trends and events with the highest totals are called reactors. On the matrix it can be seen that E-5 is a major actor event with a score of four hits. E-4 (federal government's secrecy policy...) is the only event that is not impacted by other events.

Future Scenarios. Based on the data developed up to now, three scenarios will be presented. The first scenario will be "nominal," in which the writer seeks to discover and describe the future evolution (outcome) of current forces in motion. It is an exploratory mode, a playout of current forces and existing policies, permitting only those new events, trends, or policies that would not be surprising. It is "surprise free."

The second scenario will be "normative," which is the "desired and attainable." The writer takes a moral or ethical stand on the outcome, which is considered good and has some probability of being achieved. It seeks to demonstrate that future outcomes can be linked back to the present. It will reflect the panel's view of the desired or "should be" trend levels. Policy alternatives will be developed to bring about the desired future by the year 2000. A variation is "feared, but possible," and assumes that the outcome is both

undesirable and possible (not forecasted here).

The third scenario will be "hypothethical", in which the writer consciously manipulates elements of the data base in an impartial fashion to create a "what if" outcome. It will consider the panel's views on how events will impact other events and trends.

"NOMINAL" - SCENARIO # 1

Detective Wieldy walked from the department's teleconferencing room appearing out-of-sorts. He had been working homicide at the National City Police Department for over 12 years (since 1988) and had displayed a tenacious determination to get the leads to solve his cases. He was especially challenged by the cases of the victims slain by strangers. Detective Wieldy stopped and stared pensively at his feet, and his partner knew that look. He was, for the moment, stumped. Detectives Handy and Wieldy had hoped discussing the case with Scotland Yard's best could have developed some leads. The hour, costing $2,000, was considered a worthwhile gamble. After all, the homicide training that Wieldy considered most valuable had been the Scotland Yard broadcasts, via satellite from London.

Detective Handy had always sat on his ultimate solution to solving this case. He knew how patriotic Wieldy was to his country, always the loudest voice in the stands when it came to singing the Star-Spangled Banner. Handy's favorite hobby was keeping up on the latest technology, particularly satellite technology. He had approached his ex-Marine partner once before on a less challenging case, and Wieldy wouldn't consider the idea.

Times had changed over the last decade; the economy was

behind Russia, France, and Japan when the President decided not to modernize its U.S. satellites, which greatly angered the Senate.

Since then, the Senate has resisted efforts by the President to put in place his programs to solve the deficit problem. Even more baffling was the U.S. secrecy policy around military spy satellites. Although the experts on space in the U.S. and other foreign countries could accurately assess their capabilities, the restrictive policy kept this technology unavailable for other than military use.

Handy decided to lay the groundwork before approaching Wieldy with the idea. He called the New York broker that had supplied Russian satellite photos since the late '80s. Handy had seen Russian photos of the San Diego area, which was a home port for Navy ships and nuclear submarines. Handy posed the question to the broker, "could the Russians supply photos of San Diego with sufficient resolution to recognize a face or identify the numbers on a license plate?." "No problem," quickly replied the broker. "OK, how about a certain day six months ago, between 0700 hours to 0900 hours near an intersection in National City which is in San Diego County?" The broker hesitated; he would have to check, what was it needed for? "To solve a homicide where a young woman was apparently kidnapped in her own vehicle which was abandoned near the intersection. She was found slain inside the car. If we had photos covering that time period, the killer would be in

them". Handy added, "She was real popular and a mother of two small children; everyone is real upset about it; it could bring a lot of positive publicity to the Russians (and embarass the U.S.," he privately thought). Handy faxed the broker the necessary details.

Six days later,the broker called and said "I think I got what you want;if it works out, the Russians will want to make the news release as a demonstration of goodwill." Handy walked into Wieldy's office, "Ah, Wieldy, now hear me out before you say anything...".

"NORMATIVE" - SCENARIO # 2

Officer Nabem drove past Sweetwater High on his way to grab a quick sandwich at Carl's Jr. He didn't like to leave his marked patrol vehicle when they were only three other units in the field. The school reminded him that his oldest daughter would be graduating this year, the first class of the year 2000.

Police work has really changed in National City and San Diego County since those first years in the mid-'80s. "Heck, he thought to himself, "I thought the 911 line was the greatest technology ever. Now everyone, it seems, carries a pocket phone and can get police service at the push of a button, if they really need it. Just beams a signal right up to those satellites and they tell us within spitting distance where they are standing."

" It use to be fun yapping on the radio, digging the other guys on the air occasionally. Now everything is printed out on the mobile unit, even has a screen showing me where I am on the map display, and where I'm supposed to go. Of course, the station knows where I am too; that eliminates the old hideouts. I guess I don't really mind though," Nadem mused to himself, "it used to be pretty hairy when your cover unit couldn't find you. It wasn't easy to wrestle with your prisoner and try to tell your cover where you were by holding the portable radio in the not-so-free hand."

"Well, at least those satellites don't lose you, and those radio dead-spots don't exist anymore. I just knew those pocket phones and emergency global-beepers were going to have us running everywhere. Heck, it's kind of fun now; the crooks can't get away as easily, since there are no delays in reporting their activity. Beepers, oh yeah, that deputy sheriff said that he hasn't been out with a search-and-rescue party in months. Nobody can get lost anymore."

It's amazing, my patrol unit is just like a mobile office. I fax my reports to the station, or to the other law enforcement agencies, if they need a follow-up report from me. If a guy tells me he's got a driver's license, and I'm not sure who he is, I just have the department of motor vehicles fax his drivers' license photo to my patrol unit. If the guy doesn't have any identification, or a California driver's license, I plug the fingerprint scanner into the lighter. Through a telephone relay system up to that geostationary satellite, I can try for a match-up with California ID (fingerprint identification system); even get his mug shot and rap sheet from San Diego County records or the State if I'm real suspicious.

What I really like is not having to do all those accident reports; going to court all the time just because the lawyers wanted a share of a big settlement from the insurance companies. It's not so easy anymore with that 500-foot-long airship floating up there, with all that satellite technology

equipment. At 10,000 feet or less, they can photograph and record all the traffic accidents. And those causing the accident had better not try and get away, because there's no where to hide."

"I kind of miss those high-speed chases, not the accidents though. Now we just let "H.A.W.C." (acronym for the airship, Help America Watch Crime) do all the work, and tell us where to go pick up the fugitive. They can photograph his car, and, I've heard, even the freckles on his hand. It sure cuts down on the investigative workload. It has unclogged the court calendars. It's hard to argue with a photograph or a video of how your accident actually happened.

That was the best thing the law enforcement agencies in San Diego County ever did, go contract with the Department of Defense. After all, we all share many law enforcement problems. We have the border problem with all the illegal immigration and smuggling of narcotics, the coastal patrol needs, detecting of illegal entry by small aircraft, spotting of forest fires and arsonists, disaster assessments and coordinating rescue and recovery operations, early detection and development of alternative solutions to traffic flow problems, a sentry-type line of defense for the naval operations in San Diego harbor, and development of investigative leads where crime is occurring in the open or rural areas."

"Shoot, even our morning squad line-ups are fun now. We

get the very best training, broadcasted via satellite, right to our line-up room. They say it's ten times cheaper than buying all those videos. California P.O.S.T. really got the jump on that one. It just cost us the price of a satellite dish, a decoder, and the rental of a dedicated line. Now we have the latest training technology, world-wide, and can even have a teleconference with law enforcement experts anywhere on the globe. What will they think of next?"

"It was smart for us to have pooled our resources-- the military, the state, federal, and local agencies. San Diego County has been unique due to its proximity to the border, the ocean, the military bases, the military and commercial airports, and the large port facilities and its vunerability to international criminal activities. Resources had to be combined amonge the various agencies. Along with coordinated group effort, we all shared common threats to our safety and quality of life. These included land-, air- and water-pollution problems, illegal diversion of water resources, traffic flow problems and gridlock, air traffic, and the potential for natural disasters such as wildfires and earthquakes."

"HYPOTHETICAL" - SCENARIO # 3

This was Deputy Marshall's third year working CATCH (acronym for Criminal Apprehension and Technology Communications Hookup). The system came on board in San Diego County in 1997 and has been a godsend as a solution to the jail overcrowding problems. Now, non-violent and non-recidivist type criminals are released on home detention programs as long as they remain in the state. Deputy Marshall's computer keeps tab on all those home detainees that are sentenced to San Diego County.

Several key steps made the program possible. The president's decision to go ahead with funding of the space programs and solve the deficit program through gas, cigarette, and liquor taxes; the president's decision to lift the secrecy code restrictions on the use of GPS (Global Positioning Systems) satellites (formerly resticted degree of accuracy to military use); the launching of sixteen more GPS satellites by 1995 to augment the 8 that were already up there, thus giving 24-hour coverage of the globe and California; the enhancement of technology allowing detainees' positions to be plotted on a television screen with "street maps shown in quarter square mile detail" (Stravo: Part II, page 3); and an affordable ankle-strap receiver for about $1,000 per unit.

Marshall thought the hold system was a "neat idea" (to borrow from Colonel North), especially for use not only on

probationers and parolees, but on those unprosecuted suspects opting for the district attorney's "diversion program."

Marshall was still upset at the ACLU winning a California Supreme Court decision restricting law enforcement's use of communications satellites to intercept Colombia drug czars' communications, via satellite telephonic relays, without prior court approval. Marshall wondered why the ACLU didn't jump on this diversion-program use of monitoring home detainees not yet convicted of the crime they were alledged to have committed. What a savings it has meant to the courts and prosecutors, and it gives a first-time offender a chance to reform his ways, before he gets a conviction record.

Marshall looked at the fingerprint/photo profile program on international terrorists. The globe had indeed shrunk; this program was just like the career criminal apprehension programs from a decade ago. Now international, law-enforcement-oriented intelligence groups have identified all suspected terrorists. They provide quality photos and available fingerprints to all potential victim-nations that do not support acts of terrorism. Terrorists no longer move easily around the world incognito, not with all the sophisticated screening thresholds they must cross.

Marshall's watch was beeping; he looked down at it to read the short message. It was the daily, Geneva-based, disaster-watch preparedness update, beamed down from the Landsat satellites. The message told him briefy to turn on the

TV monitor. As a member of the San Diego County disaster-watch team, he especially appreciated this program as the data provided was tailored to California and San Diego County. The Rose Canyon fault was showing signs of activity, and possibly a pending disastrous earthquake, projected to pass through the heart of a densely populated San Diego County metropolis. Marshall remembered how this satellite information had helped minimize heavy coastal damage because of accurate predictions and warnings of high winter tides resulting from hurricane-level storms occurring in the South Pacific. He marveled at having the access to global broadcasts, global training for law enforcement, knowledgeable experts at any location in the world. The computer-aided, telephonic translator facilitated candid conversations with foreign experts who did not speak English.

Marshall remembered that he wanted to get off early to watch the Maytime Band Review in National City. It was the annual statewide high school band competition, featuring the best in the California. It was a lot more fun watching it as a spectator than directing traffic at a busy intersection, like he used to be required to do. National City doesn't need as many reserve and regular officers now. The satellites overhead monitor the parade routes and traffic flow problems. People are more strategically placed, and planning/tactical operations are more accurate and effective. Yes, satellite technology is making Marshall's world a better place to work.

P A R T T W O: S T R A T E G I C P L A N

THE SITUATION

In the first part of this paper, we examined the future. It is now time to examine the present and the conditions existing today, which make it more possible to develop signposts for policies to achieve the desired future.

During the first part, we identified key trends and events that would impact the future relationship between law enforcement and satellite technology. The trends and events were projected out and resulted in three different scenarios. Subissues and forces anticipated to impact the main issue were revealed during this process. These relationships of the subissues and anticipated occurrences must be considered in the development of any desired policies. After all, strategy "suggests that actions taken today be designed to enable us to face the future on our own terms, not on those imposed from the outside" (Denhardt: 174).

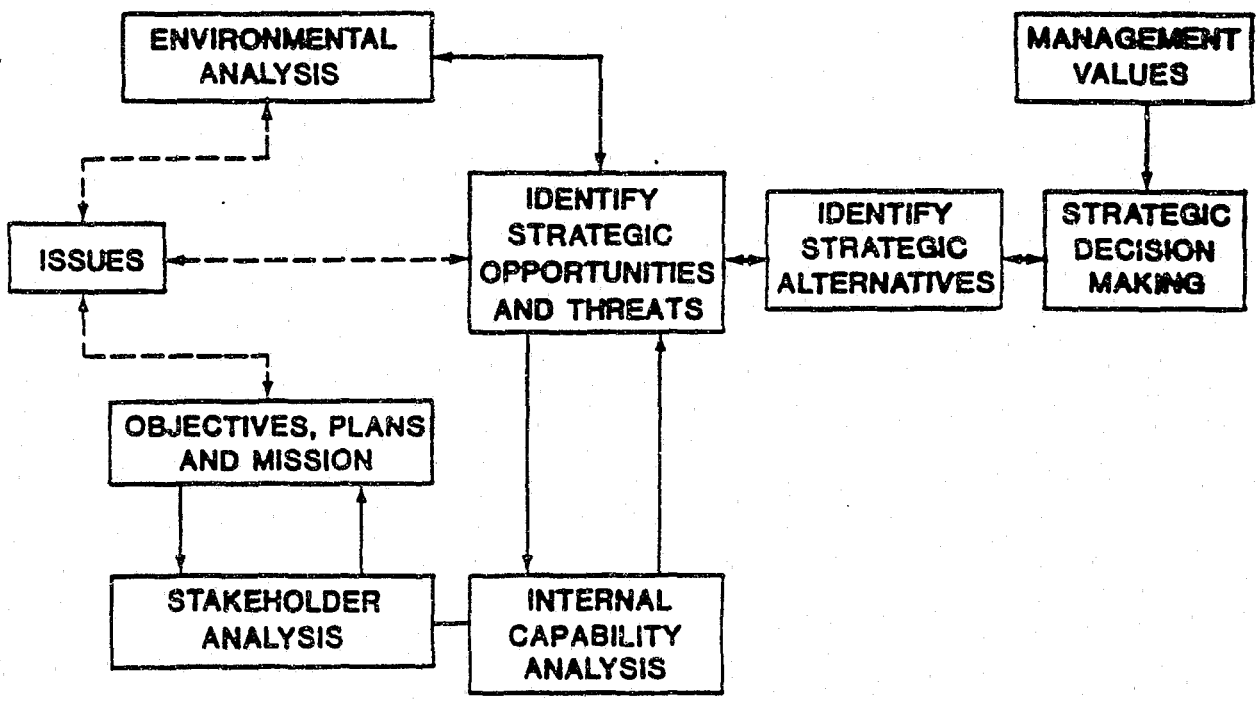
The intention of Part Two is the development of a strategy plan to achieve the desired vision of the future described in Scenario Number Two ("Normative"). It is designed to develop a San Diego County-wide blueprint for enhancement of law enforcement efforts through realistic utilization of satellite

technology.

Table IX shows the model that will be utilized to develop the strategic plan. The SMEAC model will be utilized to structure the plan (SMEAC is an acronym for Situation, Mission, Environment , Administration, and Control).

(CHART IX)

THE STRATEGIC MANAGEMENT PROCESS



1. SMEAC

A. Situation: This section includes the components of environment, resource, and stakeholder analysis. An analysis must be made of the environment within the San Diego law enforcement communities to determine critically needed services. Resource analysis will identify individuals within each governmental agencey who will be important in the implementation of the plan. Stakeholder demands will be analyzed to determine which individuals or groups will, or may have an impact on the proposed plan.

B. Mission: The mission statement is critical in stating what the organization(s) wants to do.

C. Execution: This involves deloping alternative strategies or courses of action, and a recommended course of action. In order to successfully implement multi-jurisdictional agreements, alternative strategies should be presented.

D. Administration and logistics: In developing the strategic plan for the establishment of a regional organization, the resources available and the administration and logistics necessary to implement it must be determined.

E. Control-planning system: Responsibility and accountbility will have to be determined.

2. Strategic assumption and surfacing technique (SAST): It is important to identify the key stakeholders and analyze the assumptions about each one as well as their importance. A low-probability, high-risk stakeholder (snaildarter) will be identified. Once the key stakeholders and snaildarter have been analyzed, their imvolvement will be plotted using the SAST technique. The succeess or failure of a plan is contingent upon identifying and analyzing the potential impact of these key individuals/groups.

3. Negotiation strategies: All data and information accumulated will be utilized to develop negotiation strategies.

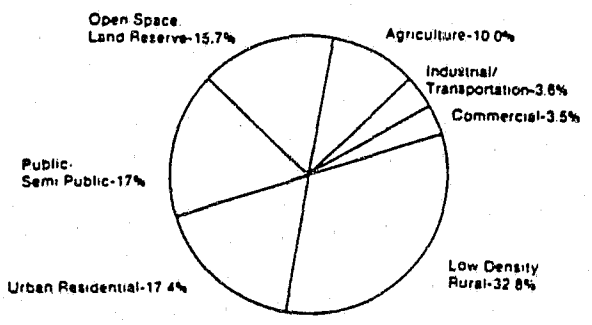
4. Conflict management: Conflict management techniques will be considered during the negotiation strategies.

The Environment: San Diego County's environment is very diverse. It has a population of 2,327,697 residents by 1988 estimates, an increase of over one-half million in less than ten years. Nine cities have their own police department with the San Diego Police being the largest, responsible for protecting almost twice as many residents as the other cities combined. The San Diego County Sheriff provides police service to the remaining unincorporated areas of 668,824 residents. The population of San Diego is expected to reach 3.1 million by the year 2010.

The region is composed of 18 incorporated cities and the unincorporated area. It has 1,231,908 acres which are utilized as shown by chart 10 and table 1 below:

(Chart X)

GROSS ACRES BY LAND DESIGNATION



(Table I)

ACRES BY LAND USE DESIGNATION
TOTAL CORDON AREA

Land Use Designation	Gross Acres	Percent of Total	Vacant Acres	Percent of Total	Percent of Gross Acres
Low Density Single Family	403,685	32.8%	298,926	69.7%	74.0%
Single Family	176,361	14.3%	62,946	14.7%	35.7%
Multiple Family	37,018	3.0%	7,491	1.7%	20.2%
Mobile Homes	411	0.0%	117	0.0%	28.5%
Mixed Use	3,511	0.3%	1,173	0.3%	33.4%
Commercial & Office	24,491	2.0%	5,978	1.4%	24.4%
Hotels/Motels & Tourist Commercial	1,070	0.1%	223	0.1%	20.8%
Schools	9,536	0.8%	1,628	0.4%	17.1%
Government	476	0.0%	58	0.0%	12.2%
Hospitals & Health Services	144	0.0%	2	0.0%	1.4%
Other Services	4,156	0.3%	977	0.2%	23.5%
Industrial	35,731	2.9%	18,012	4.2%	50.4%
Transportation, Public Utilities	8,936	0.7%	236	0.1%	2.6%
Open Space, Parks, Recreation	190,707	15.5%	0	0.0%	0.0%
Land Reserve	3,082	0.3%	3,082	0.7%	100.0%
Agriculture	123,103	10.0%	27,858	6.5%	22.6%
Public/Semi Public	209,490	17.0%	2	0.0%	0.0%
TOTAL	1,231,908	100.0%	428,709	100.0%	34.8%

(Source: SANDAG)

Recent studies by the San Diego Association of Governments (SANDAG) revealed that the San Diego region's freeway system is not keeping up with the large growth rate, both in population and cars. Freeway congestion during peak hours is becoming a serious concern. The use of freeways has increased by 50% in the last seven years, along with a 40% increase in employment. Surface street usage has increased by thirty percent during that time, while new freeway construction remains at less than a four percent increase. Alternative solutions are being looked at to avoid another Los Angeles freeway/street congestion nightmare.

Chart XI on page number 49 summarizes the crime trends and highlights for the San Diego region for 1988. The rate of serious crimes such as homicide, rape, robbery, aggravated assault, burglary, larceny, and motor vehicle theft increased 5%, from 69.3 crimes per 1,000 to 73.0 during the first 9 months of 1988, according to SANDAG.

Homicides were up 35%, and auto thefts jumped by 29% during the same time period. The ten law enforcement agencies reported 171,680 crimes in 1988, with about 10% being violent crimes.

The U.S. Navy has several large facilities here which include most of San Diego harbor which provides docking space for all sizes of ships (including a nuclear submarine base and facilities for aircraft carriers and their support ships), two

large air bases, the marine and naval training bases, and the Coast Guard air and sea base. San Diego County is bordered on the north by the Camp Pendleton Marine base.

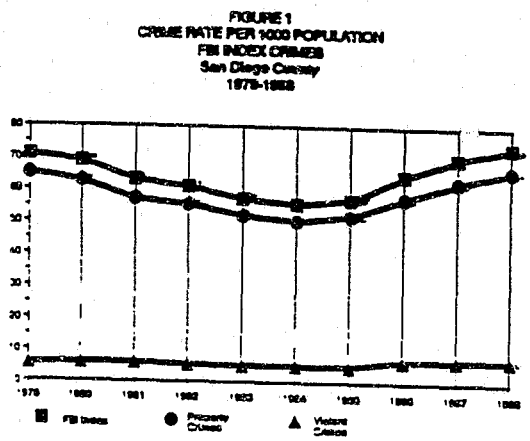
To the south is the U.S.-Mexico border, which processes more cross-border travelers/commuters than anywhere else in the U.S. A large U.S. force of federal agents, including INS, U.S. Customs, and the Border Patrol, staff the border region. The border area represents the number one regional problem to the local U.S. Congressional representatives (Ragan: B-1,B-8).

There are a little over 3,000 sworn personnel in the county to provide protection and service to the region. This tabulates to about 1.36 officers per 1,000 people. The twelve local detention centers have a rated total capacity of 2,339 beds, while the actual count of inmates averages 3,814, or 1,475 beds short (SANDAG).

The San Diego region is unique in that the law enforcement agencies work closely together. They share the same data base, and regional criminal justice information is made available to all agencies through ARJIS (Automated Regional Justice Information System). There are regional uniform report forms utilized by all the police agencies. Several grants have formed county task forces, staffed by police personnel from regional agencies to address crime problems impacting the San Diego region.

The San Diego area is projected to soon replace Southern Florida as the major gateway for drugs to enter the U.S. On top

(Chart XI)



Highlights

Reported crime in San Diego County continued to increase in 1988. Criminal justice leaders attributed the rising trend to drug use and sales, gang-related crime, and crowded conditions in the jails that preclude jail booking of most arrestees. For example, of 130,848 arrests made by the San Diego Police Department in 1988, only 12% of the arrestees were booked into jail. This situation results in a significant number of persons who fail to appear for court hearings and are rearrested.

- In 1988, 73.8 offenses were reported for every 1,000 residents in the County; the highest crime rate since 1979.
- The 5% rise in the crime rate from 1987 to 1988 is associated with an increase in property crimes, particularly motor vehicle thefts (up 30%).
- One out of 42 registered vehicles was reported stolen in 1988; an average of 105 per day, regionwide.
- The number of reported homicides reached 220, a 31% rise over the previous year.
- About one out of five major crimes was cleared or solved by police in 1988.
- Property valued at over $290 million was stolen in 1988 with the greatest proportion being motor vehicles (65%).
- Based on a sample of inmates in 1988, eight out of ten arrestees booked into jail tested positive for drug use at the time of arrest.
- The average daily population in local detention facilities rose to 4,168 in FY1987-88, an increase of 130% over ten years ago (FY1978-79).
- Felony cases submitted to the prosecutor increased by 8% over 1987.
- Juvenile referrals increased slightly from 1987 to 1988 (1%).
- Budgeted criminal justice expenditures reached $443 million in FY1988-89, up 8% from the prior year.

1979 - 1988

San Diego County's crime rate increased to 73.8 offenses per 1,000 residents in 1988. This represents the highest crime rate in the past ten years. The overall crime rate increased 4% from 1979 to 1988 (70.7 to 73.8 per 1,000). The rate of violent crimes (homicide, forcible rape, robbery, aggravated assault) was up 28% over the past ten years (5.7 to 7.3 per 1,000). Crimes involving property (burglary, larceny theft, motor vehicle theft) showed a rate increase of 2% (66.0 to 66.5).

1987 - 1988

- The crime rate rose 5%, from 70.1 to 73.8 offenses per 1,000 residents.
- The property crime rate increased 6% (62.9 to 66.5).
- Violent crimes were up slightly from 7.2 to 7.3 offenses per 1,000 (1%).

1988

Of the 171,680 crimes reported in San Diego County in 1988:

- Violent crimes accounted for 10% (16,993)
- Property crimes accounted for 90% (154,687).

Source: SANDAG

of that, it has its own local drug production problem, and has gained the reputation as the "methamphetamine" capital of the world. Local police agencies supply personnel to augment the staff at the state agency known as NTF (Narcotics Task Force). They work closely with the federal branch known as the DEA (Drug Enforcement Agency). Together they pool their resources to combat the insidious illegal drug business.

Local governments cooperate closely in planning for regional problems. For instance, SANDAG was created by local governments. It is a voluntary public agency that assures overall areawide planning and coordination for the San Diego region. It even involves the Mexican border communities.

The scope of this paper is to develop a plan that will address the San Diego County law enforcement agencies' strategy for implementing and benefiting from satellite technology over the next ten years.

Organization Capability and Resources: The overall strengths and weaknesses of the regional law enforcement agencies need to be assess in terms of environmental threats and opportunities. How the San Diego law enforcement communities capitalize on the opportunities and defuse the threats will highlight their capabilities. Two capability rating analysis forms were utilized. A group of 11 persons made of various law enforcement positions and ranks were surveyed by phone to complete the ratings. They each answered the

questions and the results were tabulated.

The group was asked to rate the San Diego law enforcement communities in areas of "Present Capabilities" and "Adaptability to Change". The following overall areas of strengths and weaknesses were identified:

Present Capabilities

Strengths	Weaknesses
Police officer skills	Manpower
Supervisory skills	Calls for service
Image	Training
Enforcement Index	Technology
Council Support	Supplies
City/County Management Support	Pay scale
Benefits	Traffic Index
Community support	Money
Turnover	Sworn/civilian
Sick leave rates	Equipment
Morale	
Management Flexibility	
Specialties	
Growth potential	

The overall view of regional law enforcement weaknesses primarily indicates a concern with manpower shortages, low pay comparable to other metropolis areas within the state, the low-level of support personnel, and lack of equipment to accomplish the job. The group views police departments as considerably behind private firms in the area of technology.

On the whole, law enforcement is strong in the area of personnel skills, management, and government support, and view many of the money shortage problems as due to the low tax-base brought on by proposition 13 (voted in several years back).

The police are proud of their image and feel that the community supports them.

On the second rating sheet addressing "adaptability to change," the group rated the departments as flexible and viewed them as innovative in addressing new crime issues (such as gangs, rock-cocaine dealers, etc.). The overall organization climate was rated as flexible. It was noted that turnover was lower in the higher ranks than in the lower ranks. This would indicate that management control is stonger. Yet, there is support for "democratic leadership style" within management, which encourages creativity and participation from the lower ranks.

Stakeholder Analysis: A list of stakeholders was compiled. A stakeholder is simply any individual or group within or outside the organization (in this case, the San Diego law enforcement communities) who has a stake in the policy. In other words, who does it make mad or glad, and how mad or glad? The list contains those individuals or groups who will have the greatest impact on the issue over the next ten years. A list of eighteen was compiled, and then narrowed down to the 12 key ones, which as follows are:

Chiefs of Police/County Sheriff
City Council Members/County Board of Supervisors
California Peace Officer Standards & Training (P.O.S.T.)
Judicial System
American Civil Liberties Union
Department of Defense
Federal Law Enforcement Agencies
District Attorney
Sworn Law Enforcement Personnel
Federal/State Politicians
News Media
Public Citizens

Next, each stakeholder was listed along with the assumption(s) as to what they believed regarding the use of satellite technology by San Diego area law enforcement agencies. The assumptions are as follows:

1. Chiefs of Police/County Sheriff
   a. Strongly support the use of satellite technology and its applications to law enforcement
   b. Would enthusiatically support sharing and coordinating with federal law enforcement agencies both with personnel and funding if available
2. City Council Members/County Board of Supervisors
   a. Very concerned about program costs versus benefits
   b. Would support the idea if substantial funding is available from state and federal governments
3. P.O.S.T.
   a. Would enthusiastically support idea as they are now attempting to sponsor training via communications satellites
   b. Would be willing to provide experts in the field to promote the idea
4. Judicial System
   a. Would enthusiastically support some potential aspects of satellite technology (GPS satellites for home detainees)
   b. Would be suspicious of how law enforcement intended to use it in surveillance
5. A.C.L.U.
   a. Would strongly opposed its use as a drastic step by government to intrude on citizen's rights
   b. Would be "Big Brother" alarmists
6. Department of Defense
   a. Would view it as an excellent opportunity to further strengthen the nation's defense systems
   b. Would offer to provide significant funding for another airship equipped with the latest satellite

another airship equipped with the latest satellite technology similar to the experimental one being constructed now in South Carolina

7. Federal Law Enforcement Agencies
   a. Would enthusiastically support it
   b. Would be concerned about coordination with local law enforcement agencies and the setting of priorities
8. District Attorney
   a. Would be concerned about constitutional amendment violations
   b. Would like several of the possibilities, particularly in the area of photographic evidence
9. Sworn Law Enforcement Personnel
   a. Would strongly support
   b. Would be concerned about increase in calls for service
10. Federal/State Politicians
   a. Would strongly support, particularly for addressing the border issues and crime problems such as auto theft
   b. Would be concerned with the cost tradeoffs and thier impact on the federal deficit
11. News Media
   a. Would support the concept
   b. Would play up the "big brother" aspect
   c. Would keep the issues pro and con in front of the public for sometime, should have supportive editorials
12. Public Citizens
   a. Will be ambivalent at first because of the "big brother" concept
   b. Will support finally because of the safety issue

The stakeholder that will probably be the "snaildarter"(low probability, high-risk stakeholder) would be the A.C.L.U. This is because they can paralyze police tactics and operations in court maneuvers. There will be many issues for the courts to decide. Satellite technology is expensive, and there would be some reluctance to spend the money if the use of the technology could be limited.

Mission Statements: There are two mission statements. The first will be at the "macro level," stating the overall mission

of the San Diego law enforcement communities. The second will be at the "micro level," addressing the regional enforcement mission as it relates to the issue.

1. The mission of the San Diego law enforcement communities is to :
---provide a safe and secure environment for the citizens within the San Diego area
---insuring the preservation and protection of life and property
---to deliver law enforcement services that are tailored and structured to meet the unique needs of the county-wide area
---accomplish the mission in a timely fashion for all citizens
---enhance the quality of community life

2. The mission of the San Diego law enforcement communities in regard to utilization of satellite technology for law enforcement application is to :
---coordinate with all law enforcement agencies to maximize effectiveness and efficiency for combating high-priority criminal activity
---commit sufficient effective personnel and other resources to enable maximum response from the available technology
---to be unbiased and impartial when responding to the needs of the citizens

Alternative Strategies (Execution): Alternative strategies were developed for consideration of different approaches to the satellite technology issue. Nine individuals, both inside and outside of law enforcement, were requested to write a 1/2- to one-page statement suggesting a strategy to deal with the issue. They were provided background material to aid their comprehension of the issue. Eight alternative strategies emerged after the completion of the assignment. The eight strategies designed to impact the satellite technology issue over the next ten years are:

1. The departments shall provide training and education regarding the operations and potential applications of satellite technology.

2. The departments shall request legal opinions from the State Attorney General's office regarding legal and illegal uses of satellite technology.

3. The departments shall intensify recruitment efforts to target scientists knowledgeable in space science to augment the technical services divisions.

4. The departments shall establish an advisory board staffed with satellite technology experts for guidance.
5. A local law enforcement council shall be formed to provide guidance as to getting agreement on which agencies do what.

6. A public relations spokesman will be recruited to serve as one voice for the law enforcement agencies.

7. The law enforcement chiefs shall recommend and staff a committee to research benefits of contracting satellite services as a group for regional applications.

8. The departments shall develop a speakers' bureau to provide community education on satellite technology's applications to law enforcement needs.

After the list of alternative strategies was compiled, the group was asked to determine those which were most valuable They were given a rating sheet so a modified policy delphi could be conducted. After the group results were tabulated, the two highest-ranking strategies and the most polarized (most variable opinion) were identified. The group recommended the following two:

1. A local law enforcement council shall be formed to provide guidance as to getting agreement on which agencies do what.

2. The law enforcement chiefs shall recommend and staff a

committee to research benefits of contracting satellite technology services as a group, for regional applications.

The following strategy was identified as the most polarized:

3. The department whall request legal opinions from the State Attorney General's office regarding the legal and illegal uses of satellite technology.

Analysis: On the following page are graphs, depicting how important each stakeholder is to each strategy, and how certain we are that the assumptions about the stakeholders are correct. Next is a Feasibility/Desirability Chart detailing the pros and cons of each alternative strategy.

Feasibility/Desireability (Chart XII)

	Pro	Con
Alt. 1:	--inexpensive --reduce dissension be --defuses suspicions --enhances efficiency rumours --immediate broad impact	--mix of persons selected may biased to certain agen- cies --may cause resentment and be viewed as usurping authority
Alt. 2:	--cost savings --wider range of services available --teamwork --centralizes control --increases bargaining stature	--may not benefit all --potential for corruption --bureaucratic redtape
Alt. 3:	--provide legal guidelines --influences judges --limits ACLU actions --minimizes legal delays --discourages lawsuits --limits liability	--invites litigation --needless restrictions

The table on the next page assesses the stakeholders' positions on each strategy:

(Table II)

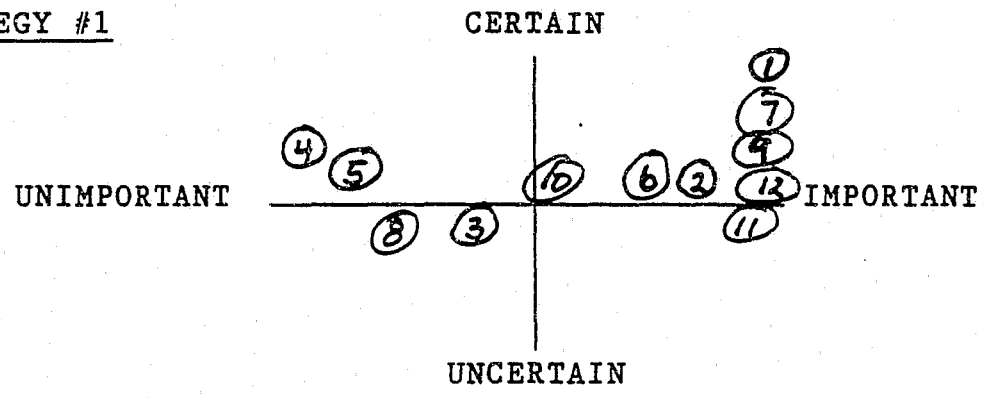
Stakeholder	"for"	"against	"split"	"neutral"
#1-C.O.P.s	1,2,3			
#2-Council	1,2			3
#3-P.O.S.T.	2			1,3
#4-Judicial	3			1.2
#5-ACLU		1,2,3		
#6-D.O.D.	1,2			3
#7-Fed'l L.E.	1,2,3			
#8-D.A.	3			1,2
#9-Local L.E.	1,2,3			
#10-Politicians	1,2,3			
#11-Media	3		2,3	
#12-Public	3		1,2	

Recommended Strategy. The recommended strategy would be strategy number #2 (The local law enforcement chiefs and sheriff shall recommend and staff a committee to research benefits of contracting satellite technology services as a group, for regional application). It is the most supported (by a small margin) and has high degree of importance. At some point in time it will be necessary to obtain an opinion from the attorney general regarding the legal and illegal use of satellite technology (strategy 3), based on the high degree of importance given it by six of the 12 key stakeholders. The plan would be implemented as follows:

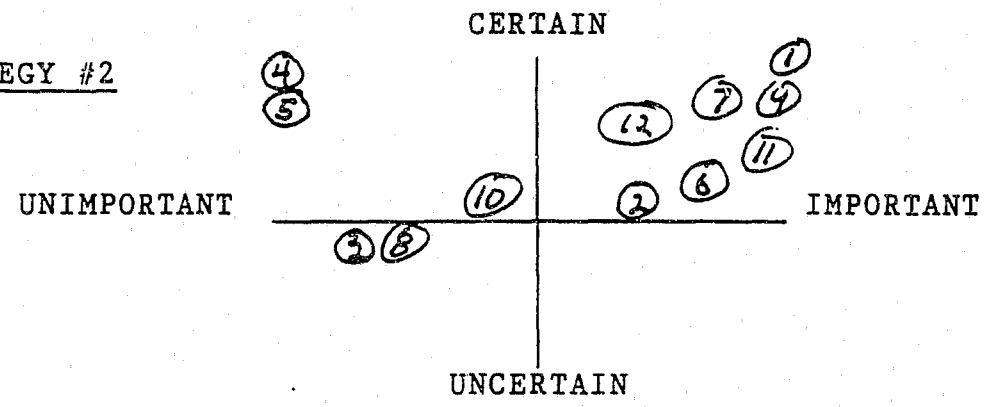
-----The first year, the concept would be fully explored at a chiefs, meeting which is held monthly for all county municipal chiefs and the sheriff. The district attorney usually attends. A P.O.S.T. representative should attend.

A knowledgeable space science individual familiar with satellite technology should be present to answer questions. A presenter familiar with law enforcement needs

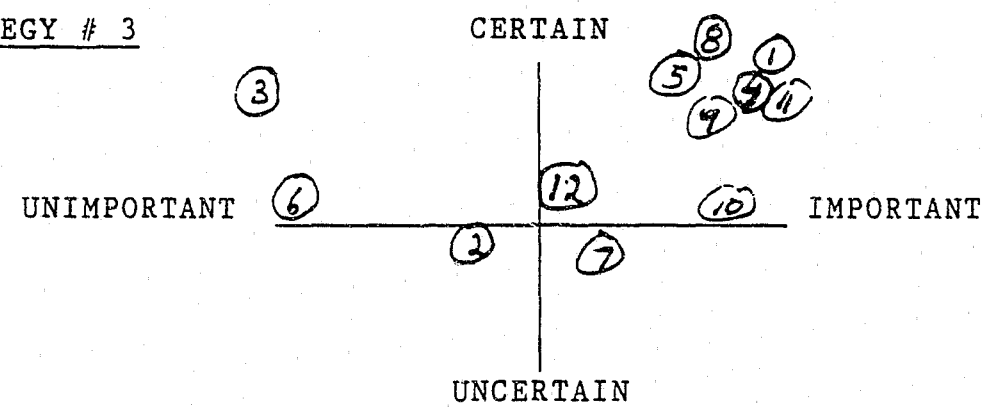
STRATEGY #1



STRATEGY #2



STRATEGY # 3



(Chart XIII)

and applications of satellite technology should make a presentation.

The presenter would recommend that P.O.S.T. contract with a distinguished organized research group, with extensive experience, knowledge, and expertise in satellite technology, in order to conduct a study. (A good example of such a group is the **California Space Institute.** It is a statewide research unit that supports and conducts space-related studies on all the campuses of the University of California system. It helps bring together California's scientific and technological efforts in the exploration of space and acts as a liaison for academia, industry, and government. It is locally based at Scripps Institution of Oceanography, University of California, San Diego [UCSD]).

It is expected that the chiefs' association would support this recommendation and that P.O.S.T. would find such as project important as they have already moved to enter the satellite communications field. The study would be given a one-year deadline, and a presentation by the research group would be selected for a Chiefs' meeting.

-----During the next two years, the recommended strategy of forming a committee to further research the possibilities and economics would be implemented, based on the results of the contract research study presented to the chiefs.

-----During the last seven years, the committee would make recommendations and presentations to the chiefs' organization. An educational approach with face-to-face meetings would take place between selected representatives of the committee and key stakeholders such as: State and from federal law enforcement officials, from agencies operating in San Diego County, state and U.S. politicians with local concerns, municipal and county government officials, the criminal justice community, P.O.S.T., and private industry leaders active in space business enterprizes.

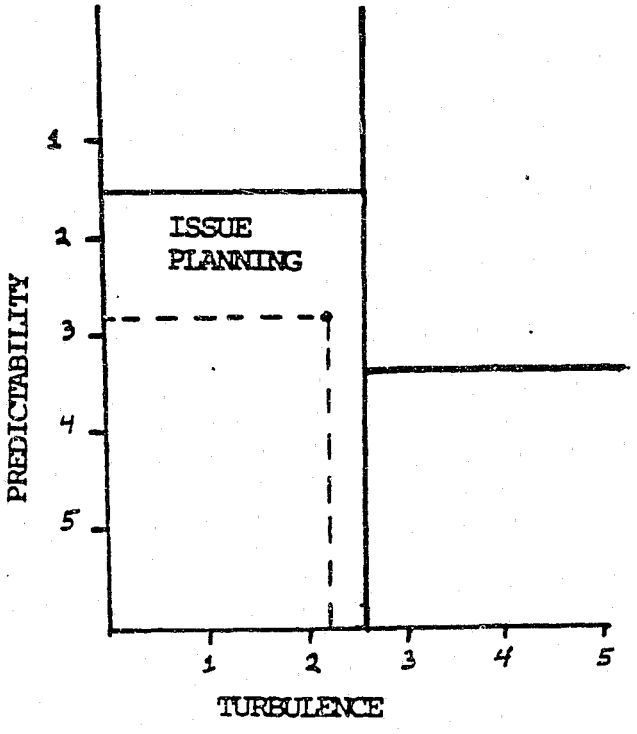
Recommendations to the chiefs' organization as how to best benefit from satellite technology and how to minimize spending will be made. It is expected that the local law enforcement agencies within the county will be able to develop the appropriate plan, and begin to reap the benefits from satellite technology beginning in 1995 (and continuing into the near future from 1995).

Planning System. There will be two planning systems for the program strategy. The first would be during the first three years as the program develops. The environment in the first years would have a low degree of turbulence (or change) and a medium level of predictability. This mode would be described as issue-planning or continuous-planning.

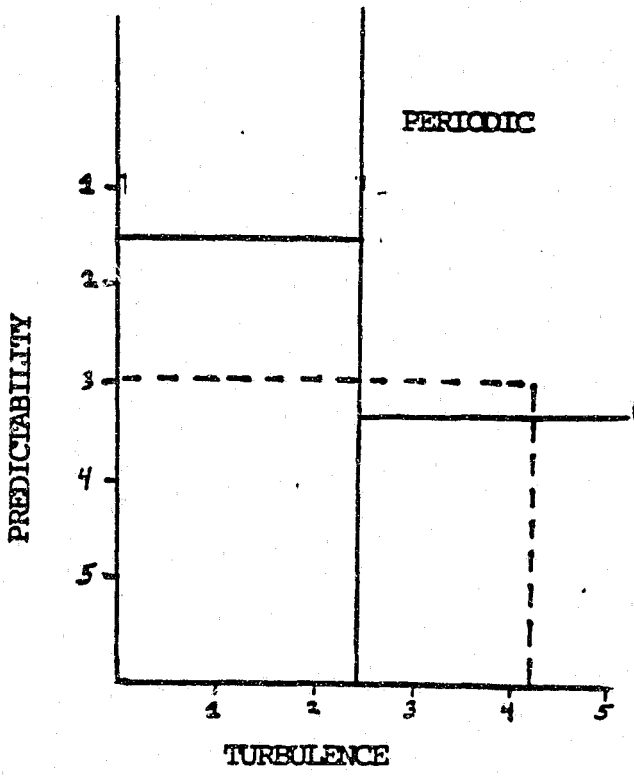
In the last seven years, there will be a high level of

turbulence (change) and a medium level of predictability. This mode would still require continous planning and issue planning. See Charts XIIII and XV.

Administrative and Logistics. In order to implement the plan, the chiefs of police and sheriff would have to approve it



Planning System 1990-1993
(Chart XIIII)



Planning System 1994-2000
(Chart XV)

and commit the departments to its implementation. Once approved, the operation of the program would come under the committee staffed by individuals recommended/selected by the chiefs. The program would be reviewed and evaluated annually to justify funding, or as needed.

P A R T T H R E E : T R A N S I T I O N P L A N

STATEMENT

The next step in the project is the development of a Transition Management Plan. Strong feelings both pro and con, can be expected to result from this innovative project. Many will view it as risky and no doubt controversial. It will involve change and be disruptive to existing organizational activities. The success of the transition plan will depend on its ability to generate the extra power to get people and the necessary resources to accomplish a nonroutine task.

The Critical Mass. The "critical mass" are those individuals, who, if they support the change, it is likely to be successful. Or if they, collectively, do not support it, it will fail. Based on research they are usually likely to be six to ten people. If any one member of the "critical mass" blocks, the change can fail. It is a "You're with me or against me" philosophy. The key actors in the "critical mass" for this project were identified to be the following:

1--Chiefs of Police (includes sheriff)

2--Federal and state politicians

3--Local politicians

4--Media

5--Public

6--POST

In order to get commitments from the above key groups identified as the critical mass, a "commitment charting technique will be utilized. This is used for forming a diagnosis and action strategy to get minimum commitments. A "commitment planning" chart is shown on page number 65a detailing where each member or group is judged to be regarding commitment (as indicated by an "X"), and where their minimum commitment needs to be (indicated by an "O"). See chart XVI.

In order to obtain the minimum commitment needed from the key players in the critical mass, certain intervention strategies may be employed beyond using power or persuasion. In analyzing the chart, only the public is viewed as possibly blocking. This is because of the initial and predictable reaction to the "Big Brother" concept. Only the politicians are as committed as they need to be. Others are minimally only committed.

The following approaches may be utilized to over come any resistance to change by a key individual or group:

--Problem solving
--Educational intervention
--Resistance management
--Role modeling
--Changing reward systems
--"Forced" collaboration

An educational intervention approach would be utilized with the minimally committed,except for the public. By having experts in space technology involved research study done, law enforcement should begin to realize the benefits and positive potentials.

A resistance management approach could be used to overcome the public's anticipated resistance. The formula for thinking about the resistance process is as follows:

$$C = [ABD] > X$$

C= Change
A= Level of dissatisfaction with the status quo
B= Desirability of the proposed change or end state
D= Practicality of the change(minimal risk & disruption)
X= "Cost" of changing

This is a readiness assessment tool to determine the sources of resistance which allows for transition management methods to be applied to soften resistance and create the proper atmosphere.

Management Structure. In order to implement the transition management plan, the following key groups will be involved in the management process: Chiefs of police, POST, federal/state politicians, and federal law enforcement officials.

In establishing this structure, the three following conditions were considered? Those conditions that existed prior to the implementation of the change, the expected condition that will exist at the completion of the change, and the intermediate condition that will exist during the change. T-M structure was designed to minimize disruptions in the existing operations and maximize efforts in bringing about a new system.

The committee system was chosen to bring about change because of the diverse political considerations and the need to provide persuasive and accurate information, supported by expert opinions from distinguished sources, with hard dollar cost figures available.

Implementation Plan. One of the key tools and methods that will be utilized to implement the plan is called critical path mapping. Essentially, an inventory list of all tasks and events that must occur to complete the change is compiled. Those tasks or events are grouped or listed in numerical order along a range of numbers according to which ones must occur first. The length of time needed to accomplish each task or event is also tabulated to fix start dates, minimize delays, and coordinate timely implementation of the next key step.

An additional tool will be "responsibility charting," which will clarify the role relationships of the management

(Chart XVI)

COMMITMENT PLANNING

o WHAT DO YOU NEED FROM THE "CRITICAL MASS"?

X WHERE DOES "CRITICAL MASS" (INDIVIDUALLY) STAND NOW REGARDING THE CHANGE?

TYPE OF COMMITMENT

Actors in Critical Mass	Block Change	Let Change Happen	Help Change Happen	Make Change Happen
CHIEFS OF POLICE			X----------→0	
FEDERAL/STATE POLITICIANS				XO
LOCAL POLITICIANS		X----------→ 0		
Media			XO	
Public	X----------→0			
P.O.S.T.			X----------→0	

team. It reduces ambiguity, confusion, time-wasting, and conflict. Management personnel, who have roles that interrelate where two or more people are involved in an action, decision, or activity concerned with the transition, are identified and listed as actors on the chart. Then the particular activity is cross-charted, utilizing the following classifications:

R - Responsibility to see the decisions or actions occur

A - Approval of actions or decisions, including veto power

S -Support of actions or decision by provision of resources but no right to veto

I -Informed of action or decisions but with no right to veto

This system will make for a more efficient and effective working relationship.

C O N C L U S I O N

My most impressive experience in conducting this study was the consistent response from space scientists, engineers, politicians' assistants, and other law enforcement officials---the long pause or the facial expression, revealing at first slow recognition, and then a rush of excitement either in their face or voice---when I asked them to think of the possible applications of satellite technology to law enforcement. I hope you will do the same--**its there** and we're going to use it; **why wait?**

When I first started this project I was interested in the imagery of satellites, I wanted those photos, those leads, to find the kidnappers and killers who leave tragic figures in the desert or some remote lonely area. Afterthought, I've discovered that the immediate and near-future benefits from space technology will be the communication satellites and the global positioning satellites. The heat-sensing and optical enhancing satellites may require additional development before law enforcement benefits from the unique technology envisioned near the turn of the century.

This study has help me understand more about space technology and I recommend the following:

° Further research and expansion of L.E.T.S.N. services to state and local law enforcement agencies.

° The State of California, through its Department of Justice and POST, should investigate the prospects for collaborative research with the University of California's Space Institute regarding Satellite applications in the field of law enforcement.

° Close attention be paid to the development of the new airships, to be equipped with the latest satellite technology, and how well the military and civilian law enforcements agencies work well in the southern coastal

areas they plan to patrol.

° The federal government should allocate funds to research the possibilities of applying satellite space technology to assist law enforcement.

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APPENDIX A

Candidate trends

T-1 Use of military spy satellites to assist police to interdict drug smuggling
T-2 Global positioning systems(GPS) satellites for tracking police vehicles
T-3 Electronic monitoring via satellite of probationers and parolees on home detention
T-4. Locating stolen vehicles equipped with electronic license plates
T-5 Teleconferencing/video conferencing and direct TV broadcast to provide training for law enforce ment
T-6 Intercepting criminal communications
T-7 Surveillance of ongoing criminal operations
T-8 Detection of homicide victims dumped/buried in remote areas
T-9 24-hour per day photographing of county regions with high-resolution capability(say 3 feet) made available for solving or developing leads to serious crimes--such as vehicle(s) photo graphed in area or location where homicide victim was dumped
T-10 Detection and prediction of potential disasters such as earthquakes, volcanic eruptions, forest fires and tidal waves
T-11 Use of military spy satellites to assist in solving serious crimes, crime series, missing person(kidnapped child), etc. T-12 Detection of forest fires and arson suspect(s) in remote areas
T-13 Global transmission through telephone relays of mug shots, fingerprints, legal documents for processing criminals and driver license photos
T-14 Pocket-size telephones priced to easily be available to public allowing global communication from any spot in California(allows calls for police assistance from anywhere)
T-15 Monitoring of regional traffic patterns/flow and congestion enabling planning for timely solutions
T-16 24-hour photographic monitoring of traffic accidents within a region lessening the need for lengthy traffic investigations and court trials to determine fault(frees up more courts/ judges while enabling settlements with lower legal costs--insurance companies/public benefit)
T-17 Monitoring of terrorist training activity on

TRENDS(continue)

T-25 Assist in surveillance/detection of crowd control problems, mass disobedience and parade activity

T-26 Development of credit card size receivers for hikers and back-packers to determine their location via satellite(navigation)

T-27 Detection of illegal crops or illegal water diversion

T-28 Tracking movements of criminals and/or parolees

T-29 Development of derigible or airships with technology equivalent to that of satellites for less expensive assistance to police in regional areas

T-30 Use of aircraft with radar platforms to serve law enforcement needs instead of satellites

T-31 Police will utilize foreign countries' satellites to assist through purchases of services such as high-resolution photographs now being made available by the Russians(5 meter resolution)

T-32 Satellite overcrowding in the skies will diminish the effect or efficiency of satellite technology by the year 2000

T-33 _____

T-34 _____

T-35 _____

T-36 _____

T-37 _____

T-38 _____

T-39 _____

Instructions : Once you have reviewed the trends that research has indicate could impact the issue, take a moment to reflect and see if you can think of any additonal trends. Remember a trend is a consistent tendency or pattern of events over a period of time. Add your trend candidates to the bottom of the list using T-33 through T-39 to designate each trend you desire to add. Now circle the five trends that you feel are most likely to have the greatest impact in the issue. Give each one a single value or rating from one through five. five being the highest value or impact and one being the lowest. Write your select value(1,2,3,4, or 5) next to the trend number you selected. No two should have the same value. For example:

5- (T-10)
3- (T-33)

Return the answers to : Facsimile #(619) 336-4376

APPENDIX B

ISSUE: What impact will Satellite Technology have on California Law Enforcement by the Year 2000?

EVENTS

E-1 Decision made by Federal government not to modernize the Nation's satellite systems(particularly military spy satellites)

E-2 Budget deficit declared too high to allow for any additional funding of the Nation's space programs

E-3 Explosion of a rocket fuel plant significantly decreasing the availability of sophisticated and rare fuel for rocket launches

E-4 Federal government's secrecy policy restricts civilian satellite technology use

E-5 Federal government does not allow civilians to have a less than 30-meter resolution capability, although government/military satellites are rumoured to have a resolution capability of counting golf balls on a golf course

E-6 Mexico objects to the U.S. government utilizing satellite technology to surveil its borders and aid law enforcement

E-7 ACLU attacks use of satellite technology as a violation of the 4th amendment rights protecting invasion of privacy

E-7 California Supreme Court or U.S. Supreme Court rules satellite technology utilized by the police is unconstitutional

E-8 Major earthquake in California

E-9 Traffic congestion in Los Angeles area freeways slows traffic flow to an average of 15 mph

E-10 President declares that commercialization of space is inevitable and in order to allow America to compete, no restrictions on available technology will be restricted if other countries are known to possess the same technology

E-11 Japan offers to contract will California law enforcement agencies to provide needed satellite technology

E-12 Russia destroys a U.S. satellite with a laser beam

E-13 Insurance companies offer satellite technology to assist law enforceme

E-14 _____

E-15 _____

E-16 _____

E-17 _____

E-18 _____

Instructions: Same as for Trends. Remember an event is a discrete one-time occurrence that affects the central issue.

APPENDIX C

II. SATELLITE COMMUNICATIONS

The communications satellite industry is the most mature of all commercial space markets. Communications satellites constitute a vital part of a much broader global telecommunications network, composed of many different technologies and types of systems. From their vantage points in space, they provide a variety of services, accessible on land, sea, and in the air, some of which cannot economically be replicated by other communications technologies.

Satellites excel at providing cost-efficient point to multi-point voice, video, and data services for a wide range of government, business, entertainment, and educational applications. In less developed areas and where geographical features make the establishment of terrestrial links difficult, satellites provide perhaps the only reliable means of communication. New applications, such as global position determination services are currently unique to communications satellite technology. One of the most important applications of this technology has been the establishment of satellites and ground stations that interconnect on a global basis, allowing instantaneous communications between all areas and peoples of the world. This has led, among other things, to freer information flow, stronger international business relations, greater cultural exchange, and a safer worldwide political environment.

BACKGROUND

The current U.S. and international communications satellite environment has been shaped by advances in technology, rapidly expanding markets for communications services and the regulatory structure.

INTERNATIONAL ENVIRONMENT

The international legal and regulatory environment has been shaped principally by the agreements establishing four international organizations: the International Telecommunications Union (ITU), the International Telecommunications Satellite Organization (INTELSAT), the International Maritime Satellite Organization (INMARSAT), and the European Telecommunications Satellite Organization (EUTELSAT). The United States is a party to all of these organizations except EUTELSAT, which is comprised only of European countries.

The ITU, among other things, establishes regulations and procedures to provide countries with a framework for coordinating and registering their respective use of the radio frequency spectrum, in order to avoid causing each other harmful interference. As part of this framework, the ITU is responsible for allocating the radio frequency spectrum among the various identified radio communications services.[1]

INTELSAT and INMARSAT are global communications satellite cooperatives whose prime objectives are to provide space segment for international public

telecommunications, and international maritime services, respectively. EUTELSAT is a regional satellite organization whose prime objective is to provide space segment to its European members to meet their pan-European requirements. Each of these organizations is based on two international agreements -- one signed by the member countries (Parties) and one signed by each Party or its designated representative (Signatory) responsible for day to day participation in the organization.[2] There are 114 Parties to the INTELSAT Agreement, 54 Parties to the INMARSAT Convention and 26 Parties to the EUTELSAT Agreement. Each organization has the same number of Signatories as Parties.

The Agreement between Parties in each of the satellite organizations recognizes the rights of Parties, Signatories and other entities under the jurisdiction of Parties to establish or use separate satellite systems to meet their telecommunications requirements. However, each organization requires Parties and Signatories to consult with the organization prior to establishing such systems. This is to ensure that the separate system is technically compatible with the organization's system, and to ensure that it will not cause significant economic harm to the organization. The recommendations from the consultations are non-binding, but they carry substantial political weight.[3]

For most countries, the Signatory is the governmental post, telegraph and telephone (PTT) agency or designated operating entity. Each of these organizations is jointly financed and owned by the Signatories, with ownership shares based on their proportional use of the system. The U.S. Signatory is Comsat, whose ownership share is approximately 25 percent in INTELSAT,[4] and 28 percent in INMARSAT.[5]

U.S. ENVIRONMENT

The cornerstone of U.S. telecommunications law is the Communications Act of 1934, as amended.[6] It establishes the Federal Communications Commission (FCC) as the regulatory and licensing authority for non-Federal Government use of the radio- frequency spectrum. Against this backdrop, the 1962 Communications Satellite Act (Satellite Act) provides for the establishment of a global, commercial communications satellite system (now known as INTELSAT) and provides for the establishment of a private corporation, Comsat, as the sole U.S. participant and investor in the system. The Satellite Act requires Comsat to provide non-discriminatory access to the system for all authorized users.[7] Importantly, the Satellite Act states that it is not intended to preclude the establishment of communications satellites separate from INTELSAT that are determined to be in the national interest or required to meet unique governmental needs.[8]

Three separate policies have been established to ensure that U.S. domestic and international satellite telecommunications activities are consistent with U.S. law and international agreements: (1) the U.S. Domestic Satellite Policy, which is intended to ensure a robust domestic satellite marketplace. (2) the Transborder

[redacted] that applies to domestic systems used to provide incidental international services to neighboring countries, and (3) the U.S. Separate Systems Policy for satellite systems intended specifically to provide international public telecommunications services separate from INTELSAT. U.S. obligations under the INTELSAT Agreement were a major consideration in the creation of each of these policies.

In the early 1970s, the FCC adopted a policy of "open entry" for qualified domestic communications satellite systems (domsats).[9] This policy, which is still in effect, is based on the concept that licensing all applicants meeting the FCC's established technical, legal and financial fitness requirements for obtaining a license will encourage the development of new technologies and services at lower costs to the public. These requirements have been tightened over the years as the number of domsats has increased and the orbit/spectrum resource has become more congested. The FCC has stated that if the number of domsat applications ever exceeds the orbital positions and spectrum available, it might have to resort to administrative selection procedures, such as comparative hearings, auctions or lotteries.[10]

Use of U.S. domestic satellites for transborder services is governed by the U.S. Transborder Policy. The Transborder Policy was established by the Executive branch and the FCC to balance the efficiencies of using U.S. domestic satellites to provide service to neighboring countries within the footprint of the satellite, with the U.S. desire to avoid causing significant economic harm to INTELSAT. The Transborder Policy, established in 1981, requires: (1) a showing by the applicant that INTELSAT could not practically or economically provide the same services as the requested domestic satellite, and (2) consultation with INTELSAT pursuant to Article XIV (d) of the INTELSAT Agreement, prior to initiation of service. The FCC's transborder decisions to date have been limited almost exclusively to the authorization of video and private line voice and data services.[11]

In 1984, the President determined that U.S. international satellite systems separate from INTELSAT (separate systems) are in the national interest.[12] This determination was made in accordance with the 1962 Satellite Act and was accompanied by the conditions that: (1) such systems may provide services only through the sale or long term lease of space segment capacity for communications not interconnected with the public-switched network, and (2) at least one foreign authority must authorize use of each separate system and participate in consultations with the United States under the INTELSAT Agreement, to ensure technical compatibility with the INTELSAT system and avoid causing it significant economic harm. In 1985, the FCC used this determination and the conditions as the basis for its decision to license qualified applicants.[13]

The Transborder Policy has always been distinguished from the U.S. Policy on separate international systems, because it only concerns U.S. domsats used to provide incidental services to nearby countries. The Separate Systems Policy, on the other hand, concerns satellites that are specifically intended to provide international services, and are considered a greater threat to INTELSAT's

economic well-being. Unlike the separate systems policy, the Transborder Policy does not expressly prohibit interconnection with the public switched network, nor does it require the sale or long term lease of transponder capacity as a pre-condition to use. These differences, coupled with the recognition that INTELSAT has developed into a robust and highly profitable global communications satellite system, has prompted the Administration to initiate a comprehensive review of U.S. international satellite policy. This process is underway.[14]

U.S. NATIONAL SPACE POLICY

The U.S. National Space Policy requires the U.S. Government, in meeting its space-related requirements, to purchase commercially available space goods and services to the fullest extent possible. This includes communications satellites, ground stations, and related equipment and services. The U.S. National Space Policy prohibits the U.S. Government from competing with or deterring commercial entities in the provision of commercial communications satellite services except for national security or public safety reasons. It also requires the U.S. Government to promote free and fair trade internationally in space goods and services. Finally, it requires the Government to continue research and development efforts for future advanced space communications technologies, and to provide for timely transfer of these technologies to the private sector, protecting their commercial value and without Federal subsidy.[15]

THE SATELLITE COMMUNICATIONS MARKET

The major components of the communications satellite industry include: satellite owner/operators, spacecraft manufacturers, and ground segment manufacturers and vendors. In addition, an entire second infrastructure of enterprises, such as satellite capacity re-sellers, domestic and international teleports and other equipment and service providers, have developed to support the satellite industry

SATELLITE OWNER/OPERATOR COMPONENT

The satellite system owner/operators component generally can be divided into two market categories: fixed and mobile services. Fixed Satellite Services (FSS) are provided via earth stations at relatively permanent locations, such as tie-in points with terrestrial telephone lines, cable television head-ends, and customer premises. Mobile services use earth stations attached to vehicles, such as trucks, ships or airplanes, or devices that are portable in their own right, such as "briefcase" telephone systems. Mobile Satellite Services (MSS) are distinguished from FSS primarily because they are designed to be used during transit. Each type of service generally requires different technology and has different regulatory constraints; however, these distinctions are blurring. In some instances, "hybrid" satellites have been constructed to support both types of services.

FIXED-SATELLITE SERVICES

Fixed Satellite Services are offered in C-band frequencies (6/4 GHz) and/or Ku band frequencies (14/11-12 GHz) depending upon the satellite system.[16] The

and Ku-band systems each have distinct technical capabilities that can be used to address the needs of different markets. They also have significant overlap among users, particularly in the video market. The C-band systems by design are low to medium power, have beam coverage areas that can encompass the entire continental United States and generally require medium to large sized earth stations to receive the low power signal. This capability is primarily used for transmitting signals to television receive-only earth stations (TVROs) located within the beam coverage area. Principal users include cable television companies that redistribute the signals to their customers, high-rise dwellings that do not have access to cable, and business establishments and homes in less populated areas. C-band systems, which preceded the commercial entry of Ku-band systems by more than a decade, have two major advantages in this market. First, they have fewer signal outages because of poor weather conditions. Second, the C-band user base has a substantial ground segment infrastructure already in place, and most satellite users with a large hardware investment in this infrastructure find the switch to Ku-band too costly.

Ku-band systems, on the other hand, have a number of advantages over C-band systems. They are less subject to terrestrial radio interference than C-band systems. Also, with the ability to concentrate satellite beam coverage on much smaller areas, they can be efficiently used with very small aperture terminals (VSATs) to provide a number of innovative service offerings. These systems are more effective than C-band for two-way data and video links, particularly for communications between customer premises using VSATs. Further, because VSATs are so small, they are much less expensive than the larger antennas generally required for use with C-band systems.

U.S. Domestic Service Providers

Fixed satellite services in the U.S. are currently provided by 10 domestic satellite systems: Alascom, AT&T, Comsat, Contel ASC, GE Americom, GTE Spacenet, Hughes Communications, MCI, IBM, and Western Union. Altogether, these companies have approximately 30 operational satellites in orbit. The primary coverage areas of these satellite systems include the continental United States, Hawaii, Alaska, and Puerto Rico. These systems are primarily used for a variety of point to multi-point audio and video programming, satellite newsgathering, private line voice, and data networks. Some of these companies have investments in space and ground segments exceeding $1 billion.[17]

U.S. Transborder Service Providers

A significant number of the existing and planned U.S. domestic satellite systems have beam coverage that extend beyond the continental U.S. into Canada, Mexico, the Caribbean, Central America, and South America. To date, 23 U.S. domsats have completed Article XIV (d) consultations with INTELSAT, and have been authorized by the FCC to provide transborder services to over 40 foreign locations, within Canada, Mexico, and countries in Central America and the Caribbean Basin. Consultations have been initiated for an additional seven U.S. domestic satellites, but differences with INTELSAT on the technical compatibility

of these satellites have impeded completion of the process. In addition, a numb of Canadian and Mexican satellites are authorized for the provision of transborde services to and from the U.S.[18]

International Service Providers

The provision of international fixed satellite services is currently dominated by the International Telecommunications Satellite Organization (INTELSAT). As mentioned above, INTELSAT is composed of 114 member nations, including the United States. Its 15 satellites, each with C- and Ku-band capacity, handle over two-thirds of the world's international telephone traffic, and almost all international video. It also leases and sells space segment capacity to countries to meet their domestic communications requirements.[19]

Another global system, INTERSPUTNIK, was established by the Soviet Union in 1971 as an alternative to INTELSAT, to develop communications between Soviet bloc countries, and to offer international communications services to all interested countries. By year-end 1987, INTERSPUTNIK had 18 member countries, most of which belong to the Soviet bloc.[20] A number of INTELSAT members, including the United States, use the INTERSPUTNIK system on an occasional basis for communications with these nations.[21]

There are also several "regional" international satellite systems in operation. These are the European Telecommunications Satellite Organization (EUTELSAT), with 26 member countries; the Arab Satellite Organization (ARABSAT), with 22 member countries; and the Palapa system, which is entirely owned by Indonesia but offers leased capacity to neighboring countries to meet their domestic and international requirements. EUTELSAT is the largest of these systems, providing Europe and North Africa with international telephony, data and video services.[22]

Additional international systems are under development or are being planned. The system closest to establishment is the privately financed U.S. PanAmSat system. PanAmSat will provide C- and Ku- band space segment capacity, via sale or long term lease, for domestic and international voice, video and data services in North and South America, Europe and North Africa.[23] It is scheduled to be launched in June 1988.[24]

Other systems being planned include a number of U.S. private international systems, such as Orion, ISI and Finansat, for trans-Atlantic and trans-Pacific services. There are also several systems in the planning stage that will be owned by international consortia, such as Pacific General Telecommunications Satellite and Pacstar, both for coverage of Pacific basin countries. Additional regional systems are under consideration by several countries in Africa and by several countries in South America.

Foreign Domestic Service Providers

Twelve foreign countries own and operate their own satellite systems for domestic communications: Australia, Brazil, Canada, the People's Republic of China, France, India, Indonesia, Italy, Japan, Mexico, West Germany, and the U.S.S.R. Countries planning to establish such systems include Israel, Italy, Luxembourg, Sweden, and the United Kingdom. At least five other countries are considering the possibility.[25] INTELSAT also sells and leases transponders for domestic use.[26]

Demand For Fixed Satellite Services

U.S. Domestic Services

The U.S. domestic satellite companies are going through a market reorientation. The rapid penetration of fiber-optic cable throughout the United States has significantly reduced the amount of voice traffic carried on U.S. domestic satellites, leaving a substantial amount of excess capacity to be filled by other satellite applications. The increased costs and uncertainty caused by the space transportation difficulties over the past two years have added to the difficulties in this industry.

Some satellite owner/operators are reducing their investment in space and ground segment, or leaving the market altogether. In 1985, for example, the FCC authorized construction and launch of 26 new U.S. domestic satellites. Within two years, approximately 10 of these authorizations have been returned because the licensees chose not to proceed with their plans. Companies planning to remain in the market are reconfiguring their services to capitalize on the efficiencies inherent in satellite communications, such as point to multi-point provision of video and data services and the use of VSATs for customer premises applications.

The projected revenue for transponder sales and leases of all systems in 1987 is estimated to be $1 billion, and is expected to grow at an annual rate of 7.5 to 10 percent.[27] By 1990, demand for transponder capacity should exceed supply. A very strong VSAT market could also exist by 1990. Advances in technology, such as the development of flat antennas, coupled with increased industry awareness of VSAT applications, are expected to stimulate VSAT growth. In addition, the market should be further stimulated by the increased demand for mobile satellite services.[28]

Examples of VSAT users are the K-Mart and Wal-Mart department store chains; the Southland Corporation, owner of 7-11 convenience stores; Thrifty Corp., which operates more than 640 drug stores and 170 sporting goods stores; Schlumberger, with its oil and gas wells; and Computer Power, which supplies mortgage and banking information. These companies and others use VSATs to connect each of their outlets to central nodes, for such applications as monitoring company-wide operations on a real-time basis, inventory control, credit card verification, private-line voice and data services and industrial video conferencing.

VSATs are also used to some extent in C-band by Contel ASC (formerly Equatorial Communications, Inc.) with spread-spectrum technology.

Transborder Services

Transborder services have been authorized by the FCC to over 40 foreign locations, including Canada and Mexico and countries in Central America and the Caribbean Basin. Of those countries that are currently authorized for transborder services with the U.S., only Canada and Mexico are authorized for two-way services, such as private-line voice and data communications. The rest are limited to receive only services, such as video and data distribution, that originate in the U.S. The transborder service options should expand over time until ultimately there is total freedom to interconnect with the public switched-network for all types of services.

International Services

The INTELSAT system handles more than two-thirds of the world's international telephone traffic, and almost all international video. In 1986, total revenues were $488 million, up 6.8% from $457 million in 1985. Revenues in 1984 were $411 million. The 1986 revenue was derived from the following sources: full time international voice services (73.1%), international data services (8.1%), domestic leases (5.1%), occasional use television (5.1%), INMARSAT lease (2.1%), international television leases (2.5%), other (2.4%) and INTELSAT business service (0.9%).[29] Comsat's portion of INTELSAT's 1986 revenue was approximately $126.88 million.[30]

International satellite service providers face increasing competition from fiber optic cables connecting major international points, and supported on either end with fiber-optic distribution networks. For example, the Trans-Atlantic (TAT) 8 cable, which will become operational this year, is likely to attract an increasing amount of the switched voice and data traffic that is currently provided by INTELSAT over that route, and the majority of new voice and data traffic on that route. Two additional trans-Atlantic fiber-optic cables that are scheduled to enter service in 1989 (PTAT and TAT-9) will have the capacity to carry multiple television signals, making the market for point-to-point international service provision even more competitive.

As has been the case in the U.S. domestic telecommunications market, satellite service providers have begun to concentrate on areas that are not well served by fiber networks, generally those that require point-to-multi-point distribution over large geographic areas. The market for point-to-multi-point services is primarily video distribution, with a growing number of customers for private line voice and data networks for businesses.[31] These are the areas in which the potential growth is projected for international satellite communications service providers, and the area in which competition will be greatest between INTELSAT and new international satellite systems such as PanAmSat.

Foreign Domestic Services

Between December 1985 and March 1987, 12 countries in addition to those that own their own satellite systems, purchased a total of 32 INTELSAT transponders to meet their domestic communications network requirements, including television broadcasting and other essential services. INTELSAT's total revenues from the sale of these transponders were $79.3 million. In addition, at the end of 1986, the following 25 countries were leasing capacity from INTELSAT for domestic communications services: Algeria, Argentina, Chile, the People's Republic of China, Colombia, Denmark, India Libya, Malaysia, Morocco, Mozambique, New Zealand, Niger, Nigeria, Norway, Peru, Portugal, Saudi Arabia, South Africa, Spain, Sudan, Thailand, United Kingdom, Venezuela, and Zaire.[32]

The increasing demand for foreign domestic satellite services is to some extent attributable to the effects of potential competition between INTELSAT and new international satellite systems that are in the planning stages. The threat of competition since 1983 has caused INTELSAT to focus more than ever on meeting user requirements for domestic services by lowering prices for existing services, developing new services and substantially increasing marketing efforts. Similarly, the marketing efforts by prospective satellite service providers and their development of systems that are technically better suited to meeting user requirements than the existing INTELSAT network, has stimulated new demand, particularly in Central and South America and the Pacific Rim area, where marketing efforts have been heaviest.[33]

MOBILE SATELLITE SERVICES

Commercial interest in providing land, maritime and aeronautical mobile satellite services has increased dramatically over the past several years. The mobile communications market is potentially quite large, and could become a major profit center for the satellite industry.

U.S. Service Providers

In the United States, a number of companies have applied to the FCC for authority to establish domestic systems for provision of mobile satellite services (MSS). These services include voice, data, and paging services to mobile units, such as trucks, boats, cars, trains, and planes. Due to the limited amount of MSS spectrum currently allocated (1530-1544 MHz/1646.5-1660.5 MHz), the FCC has directed these companies to form a single consortium as a condition for licensing approval.[34] Consistent with this requirement, the companies formed the American Mobile Satellite Consortium, Inc., and filed a joint ownership agreement with the FCC on May 3, 1988.

In addition to MSS, radiodetermination satellite service (RDSS) holds the promise of large markets domestically and internationally. RDSS includes radiolocation and radionavigation, and may include applications such as digital messaging as well. These services permit immediate information transfer between mobile units and control centers, including position updates, directional guidance, time of

arrival, reporting of incidents, and traffic monitoring/control. Potential users of this service include railroads, airlines, ships, and trucking companies, as well as governments.[35]

Two U.S. operators, Geostar Corporation and OMNINET Communications Services, have received licenses from the FCC to offer RDSS services. The first of these companies to commence operations is Geostar, which is currently "piggy-backing" its position determination packages on GTE Spacenet's satellites. Geostar will have two piggy-back systems in operation by the end of 1988, and plans to launch its own satellites beginning in 1991. To date, Geostar has raised more than $50 million from more than 500 shareholders, managed funds (pensions), and private investors.[36]

Geostar has also licensed its technology to various foreign entities in the interest of developing RDSS worldwide. Under agreements from Geostar, RDSS is being developed in Europe, Middle East, and Africa by a consortium of 26 organizations from 12 European nations (Locstar), and in India by the Indian Space Research Organization. Geostar has Memoranda of Understandings with Australia, the People's Republic of China, and Brazil for joint studies of the possible development of RDSS in those countries. In addition, the Caribbean Broadcast Union, comprising 17 Caribbean countries, is studying providing RDSS using Geostar's U.S. satellites.[37]

Although OMNINET has been licensed to construct and operate an RDSS system, it is currently proposing instead to provide low speed communications services to mobile users over existing fixed satellites operating in the Ku- band, and existing private terrestrial radio systems. OMNINET has recently petitioned the FCC for authority to use the GTE Spacenet G-STAR-1 satellite, employing spread spectrum technology to serve the transportation industry with two-way, low-speed digital-data services.[38]

Starfind, Inc. has designed a system for position determination that it states can be established at a fraction of the cost of traditional geostationary satellite systems. Starfind attributes its cost estimates to: (1) technology that permits position determination with a single satellite based on its unique motion, (2) very light-weight satellites of only 300 lbs apiece, and (3) the ability to launch the satellites on small capacity class expendable launch vehicles. Starfind has not yet applied to the FCC for an operating license, but has a Memorandum of Understanding with Space Services Inc. for the launch of five satellites beginning in 1989. Starfind recently sold the rights to market its products and services in South and Central America, as well as Mexico, to a South American company for a substantial fee.[39]

International Service Providers

INMARSAT is the largest provider of mobile satellite services in the world today, with 54 member nations, including the U.S. As with INTELSAT, the U.S. participates in INMARSAT through its designated operating entity, Comsat. Comsat's current ownership share in the INMARSAT system is approximately 28

percent.[40] Currently, INMARSAT is chartered to provide maritime satellite services. However, amendments have been proposed that would permit INMARSAT to provide aeronautical services. The United States has accepted these amendments, but has not yet resolved legal and regulatory issues concerning the manner in which U.S. entities, including Comsat, may participate in the provision of INMARSAT aeronautical services.[41] INMARSAT has also taken steps for the eventual provision of land mobile and radio determination services.[42]

Aeronautical Radio Inc. (ARINC), which is the communications company for most of the commercial airlines, domestically and internationally, is also planning to establish an aeronautical satellite system; however, its initial request for authorization was rejected by the FCC.[43] As an interim step, ARINC has stated its intention to provide aeronautical satellite services using leased circuits from INMARSAT. This lease proposal has been agreed to by Comsat and is now pending before the INMARSAT Council.[44]

Demand For Mobile Satellite Services

During 1986, INMARSAT's telephone traffic increased by 7.8 percent and telex traffic grew by 15.4 percent over 1985 levels; however, the overall revenues of $61.3 million remained roughly the same as in 1985, due to a decrease in system utilization charges. Traffic growth was constrained by a 20 percent traffic decline in the offshore sector as a result of the decline in demand for petroleum products. Nonetheless, there was a 25 percent increase in traffic in the overall shipping sector, including passenger vessels, trading ships, fishing boats, and yachts. Provision of aeronautical and land mobile services in the years ahead should provide additional sources of revenues to INMARSAT and competing systems.[45]

The RDSS market promises tremendous growth over the next decade. In addition to the U.S., countries in Europe, plus Canada, Mexico, India, Australia, and the People's Republic of China are expected to be major markets for RDSS services and equipment. Worldwide annual revenues from the provision of RDSS services are expected to be from $150 to 200 million by 1992. By 1995, annual worldwide revenues are expected to reach $1 billion or more. These projections are based in part on the anticipated effect on user demand of significantly declining prices of RDSS ground units. For example, in the U.S. alone, there are expected to be more than 135,000 units in operation by the end of 1990, with each unit selling for $1,000 to $2,000. By 1995, the price per unit is expected to drop to less than $500, and the number of units in service is expected to increase to more than 1 million.[46]

SATELLITE MANUFACTURES COMPONENT

U.S. MANUFACTURERS

The three primary U.S. spacecraft manufacturers for commercial satellite systems are Ford Aerospace and Communications Corporation (a division of the Ford

Motor Company), GE Astro-Space (a division of General Electric), and Hughes Space and Communications Group (a subsidiary of General Motors). These companies have manufactured most of the Free World's communications satellites. There are at least 40 additional firms in the United States that manufacture spacecraft components for commercial satellite systems.[47]

FOREIGN MANUFACTURERS

Europe's primary satellite manufacturing companies include British Aerospace and Marconi (U.K.), Matra and Aerospatiale (France), and MBB (Germany). Japan's major spacecraft manufacturers are Nippon Electric Company (NEC), Mitsubishi Electric Company, and Toshiba. Canada's Spar Aerospace is also involved in most aspects of satellite system manufacturing. These companies have begun forming consortia among themselves for bidding on particular system proposals. While in the past these companies teamed with a U.S. spacecraft manufacturer as the prime or major sub-contractor, the European and Japanese firms have developed increased competence in satellite technology and an increasing ability to compete against U.S. companies. The European companies already possess the technical competence to build their own satellites. The Japanese companies will be competitive providers of satellites by the year 2000. The Soviet Union is attempting to market its communications satellites for sale or lease on a commercial basis.

DEMAND FOR COMMUNICATIONS SATELLITES

Demand for commercial and foreign communications satellites can be divided into three categories: (1) satellites to replace those whose operational lifetimes have expired, (2) satellites required to expand existing satellite systems, and (3) satellites required for the establishment of new satellite systems. The decision to construct, launch and operate a satellite is based on numerous factors, including market conditions, costs, timing and alternatives.

Worldwide commercial billings for communications satellites by U.S. and foreign manufacturers in 1987 totaled approximately $1 billion. Total billings in 1986 were also approximately $1 billion. Sales by U.S. manufacturers constituted approximately one half of these totals. Sales should increase steadily at least through 1990, as the demand for satellite transponder capacity catches up with the current supply.[48]

In addition, demand for satellite communications equipment in the Pacific Rim countries, Africa, and Latin America should continue to increase. U.S. spacecraft orders between now and 1990 include shipments to Japan, the United Kingdom, Luxembourg, Australia, and Canada.[49]

GROUND SEGMENT COMPONENT

MANUFACTURERS

The major U.S. ground station manufacturers include Andrew, California Microwave, Collins, Equatorial Communications (recently acquired by Contel), Harris, M/A Com (acquired by Hughes), Microdyne, NEC America, Scientific Atlanta, and Vertex. There are more than 80 firms in the U.S. alone that manufacture earth stations and related equipment. These companies provide a variety of services or equipment including network services based on the use of VSATs and related ground station equipment.

FOREIGN MANUFACTURERS

Foreign manufacturers of earth terminals and related ground equipment include European, Canadian, and Japanese firms. The primary European manufacturers are Siemans, CSF Thompson, and Alcatel. The primary Japanese manufacturers are NEC, Mitsubishi and Toshiba. The major Canadian manufacturer is Spar Aerospace.

DEMAND FOR SATELLITE GROUND SEGMENT EQUIPMENT

Revenues to U.S. companies from the domestic sale of earth stations (exclusive of related tracking, telemetry and control equipment) totaled $1 billion in 1986. Revenues dropped in 1987 to $700 million, due to the decision by broadcasters to eliminate free access to video signals through scrambling and end user uncertainty caused by the Challenger accident. Forecasts for 1988 are that revenues from earth station sales will rise 15 percent, to $805 million.[50]

U.S. exports of earth terminals have grown at an increasing rate over the past three years, from $27 million in 1985 to $33 million in 1987. Future export growth should follow the expansion of satellite broadcasting capacity in Europe. The estimated worth of the earth station market in Europe by 1990 is $3 billion. The rapidly industrializing Pacific Rim nations should also provide immense market opportunities as well as new competitors for U.S. earth station manufacturers and distributors.[51]

U.S. INDUSTRY VIABILITY ASSESSMENT

The following section represents a distillation of current industry views on factors affecting the commercial prospects or viability of this industry sector. The industry concerns presented here have been expressed over the last year to the Department of Commerce through briefings by more than 100 companies covering the entire range of commercial space activities.

The views expressed here are those of space industry representatives and do not necessarily constitute policy recommendations by the Department of Commerce. This section is intended to provide a basis for more informed discussion of these

issues. Where a diversity of industry views exists, an attempt has been made to present the various industry views in a balanced manner.

Satellite communications faces significant competition from terrestrial communications media providing similar services. The terrestrial medium offering the greatest challenge to satellite communications is fiber optic cable, particularly in the area of point-to-point voice communications.

Some forms of satellite communications, such as mobile services, are not directly threatened by competition from fiber optic cable, which is limited to connecting fixed points; however, the continuing expansion of cellular telephone services, as well as other land-based mobile communications technologies, will, in the future, challenge some aspects of the mobile satellite services market.

Other forms of satellite communications (point to multi-point, e.g. the market served by VSATs) are more economical than fiber optic cables, especially over long distances and difficult terrain. Satellite communications is also required as back-up to fiber optic cables to compensate for frequent outages. One trans-Atlantic cable had 81 days of outage last year, compared to 35 hours of outage on the INTELSAT system during the entire history of the organization. Moreover, the application of digital techniques is vastly increasing the usable capacity on existing satellite links, making it less costly and more competitive.

Access To Space

Costs

U.S. communications manufacturers and operators have indicated that the availability of reliable, affordable launch vehicles is a key factor in the viability of the communications satellite industry. Costs of commercial satellite communications services will increase due to higher costs for launches and insurance. This makes it more difficult for the satellite industry to maintain or expand market share in competition with fiber optics and cellular telephone systems, both of which continue to decrease in price.

Uncertainty Over Launch System Availability

Satellite owner/operators have expressed concern about whether the launch service providers they contract with will still be in business three years later for the scheduled launch date. Any uncertainty in this regard causes serious concern for the satellite owner/operator, who has invested hundreds of millions of dollars in the space and ground segment in anticipation of a reliable, timely launch. It also makes raising new capital for future satellites extremely difficult.

Range Use -- Schedule Reliability

Satellite owner/operators and manufacturers have complained about being unable to secure firm launch dates or prices with U.S. launch service providers.

END