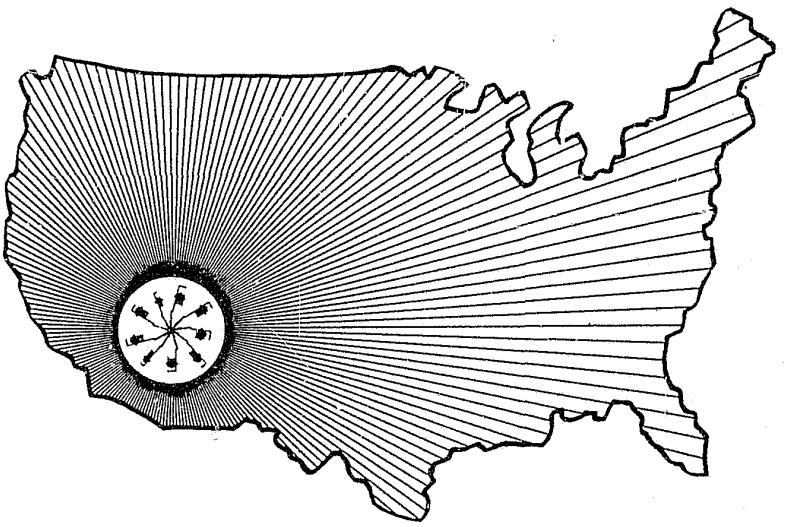
National Law Enforcement Telecommunications System



UPGRADE PROJECT

(FINAL REPORT)

1977

FINAL REPORT FOR NATIONAL LAW ENFORCEMENT TELECOMMUNICATIONS SYSTEMS UPGRADE PROJECT

1973 - 1977

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Final report of work performed under Law Enforcement Assistance Administration Grants, Nos. 72-SS-99-3006, 74-SS-99-3307, 75-SS-99-6018, and 76-SS-99-6032, awarded to NLETS.

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> The course of law enforcement has been profoundly altered by the introduction of the capability to communicate over distances. The sophisticated electronic communications devices which industry and technology have produced and made available are, to say the least, incredible, if not magnificent. (Tobias, 1974, ix)

Introduction

For a period of time prior to Christmas Eve, 1973, interstate police communications in the United States were, at best, haphazard. Although efficient systems existed which allowed the public to communicate with a local police headquarters and efficient systems existed which enabled a police control center to maintain instantaneous contact with mobile police officers, the third leg of the law enforcement communications system had broken down.

Individual police jurisdictions had great difficulty in communicating with one another. This was especially true if messages were required to travel between states. The

enormity of the problem can be illustrated, at least on a theoretical level, by suggesting that in some instances it was possible for a fleeing felon to actually out run the electronic interstate police communications network. This network, designed for another era, had served its function well but had grown inadequate in handling its burgeoning traffic commitments.

The Law Enforcement Teletype System, formed less than ten years earlier to serve interstate police communications needs, was, in effect, suffering from terminal information overload. Vital police messages could be tied up in its circuits for hours before being delivered to their proper destinations. An equally important ramification of the system's inadequacy was that automatic long distance data retrieval was impossible.

In an age obsessed with statistical records, the flurry of paper documents required by law enforcement agencies had long since overwhelmed manual filing systems. Many police systems had found it expeditious, if not an absolute necessity, to relegate many of their required records to computer-accessed electronic data banks. But much of this stored information was underutilized because there was no rapid access and transmission system in existence which could enable a police officer in one state to benefit from valuable, even lifesaving, information which was available for his use in the data banks of another state.

The deficiencies in interstate law enforcement communications were recognized, and representatives of the states-operated Law Enforcement Teletype System cast about for the means and methods of improving their network. Funding for the improvements required was found in the form of a series of grants from the Law Enforcement Assistance Administration.

One purpose of this report is to document the metamorphosis of the National Law Enforcement Telecommunications System from its humbler beginnings to the ultra-sophisticated communications network that it has become. Additionally and primarily, this document is to serve as a final report for LEAA grants #72-SS-99-3006, #75-SS-99-6018, #76-SS-99-6032 and supplementary grant #74-SS-99-3307. The grants, which commenced on June 29, 1973 and covered a time span of forty-eight months, provided much of the four million dollars needed to make the nationwide interstate police communications and data bank access network a potent criminal justice tool.

Much of the information needed to document this historical examination was taken from primary sources such as grant applications and reports which were available in the NLETS files. The information is presented for the most part in a chronological order with the majority of emphasis placed upon those years in which the LEAA grants were operative. As the entire upgrade project of the NLETS network was philosophically divided into three phases, this report

also reflects those divisions. Phase I of the project provided the foundation for the new high-speed communications system through the employment of design and implementation consultants and the purchase of a computerized message switching system. The computer/switcher which first went into operation on the day before Christmas, 1973 is the heart of NLETS. Phase II was primarily concerned with providing assistance to individual state users to develop computer interfaces needed to allow NLETS to operate as a truly high-speed sophisticated communications system. Phase II additionally encouraged new users and new uses of the national law enforcement communications network. Phase III of the upgrade project dealt with the concept of redesigning the network lines for greater efficiency and to allow the system, through savings in line leases, to become a fiscal self-sufficient entity capable of providing the necessary communications services through funds available from monthly user contributions.

Additional sections of this report describe the historical roots of the National Law Enforcement Telecommunications Systems, indicate the present parameters and operating procedures of the network, provide a summary of the upgrade project, and offer projections for future operations.

Historical Background

> One of the cornerstones of modern life is the ability for men to communicate with other men. Whether it be from across the street, or across the continent, man, to survive, must be able to convey and receive an astounding and continual flow of intelligence, or if we may prefer to call it, information. Our world depends on countless exchanges of data, be they verbal, written or visual. (Tobias, 1974, p. 5)

Communication is a necessity to all societal elements; it is, in effect, the cement which binds us together. Efficient communication is especially important in preserving cultural norms through criminal justice functions. In our society in which personal channels of communication are instantaneous and in which personal channels of transportation are worldwide, the resources and mobility available to the offender require that, in order for society to prevail against the offender, the world be treated as a single global village. Even though political jurisdictions severely limit a world view, communication systems allow instantaneous access to distant data bases containing information on criminal activities, property registrations, identifications, etc.

The law enforcement community, when given access to the communication systems made possible through continuing advances in technology, has been able to maintain a high degree of efficiency in an increasingly complex and mobile society. The efficiency of law enforcement can be directly

coupled to the internal and external communication systems. Leonard (1970, p. 3) stated, "The evolution of American police administration in its present form is geared directly to the emergence of the police communications system."

However, it should be noted that advances in law enforcement communications are relatively recent and have not always been easily accomplished. Tobias (1974, p. 12) indicated that "in fact, an article in the March, 1927, Police Journal stated emphatically that radio was not for the police." Two years later a significant disagreement took place between the Federal Radio Commission and the State of Michigan concerning the allocation of a radio license for the Michigan State Police. During this disagreement the FRC threatened to send federal personnel to Michigan to halt the operation of the police radio transmitter (Tobias, 1974, pp. 14, 15).

The police prevailed, however, and two-way radio became one means by which effective law enforcement communications could be accomplished. Tobias (1974, p. 14) described police communication at that time: "The thirties saw radio become a potent weapon in the fight against crime, both as a communications tool and as a deterrent. Radio communications, combined with the mobility of the automobile, created a very powerful tactical weapon in the hands of law enforcement."

Long before two-way radio became a communications reality, law enforcement agencies had perceived a need for fast and accurate communications. The invention of the telegraph instrument provided a partial solution to the

communications void. In fact, Leonard (1970, pp. 4-5) stated:

> The appearance of the telegraph as a means of communication marked the first advance in the development of police communication systems. It was first used in the larger cities for communication between police headquarters and the precinct stations. . . . The 'telegraph key' became the symbol and the instrument of communications between headquarters and the precinct station and to a limited extent, between the police departments from one city to another.

The "telegraph key" quickly lost favor and was replaced by the newer technology of two-way radio. The major advantages of radio were its increased speed and more importantly its flexibility. The receiving and transmitting instruments were not physically tied to the restraints of a wire but enabled the communications system to accompany the officer into the field.

While radio provided a vital line in the law enforcement communications system by providing the potential of instant contact between the officer in the field and his headquarters, communications between police departments began only a few years earlier with establishment of the teletype as an instrument of police communications. The teletype was first used in law enforcement in Connecticut in 1927 (NLETS, 1973, p. 1). Leonard (1970, p. 10) described use of the teletype:

> County and state police teletype networks were not long in developing, once the efficiency of this new communication facility was demonstrated. Early county installations appeared in Essex County,

> New Jersey, and in Nassau County, Long Island. The first state-wide police teletype network was placed in operation by the Pennsylvania State Police in 1929. . . . Other states soon followed in the footsteps of Pennsylvania.

The teletype was found to be especially useful in law enforcement communications. As Leonard (1970, p. 10) stated:

> It combines the speed of the teletype with the authority of the printed word. The distance, whether a few feet or the width of a continent, makes no difference; the results are the same--accurate, fast and reliable transmission of orders and information from one point to another.

Teletype communications within the political jurisdictions of a state or of a county were easily established and proven to be quite useful; however, criminal mobility increased, and the need for wider area police communications became apparent. The first teletype system that interconnected states went into service in 1930 and connected New Jersey, New York, and Pennsylvania (NLETS, 1973, p. 1). These networks, established between states, continued to develop on a regional basis. Hassenpflug (1965, p. 2) said, "A number of small manual two-point circuits appeared, interconnecting various states such as Massachusetts to Vermont; Connecticut to Rhode Island; New York to Washington, D.C.; Ohio to Pennsylvania; Virginia to Ohio; North to South Carolina; and Florida to Alabama; to name a few." Because of the shorter distances and therefore lesser costs in the form of line charges, these early interstate teletype networks were established first in the New England states and along the

Atlantic seaboard (Flanagan, 1977). "The West Coast System began with California's connection to Nevada, then Yuma, Arizona and up to Oregon in 1953. The Gulf States of Texas and Louisiana were connected by teletypewriter in 1958. . . . By the end of 1962, there were nearly 3000 LETS locations throughout the United States." (Hassenpflug, 1965, pp. 2,3) By 1963 the eastern seaboard states were interconnected in a teletype network that extended from Maine to South Carolina and as far west as Ohio and West Virginia (Hassenpflug, 1965, p. 3).

Other smaller regional networks were established throughout the country, but for the most part the relationships between states in the teletype networks were very informal. West Virginia's link to the rest of the nation's law enforcement agencies in 1955 was not atypical. Two teletype machines were located in the Ohio State Patrol barracks in Jackson, Ohio. One teletype line went to Columbus and thereby to other states, and the second line terminated in Charleston, West Virginia. A message sent to or from West Virginia had to be retransmitted by hand in Jackson and so forth until the message reached its final destination. As there were no links between the separate systems, delays were inevitable, and the small informal networks were inefficient even for handling the relatively small amount of traffic required of them in the 1950's and 1960's (Flanagan, 1977).

Other means of interstate communications were also attempted. Some areas relied simply on voice communications

transmitted from one police department to the next. While lack of speed was a problem in this type of communication system, its greatest shortcoming was the substantial amount of inaccuracy which could be induced into the system. The context of the message could change quickly with the addition or deletion of a word or a misunderstood syllable.

Another communications system was attempted early in law enforcement communications history. In 1935, NPCN, the National Police Communications Network for continuous wave (CW) communications was formed. Tobias (1974, p. 20) described it:

> There were nine frequencies allocated for CW net use. By 1951, there were 90 CW stations, but just ten years later, this number declined to about 80, where it has remained. The use of CW has decreased markedly as a means of information transfer, except for certain federal agencies. Because of high speed data and teletype and the problems of training personnel and licensing requirements, CW has been limited mainly to use during emergency conditions where distant communications by radio is necessary.

Although CW had served police communication as well as could be expected, the private line teletype became more popular since it offered some unique advantages. As NLETS (1973, p. 5) stated:

> It was economical, . . . [it was] confidential, as messages were only available to police agencies, [it provided] a written record of each message sent over the system, where they could not be 'mis-copied' or misconstrued. There was no limit to its expansion capabilities; Canada, Mexico, Alaska, Hawaii and even overseas is certainly feasible. It is

> designed for future developments in the ever changing computerized communication field.

The early 1960's saw two major links of the police communications system well defined and established. The ubiquitous telephone had provided a readily accessible first link between the public and the police headquarters. The second link, that between police headquarters and the officer in the field, had been well established by the use of reliable two-way radio communications. But the third link, that of providing intercommunication between police departments, was still, at best, haphazard.

After World War II, the population increased, citizens became more mobile, and technology improved. While these things were occurring exponentially, the necessity of increased record handling capacities in law enforcement agencies became apparent. Some agencies began to use electronic data processing in the late 1950's, and the need for an organized interstate police communication system emerged.

The Law Enforcement Teletype System

A nationwide teletype communications system was needed to complete the third link of the police communications system. Early impetus for such a system came from the annual Police Teletypewriter conference held in Nags Head, North Carolina in May of 1965. Approximately twenty-five states agreed at that meeting to install an automatic interstate communications

system with a central switching system. Captain George J. Bundek of the Delaware State Police was elected national coordinator of the Police Teletypewriter Network. (International Association of Chiefs of Police Communications Committee, 1965, p. 6)

Bundek traveled to Salt Lake City in October of that year to propose a national police teletype system to the Western Area Network Telecommunications System. The proposal was accepted, and a National Law Enforcement Teletype System was on its way to becoming a reality. (IACP Communications Committee, 1966, p. 2) The possibility of such a national service became apparent early in 1964 when officers of the different regional interstate police teletype systems then in operation learned of an arrangement through which they could qualify for reduced line rates through the General Services Administration's Telpak Arrangement. (Bundek, August 2, 1966, p. 2) A network of the forty-eight contiguous states and Washington, D.C., and New York City was designed and made operational in 1966.

The first official message was sent over the system at 11:00 a.m., Eastern Daylight Savings Time on May 2, 1966. In that message The Honorable Charles L. Terry, Jr., Governor of the State of Delaware, stated in part: "This dynamic method of communication between law enforcement authorities throughout our union will mean a tremendous boost in our never ending battle against crime." Subsequent messages were sent over the system that day by other governors; all of them dealt

with the importance of the establishment of the system in the fight against crime. Later that morning, in a message to all circuits, Captain George Bundek stated, "National LETS today becomes operational and I expect it to prove itself being the most valuable tool available to all police agencies."

The Law Enforcement Teletype System, which was made up of the original regional networks and which used torn tape relays and low-speed circuits, was housed in the Arizona Highway Patrol Headquarters in Phoenix, Arizona. For the first time all forty-eight continental states were linked through a law enforcement teletype system. To do this the United States was divided into six circuits. These circuits contained a maximum of thirteen states to a minimum of four states. The system could operate with each circuit serving as a network or with all six regions tied together as a national network. The system was designed to operate automatically at a speed of 100 words per minute. To transmit a message, a paper tape was first punched; this tape was then fed into the transmitter gate of the teletypewriter. When the control station transmitted the start code, the tape was fed through the transmitter gate where the punched tape modulated an electrical signal. By assigning the proper address codes or call directing codes, the signal was automatically transmitted to its correct destination through the switching center located in Phoenix. Incorrect codes resulted in the message being intercepted in the switching

center where operators were needed to re-enter the message along with the correct code back into the system. At one time this network, developed by Bell Systems, was processing six thousand messages per day with about 10 percent of those messages being switched "cross office" or from one region to another. According to NLETS (1973, p. 4) over 4500 teletype terminals in law enforcement agencies across the nation were connected to LETS with each state paying approximately $400 per month for the service.

The last state joined the LETS in February, 1967, and the Federal Bureau of Investigation was also accepted as a member. The utilization of the system surpassed the estimates of its founders. By early 1967 over 2.5 million messages had been sent over the system, and the Communications Committee of the International Association of Chiefs of Police was anticipating the need to interface the teletype network with computer installations so that information could be retrieved and dispatched more quickly. (1967, p. 10)

By the early 1970's the original national system had gradually developed an inadequacy to handle the volume of traffic which had been generated. The inevitable message backlogs consequently occurred. Part of the problem was attributed to inexperienced operators that occasionally did not transmit exact address codes along with the message. Part was attributed to the inherent delays in the system. According to NLETS (1973, p. 4), "The maximum time lag for

any message to reach its destination is nine minutes. This, of course, is if all circuits are busy. The average message reaches its destination in a matter of a few minutes." The few minutes' wait became backlogs of traffic which required three- and four-hour waits for transmission of the message. Flanagan (1977) indicated that rules required that each state could only transmit three messages each time it was polled, and no priority system existed through which timely messages were transmitted first.

The telephone company switching equipment could not handle the traffic load; therefore, the LETS Board of Directors, made up of a user representative from each region, entered into a contract with Computer Control Systems in 1970 in order to upgrade the traffic capacity of the system. Two mini computers were installed in the Phoenix, Arizona switching center to replace the old cross-office switching equipment (NLETS, 1973, p. 6).

In March of 1970, LETS was reorganized and incorporated as a national nonprofit corporation under the laws of the State of Delaware. It was a significant achievement that the individual states could, with their diversity of philosophies and priorities, find agreement to organize and to operate the original LETS interconnection system for four years--the system which, in effect, first established the nationwide police communications system much needed to combat the rising rate of crime present in this increasingly complex society.

That system, even with computerization, was soon rendered inadequate due to the large increases in traffic and the growing commonality of state-computerized data handling systems. Beddome (1975, p. 8) stated, "Since LETS was not directly connected to state law enforcement computer systems, it could not rapidly access on-line driver license and motor vehicle registration information--needed within a few seconds by a mobile police unit chasing a vehicle with out-of-state plates." Tobias (1974, p. 470) pointed out, "Today, the need for rapid access to a wide variety of data is acute. Law enforcement problems are complex and involve the interplay of many individuals. The increase in crime and the mobility of the criminal has created the need for data processing capabilities at an exponential rate."

This data, if not handled efficiently, could adversely affect the operation of any law enforcement agency. As Tobias (1974, p. 466) stated:

> Data may originate in a variety of ways, depending upon time, place, situation and requirements. For the law enforcement application, data can mean a license or registration, a criminal history or rap sheet, a fugitive warrant, etc. A tremendous volume of data is generated daily in the law enforcement function. Computer systems allow reading and immediate access to the information, thereby promoting economy, efficiency, and effectiveness.

A computer system for handling the data required of the law enforcement agencies was a much heralded addition to the arsenal of crime fighting weapons. Leonard (1970, p. 44) observed:

> The appearance of the computer and its related technology promises a new renaissance in police affairs of major dimensions. Through the communication channels of the telephone, radio, and the teletypewriter, it brings police departments in the smaller communities into almost instantaneous contact with unlimited resources in terms of information management.

The effectiveness of the computer in law enforcement, though, is limited if the officer in the field does not have ready access to the records stored in computer files. While intrastate and regional computer-based records systems were being developed to make information available to the officer on a systematic and orderly basis, no national interstate communications system was capable of exchanging pertinent data through computer-to-computer interface.

Goals published in 1973 by the National Advisory Commission on Criminal Justice Standards and Goals in part state:

> Standard 23.2-5: Every agency operating a full-time communications center and employing 15 or more persons should, by 1975, install suitable equipment to provide access to local, State, and Federal criminal justice information systems. The minimum suitable equipment should be a teletypewriter capable of being connected to a data base;

and

> Standard 24.4-2: Every agency operating a full-time communications center and employing 15 or more persons should, by 1975, install a basic telecommunications terminal capable of transmitting to and receiving from established national, State, and local criminal justice information systems. The telecommunications network

should provide network switching compatible with computer-based information systems.

These goals coupled with a need for computer access and an ever-increasing traffic flow made apparent once again that an upgraded high-speed criminal justice communications system was needed.

In 1972 Thomas Allen of the Maryland State Police was elected as president of NLETS. "Under his leadership, LEAA was approached for a grant to upgrade the system. In July, 1973, a grant was awarded to NLETS. Mr. Bernard Flood was selected as the Executive Director." (NLETS, 1973, p. 6)

The new system was designed to use high-speed circuits. This would allow the users to make direct inquiries into computerized records including motor vehicle files. It would also increase the overall efficiency of the day-to-day interstate communications between criminal justice agencies throughout the nation. The new system was to become operational by December of 1973 (NLETS, 1973, p. 6).

The NLETS Upgrade Project--Phase I

The National Law Enforcement Teletype System, Inc., applied to the United States Department of Justice, Law Enforcement Assistance Administration (LEAA) for a grant to upgrade the inadequate system. This was needed to provide the technology to carry the present and predicted traffic load and to make possible computer-to-computer exchanges of communication.

A grant from LEAA for $1,189,439 was awarded on June 29, 1973. This grant, Phase I of the total project, was to run from June 29, 1973 to December 28, 1974. Its primary purpose was to "provide the National Law Enforcement Teletype System (NLETS) with a quantum improvement in efficiency, speed, flexibility and sophistication." (National Law Enforcement Teletype System, Application for Grant, Phase I, June, 1973, p. 1)

The first detailed project budget indicated that most of the budgeted money ($919,000) was to be spent for equipment lease, purchase, or installation. This included a computer/switcher, installation and programming, leased communication lines, and low-speed terminal installation. Over $392,000 of this sum was to be provided through NLETS user monthly contributions; this money was to be used primarily for the lease of communication lines for the network. The rest of the money was budgeted for salaries, consulting, legal counsel, maintenance, the establishment of an administrative office, and publication of an operations manual.

The funds requested in the grant application were to be spent implementing a telecommunications network vastly superior to the existent Law Enforcement Teletype System (LETS). The specific goals stated for the upgrade project were these: (1) the establishment of "a sophisticated law enforcement telecommunications system with sufficient speed and flexibility to meet the varying needs of subscribers in all of the . . . [contiguous] 48 states," (2) utilization of

standardized communications "procedures, codes, addresses, and data elements" through close coordination with project SEARCH and the FBI (NCIC), (3) expansion of capacity to permit additional bona fide law enforcement subscribers. The primary goal envisioned, however, for the upgrade project was the establishment of "a sophisticated law enforcement telecommunications system." The additional goals were subservient.

As a first step to developing that system, the initial design included a minimum of twenty-six subscribers that were to be equipped for high-speed (2400 BPS) computer-to-computer exchanges. This would allow those subscribers direct instantaneous access to state law enforcement data bases in those states where such access did not violate state law on privacy or security considerations. While only a limited number of states were to be served by computer-to-computer access, other states that were unable, because of philosophical or fiscal reasons, to support this technologically advanced system were to be provided with a medium-speed service (150 BPS). The new NLETS was to have the flexibility necessary to allow any subscriber to converse with any other subscriber regardless of the level of sophistication of the state interface. Specifically, the upgraded system was designed to provide the following results:

A. Increase the overall throughput of the system by a factor of more than 31.
B. Reduce to almost zero the waiting time for an individual user to gain access to the system.

C. Permit additional law enforcement subscribers to utilize this nationwide system.
D. Vastly enhance the ability of the criminal justice community to exchange operational and administrative traffic vital to effective law enforcement assistance. (Phase I, p. 2)

In order to implement a structure necessary for the successful completion of the telecommunications system, NLETS was organizationally restructured. The Board of Directors of NLETS, consisting of representatives of member states, assumed responsibility "for the overall design, implementation and management of the system." To aid the Board of Directors, the president of the system established an Operational Procedures Subcommittee and a Technical Standards Subcommittee. These subcommittees along with an executive director, selected by the Board of Directors, and outside consultants designed, monitored, guided, and administered the transformation of the Law Enforcement Teletype System into a space-age telecommunication network.

Since the new computer/switcher was to be located at the existing Phoenix site, the Arizona Department of Public Safety was designated as a subgrantee. The Department of Public Safety provided a site supervisor who assumed responsibility for the NLETS upgrade at that location. His duties included supervision, installation, coordination with vendors supplying equipment, and testing and implementing the switcher. Care was taken so that installation did not interfere in any way with the normal operation of the existent system. The Arizona Department of Public Safety also assumed responsibility

for the "receipt, disbursement, and financial accounting of all funds (Federal and State) associated with . . . [the] project." (Phase I, p. 4)

A communications consulting firm was employed to assist in the technical areas required to design the upgraded system. Among other duties the consulting firm was to

1. Develop the system parameters.
2. Design the system.
3. Develop RFP's for
   a. The lease or purchase of the computer/switcher.
   b. The lease of the interconnecting lines, modems, line conditioning and the low-speed terminal equipment.
   c. The interface between the National LETS system and the various state LETS systems. This will include electronic interface between low-speed users as well as high-speed users.
   d. Such other hardware, software or consultative services as may be required. (Phase I, pp. 4-5)

Although the primary tasks performed during the first six months of the project were to select and procure the hardware and software required to allow the first phase of the network to become operational by the target date of December 24, 1973, other tasks were performed concurrently. These included (1) the development of operating procedures with an accompanying manual of directions to aid in the use of the system and (2) the completion of a survey of current users who would be both willing and capable of supporting a high-speed interface by the target date of December 24.

A period of approximately one month was planned to allow a "deliberate and methodical cutover of the existing system to the new system." The existing system remained operational until the new system had been completely de-bugged and had

proven itself capable of handling the traffic load without error.

The grant, which made this upgrade possible, had been approved on June 29, and just three months later, by September 28, 1973, the project was well underway. Bernard H. Flood had been employed as the executive director, a secretary had been hired, an office had been opened in Phoenix, Arizona, and consultants had been employed to aid the executive director and the board in the selection of the vital hardware needed to implement the project.

Selection of the necessary hardware and an increase in the interest of the states wishing to have high-speed computer interface from an original twenty-six to thirty-five brought about the realization that the original grant would be insufficient to meet the goals of the project. (B. H. Flood, September 28, 1973) Application was made in November, 1973 to LEAA for a supplementary grant to cover the additional unpredicted expenses. The request was approved and the grant was awarded on January 23, 1974.

The supplementary grant for $475,413 was primarily intended to cover the costs unforeseen when the original grant request was submitted. Among other items, the new budget contained an additional $21,000 for full-time availability of maintenance for both hardware and software. An increase of over $394,000 allowed for the purchase rather than lease of a more complex computer/switcher than was originally contemplated, and an additional $36,916 was

budgeted for leased lines and low-speed terminals. (National Law Enforcement Teletype System, November, 1973)

Prior to the award of the supplementary grant, however, the new computerized switching system for NLETS was in operation. The December 24 deadline had been met, and just six months after the first LEAA grant award was awarded, the new communication network was a reality. NLETS President Tom Allen of the Maryland State Police sent the first formal messages over the system to LEAA administrators telling them that the new system was operating as scheduled.

Action Communications Systems had been selected to provide two complete programable telecontroller processors. These special-purpose computers, valued at over $700,000, serve as the nucleus of the communications system. The two units, located in the Arizona Department of Public Safety Headquarters Building for security purposes, operate as a "store-and-forward" system. All incoming messages are stored on magnetic disks as they are received. These messages are then forwarded to their proper destination when that terminal or computer is available to receive them. Communications News (January, 1974, p. 27) described the process:

> The NLETS system consists of a pair of Telecontroller programable processors. This means there is a backup at all times. If a failure should occur in one of the processors or associated peripherals, the system will be switched over to the standby processor and peripherals for continued operation. The system as configured, is capable of providing better than 99.9 percent on-line reliability.

The new system which first went into operation included fourteen high-speed line interfaces and three low-speed computer connections with the rest of the states being connected via 37 ASR teletype-150 baud lines. (C. Beddome, February 11, 1974) The original states interfaced to NLETS via computer included Arizona, Connecticut, Florida, Georgia, Illinois, Indiana, Kansas, Maryland, Missouri, Montana, Nebraska, New Mexico, Oregon, Pennsylvania, Texas, and Vermont. Additionally, the FBI had a computer interface to the system through NCIC.

Upon the cutover to the new system NLETS Executive Director Bernard Flood stated, "The accelerated system upgrade program is a perfect example of the kind of accomplishments achievable through the joint efforts of the state law enforcement agencies and the United States Department of Justice, Law Enforcement Assistance Administration (LEAA)." (Communications News, January, 1974, p. 27)

With the new high-speed system in operation, the Board of Directors approved a change of name for the organization. The Law Enforcement Teletype System officially became the National Law Enforcement Telecommunications Systems, Inc., as of the January 15-17, 1974 Board of Directors meeting. This change was to reflect the new and expanded potential and capabilities of the system. Interstate law enforcement communications no longer suffered from the technical limitations of the teletype but had moved into the age of high-speed computer access and transmission.

By February 1 of 1974, the cutover was complete, and the old switching system which had been on standby during the de-bugging of the computers was disassembled. C. J. Beddome was employed as executive director early in 1974 to replace Bernard Flood who returned to service with the Arizona Department of Public Safety (C. Beddome, February 11, 1974).

By fall of 1974 the system had become well established, and outside law enforcement agencies such as the Drug Enforcement Administration were requesting access to the system (C. Beddome, October 15, 1974). A users manual had been published so that the state operators could efficiently communicate via the NLETS network, and the cost to the individual states was raised to $800 monthly effective July 1, 1975. The purpose of this planned rate increase was to sever the fiscal dependency on LEAA and to allow the system to move towards self-sufficiency on an orderly basis (C. Beddome, October 15, 1974).

An additional concern at this time was an evaluation of the location of the computer/switcher as mandated by a special condition (number 13) of the original grant. The purpose of that special condition was to evaluate the present location and future possible locations of the central computer. This was done to investigate possible savings through reducing leased line costs by obtaining a more centralized location for the switcher.

The rationale by NLETS ("Evaluation of Optimum NLETS Computer/Switcher Site," 1974, p. 1) for placement of the

switcher in its Phoenix location was based on these points:

> Nine previous years' experience of Arizona DPS communications personnel in the NLETS operation.
> Proximity of old and new system for easy transition.
> Lack of interest by potential host states in the Midwest.
> Possibility of more than one switching center in the future.
> Site preparation might have caused undue delay and missed deadlines.

Three alternatives to the present Phoenix site were identified and researched. Alternative number one included moving the switching center to another state location. This would result in savings of approximately $60,000 per year. However, no state agencies offered to provide housing at the same rate that was available in Phoenix. Additionally, the moving expense would total a minimum of $138,000 which could not be recovered for several years. Finally, a major move was thought to entail potential delays not desirable during the developmental grant period.

Alternative number two was to house the system in a state criminal justice facility and to pay for all services on an "as-used" rate. In addition to the problems generated by the move as outlined in alternative number one, this alternative provided an estimated increase in operating expense of $51,200 per year. The "break even" point for this alternative was projected for the spring of 1982.

Alternative number three was that NLETS would lease space and outfit it on its own. The two major objections to this alternative were the high initial cost and the

problem of providing proper security for the system. Each of these alternatives was discussed in NLET's "Evaluation of Optimum NLETS Computer/Switcher Site" of 1974.

Other factors entering into the decision not to move the switching center from its present Phoenix location included these:

1. An established working relationship with the Arizona Department of Public Safety.
2. The establishment of AT&T long lines maintenance crews in Phoenix thus providing quick service in response to maintenance problems.
3. The necessity of training additional personnel for the operation of the system in a new location.
4. The possibility of the establishment of a second switcher network in the future--one of which would serve eastern states and one which would serve the western states. This possibility was based upon a study by the Jet Propulsion Laboratory known as Nalecom, which projected an ever-increasing volume of traffic on the system.

For these reasons the switching center was to remain in the original Phoenix location, and additional methods of reducing line cost were to be investigated (Beddome, December 31, 1974).

In March of 1975, NLETS submitted a request to LEAA to adjust the grant so that it could be extended through April 30, 1975. This extension with its resultant reallocation of funds was necessary for NLETS to continue operations. As a sum in excess of $190,000 remained unencumbered in the NLETS grant and Phase II of the upgrade of the NLETS system was to be approved by LEAA, the request did not amount to an increase in funding of the project but only a readjustment in

the timetable and categories of expenditures (NLETS, March 21, 1975).

A need for this reallocation might have been in part due to some "mix up" when the Arizona Department of Public Safety was administering NLETS financial affairs including money dispersed through the LEAA grants (NLETS, December 31, 1974). By the date of the request for grant adjustment (March 21, 1975), however, the certified public accounting firm of Brown and Weekley had been employed to assist NLETS in developing its own accounting procedures (NLETS, March 21, 1975).

The LEAA grant was adjusted as requested to run an additional five months or from January 1, 1974 until April 30, 1975 thus allowing for continued NLETS operations throughout a critical developmental period.

A final report for the original grant detailed the progress from the period of time June 23, 1973 until April 30, 1975 and covered the accomplishments of NLETS during this time. This report, submitted to LEAA, included a review of the disposition of the many special conditions attached to the grant. For example, in order to receive the Phase I grant from LEAA, NLETS was required, among other special conditions, (1) to house the computer/switcher in a state criminal justice agency so that adequate safeguards on system security and "privacy to records moving through the system" could be insured, (2) to provide for the administration of all grants by the Arizona Department of Public Safety "pursuant to the

applicable statutes, policies and procedures of the State of Arizona," (3) to develop operational and technical procedures and policies jointly with Project SEARCH, (4) to utilize "NCIC operating and technical standards and procedures" as appropriate in order to insure nationwide communications compatibility. Additional conditions concerning bidding procedures and record and reporting procedures were also met by the NLETS organization.

After some frustration, much hard work, and the expenditure of additional funds made possible by the supplementary grant, the first phase of the planned forty-two month NLETS upgrade project concluded. The accomplishments of the system during this time were significant.

The goals of the project had been met on schedule. A sophisticated NLETS telecommunications system had been designed and implemented. The system was capable of computer-to-computer access of state driver's license and vehicle registration records. All the continental United States, Hawaii, Alaska, and Puerto Rico along with federal agencies such as the FBI (NCIC) and TECS (Department of Treasury) had access to the system through a compatible network of both high- and low-speed dedicated lines. (Later, for a variety of reasons, Hawaii and Puerto Rico would drop out of the system.) Thirty-three states had completed or were scheduled to complete computer-to-computer interface to the Phoenix switcher. (This was well above the twenty-six states originally projected to have this capability in the

grant application.) Most of the states were interconnected by high-speed lines, and seven states had fully automated interfaces with their own intrastate law enforcement communication systems. An expanded NLETS organization had been developed, and headquarter offices had been established in Phoenix in order to more efficiently conduct the day-to-day business of the organization. (NLETS, May 23, 1975)

The reality of the upgraded NLETS network can best be demonstrated with system traffic statistics generated at the close of the first LEAA grant period in December, 1974. All traffic on the system increased 46.7 percent over the previous year. The greatest increases in the use of the system were in the areas of driver's license inquiries and vehicle registration inquiries. Increases of 79.9 percent and 93.2 percent respectively were tabulated. (NLETS, May 31, 1975) The increases in the number of messages sent over the system, each with virtually no delay, indicate dramatically the extent to which the state users embraced the high-speed upgraded NLETS network.

The NLETS Upgrade Project--Phase II

While Phase I, or the original LEAA grant to NLETS, provided the foundation for the high-speed interstate law enforcement communications network, much additional work was needed before all state users were adequately equipped to take advantage of the potential offered by the system.

As a planned continuation of the upgrade project, Phase II required a third major grant from LEAA. This grant for $804,590 was scheduled to run for one year beginning May 1, 1975. A variety of delays in the implementation of the goals of this phase of the upgrade actually caused this grant period to be extended at no cost to a total of twenty-eight months, finally terminating in April, 1977.

Some of the goals envisioned for the Phase II grant period included (1) encouraging additional users and new applications of the system, (2) encouraging the continuing upgrade of the individual state systems so that additional computer-to-computer interface and automated access to vehicle registration and driver's license files would be more readily available, (3) development of policies and procedures for system security and personal privacy "which both conform to proposed federal legislation and provide adequate safeguards for sensitive information transmitted over NLETS facilities," (4) implementation of cost reducing equipment and procedures necessary for the system to regain fiscal independence by a target date of December 31, 1976. (NLETS, April 23, 1975)

While Phase II is best characterized as a continuation of the programs initiated in Phase I, principal objectives are predominant. These include a "continuing improvement of the management and technical capabilities of the system"; and a desire to make "NLETS facilities available to all elements of the criminal justice community at the state and local level." (Ashton, January 6, 1975, p. 3)

In the evaluation of the grant by LEAA, communications specialist S. S. Ashton (January 6, 1975) stated, "At the end of Phase II of the upgrade and the second year of full operation, NLETS will be a substantially more flexible system capable of better meeting the varied requirements of a much broader segment of the criminal justice community. Additionally, it will be electronically interfaced with twelve more intrastate criminal justice telecommunications systems" (p. 4). The grant funds requested were to be used in the areas of adminstration and management costs, contractual, equipment, and supplies and other operating expenses.

The majority of the money requested was budgeted for the acquisition of additional hardware necessary to improve the efficiency of the system and to decrease the cost of the leased lines. Additional large sums were required to continue a technical assistance program. This program was designed to provide funding reimbursements to the individual states that developed a computer-to-computer interface with the Phoenix switcher. (NLETS, December 16, 1974, pp. 1-5)

In July of 1975 an "NLETS Work Plan" was submitted to LEAA. That paper described some of the major tasks envisioned in Phase II of the NLETS upgrade project. The tasks to be completed were identified as concerning the following areas: multiplexing, purchase of modems, multiblocking, data transparency, computer reconfiguration, interface states, and a terminal users directory.

Multiplexing was implemented in an attempt to decrease the cost of leased lines running from the state port of entry terminal to the Phoenix computer/switcher. The purpose of the multiplexers was to allow more than one message to be sent over one line at a time, thereby decreasing the number of lines needed to handle the traffic load. After a suitable period of testing, multiplexers were installed at seven locations throughout the United States including the original test sites of Albany, New York, and Pikesville, Maryland.

Quarterly reports provided to LEAA by the NLETS staff indicate the progress of the multiplexer installations. A portion of the multiplexing system had been installed and was operational by the August 7, 1975 reporting period. Each hub was installed in stages and immediately began saving large sums of money. By the September 31, 1975 reporting period, the entire multiplexer network had been installed, thus accruing a cost savings of nearly $10,000 per month. This was somewhat ahead of the projected schedule. With the full multiplexer system operational by the end of 1975, NLETS was on its way to becoming more financially self-supporting due to the substantial decreases in monthly operating costs. However, the switch to a multiplexer system created a loss of voice circuits integral to the original network, and a limited in/out WATS telephone link was established in order to allow unfettered trouble reporting. (NLETS, August 7, 1975, p. 2)

The second important task identified by the NLETS staff was that of investigating the purchase of modems. Modems are,

in effect, modulators. They convert the signal which travels over the telecommunications lines into a different type of electrical signal which is intelligible to a computer. Modems are needed to interface the computer to the line at both the sending and receiving ends of the line. The purpose of purchasing the modems was to decrease some of the monthly rental costs associated with the operations of the telecommunications system.

An ad hoc committee for the advancement of telecommunications was assigned the task of analyzing different methods of improving the NLETS network. This committee, in conjunction with their assigned task, conducted research into the possible purchase of the modems. Their recommendation, as reported May 21, 1976, was to postpone the purchase of the modems until such time as the purchase and installation of line concentrators had been completed. Installation of concentrators and high-speed modems was scheduled to become part of Phase III of the NLETS upgrade. Other modems leased from AT&T during Phase II were replaced by purchased equipment during Phase III, thus lowering the monthly operating costs even further.

A third task was that of developing multiblocking in order to allow increased message length. The need to increase the possible message length from one block of up to 1000 characters to five blocks of 1000 characters or up to 5000 total characters was recognized early, and plans were made to incorporate this change. The cost of this benefit to NLETS was negligible as the computer/switcher software was in existence and had

been included as part of the original protocol.

The computer/switcher was made ready to accept the change by June 15, 1975 in order to be operational by the projected July 1, 1975 date. (NLETS, October 21, 1975) However, continuing delays by individual state users pushed the date back to October 1, 1975 and then again to January 5, 1976 and finally to February 17, 1976. The multiblocking concept required that all users be technically capable of participation prior to its use on the system. Multiblocking was a reality by the April 30, 1976 NLETS reporting period.

A fourth projected task of the Phase II upgrade was that of investigating the viability of data transparency. Data transparency is needed to provide the capacity of sending bit streams of characters between frames of predefined control characters without character checking. This is necessary to allow the transmission of facsimile data, intelligence information, or legal research data. This software upgrade would have been necessary to support the Automated Legal Research project (ALR), and DACOM/CCTRF facsimile project; however, by the August quarterly report of NLETS of 1975, contact between NLETS and ALR and DACOM/CCTRF had slowed significantly. NLETS continued to investigate the possibility of data transparency with ACTION Communications Systems, Inc., (ACS), the computer vendor, but no formal steps were taken since, after much analysis, neither application could be adequately justified.

A fifth task was computer reconfiguration. This would allow more efficient utilization of the computer/switcher to

handle increased traffic loads. In order to maximize throughput or to minimize the amount of time needed for a message to be transmitted through the computer/switcher, some modification of both the hardware and software was required. However, a detailed examination of the traffic load indicated that the computer/switcher configuration was capable of handling the load. A peak hour load in October of 1975 utilized approximately 28 percent of the capacity. This adequate capacity coupled with a forecast of new developments and more sophisticated hardware on the horizon led to a decision to postpone the Phase II computer reconfiguration and instead to address the task of the reconfiguration needed to improve throughput efficiency in a future Phase III upgrade grant.

A sixth required task was that of continuing the technical assistance program to the state users. This program, initiated in the original grant, provided money to reimburse the state users some of the expense involved in developing an interface between their state law enforcement and motor vehicle registration and driver's license computer systems and NLETS. It was projected that twelve additional states would upgrade to a computer interface during the final months of the Phase II grant period.

States to receive technical assistance reimbursement from funds provided from the Phase II grant included the following:

State	Amount
Alabama	$ 3,927.69
Alaska	$12,130.44
Colorado	$ 5,760.00
Connecticut	$14,000.00
Iowa	$10,109.00
Michigan	$12,467.00
Mississippi	$14,000.00
Montana	$ 7,614.00
New Mexico	$14,000.00
North Dakota	$14,028.20
South Carolina	$10,456.45
Texas	$ 7,250.00
Virginia	$ 3,210.00
Washington	$10,665.23

Other technical assistance funds were used in developing interface plans for Kentucky, Nevada, New Hampshire, Utah, and Vermont under Phase II grant funding. By the end of the NLETS upgrade project, the District of Columbia and most states would receive substantial financial reimbursement for expenditures that they had encountered in developing plans and upgrading their intrastate systems to interface with the new high-speed national system.

The seventh major task to be undertaken by NLETS during this phase was that of developing a users directory of ORI "addresses" for all users. The ORI list would serve as a "telephone book" for the NLETS user and allow him to easily

identify and individually address any other user by ORI or computer readable address. A printing of 10,000 of these user directories was to be contracted and distributed by the end of the grant period.

However, this task turned out to be more complex than originally envisioned, primarily in regard to the sorting and arranging of the alphabetically arranged ORI's. Prior to developing a "Request for Quotations," NLETS (October 21, 1975, p. 2) surveyed all of the users to determine what their specific needs might be and how these needs might be met in the users directory. Then a local printing firm was consulted with regard to the effort and cost related to publishing the compilation. By April 30, 1976, all tasks related to Phase II had been completed or discontinued except the publication of the user's directory. On June 8, 1976, an LEAA grant adjustment provided an extension of the grant in order to allow completion of the job of developing, printing, and distributing the NLETS ORI directory.

Additionally, LEAA made a determination that federal rules required the directory to be published by the Government Printing Office. To accomplish this, LEAA in a subsequent grant adjustment deobligated $50,000 and released NLETS from the responsibility of printing, assembling, and distributing the NLETS ORI directory. Nevertheless, NLETS remained actively interested in the directory project. At the expiration of the grant on April 30, 1977, the executive director awaited the final proofs so that they could be

approved, and 12,000 copies of the directory could be printed and distributed to the users by the Government Printing Office.

All of the above-listed tasks were designed to meet the goals of increasing usability and efficiency of the system by offering new and improved services to its users while at the same time reducing operating costs in a planned move toward fiscal independence.

The National Law Enforcement Telecommunications System improved significantly with the completion of the tasks outlined in the LEAA reports. These improvements were again reflected in the utilization of the system. For example, from January 1, 1975 until March 31, 1975, traffic on the system increased 22.8 percent overall. This included a 14.6 percent increase in administrative messages, a 47.7 percent increase in vehicle registration inquiries and a 42.5 percent increase in driver license inquiries. Part of this increase was attributed to the completed implementation of high-speed computer interface by the states of Wyoming, Ohio, Oklahoma, and the District of Columbia. (NLETS, April 14, 1975)

Other potential users also approached NLETS for access to the telecommunications system at this time. These included Naval Investigative Services, Drug Enforcement Administration, U.S. Department of the Army, and the U.S. Marshal's Service.

Additional services were also investigated. These included a "weather query" service that would allow states to

exchange information about road conditions and a service that would allow a pilot test of an automated legal research system. (NLETS, April 14, 1975, p. 3)

The first quarter of 1975 also brought the first of several changes in the management structure of NLETS. One of the initiators of the project to upgrade the system, Tom Allen of the Maryland State Police, resigned as president. Three additional presidents were to follow him in the executive position of NLETS. The first of these, Vice President Leo Zelenko, assumed the duties of the office vacated by Tom Allen. Leo Zelenko, of the New York State Police, was elected to a full term as president at the 1975 annual NLETS meeting.

NLETS accomplishments during the period of time that Phase II of the upgrade project was operative were many and varied. Noteworthy additional uses of the system were explored. These, in part, included facsimile transmission, a nationwide automated legal research service, a national index of revoked and suspended driver's license files in cooperation with the National Driver Register and an Interstate Prisoner Transportation Index System in cooperation with the National Sheriff's Association. (NLETS, July 5, 1977) This latter use included a proposal in which a clearinghouse on extraditable prisoner exchange was explored so that funds could be saved by using the same officers to escort prisoners between similar locations without "dead heading."

In line with the goals of the project, new and potential users were contacted concerning inclusion into the system;

approved agencies included Puerto Rico, the Drug Enforcement Administration, U. S. Marshals, Postal Inspection Service, Department of State, and Army Law Enforcement Division. Other agencies which had expressed interest but had not yet applied included Parent Locator Service, Secret Service, and the Air Force Office of Special Investigations. NLETS (July 5, 1977) reported that agencies which expressed interest but had not for one reason or another become members of the system included National Criminal Justice Reference Service, Amtrak Police, Weather Bureau, Department of Agriculture, Law Enforcement Intelligence Unit, Federal Advisory Committee on False Identification, and Law Enforcement Assistance Administration. The Royal Canadian Police Information Centre (CPIC) also held discussions with NLETS about membership.

Many grant adjustments were sought and approved during Phase II of the upgrade project. Some of these provided for extensions of time needed to allow additional state users to qualify for technical assistance funds. Other adjustments allowed the NLETS staff to develop and to test new techniques designed to improve the efficiency of the communications network while at the same time reducing the overall cost to the user. One such adjustment allowed the relatively new technology of the microprocessor to be used in testing the feasibility of interactive or conversational traffic. Another grant adjustment allowed a contract to be negotiated between Action Communication Systems and NLETS to provide an on-site computer specialist to assist at the Phoenix switching center. An on-site trouble shooter was needed to perform minor

hardware and software tasks necessary to insure continued reliable operation of the switching system. This telecommunications specialist was also necessary to assist state technicians who were busy testing new programs and hardware.

Operationally, the NLETS subcommittees and staff were active in many areas. Formal user agreements were developed in which the states contractually agreed to abide by the rules, regulations, and procedures of NLETS (October 21, 1976, p. 5), and Regional broadcast capabilities were developed which allowed the user to address all control terminal agencies in any one of the eight regions through the use of a single two-character code. In line with a goal of Phase II, NLETS (February 2, 1976, p. 3) also developed policies to control the transmission of criminal history record information so that an individual's privacy rights could be maintained. Additionally, NLETS committees (May 21, 1976, p. 3) recommended changes in the NLETS Constitution and Bylaws in order to allow more responsibility in the governing of the system by the NLETS representatives and the member states.

The annual NLETS conference was held in Scottsdale, Arizona in May of 1975. While some expenses of that conference were paid by the Phase II grant, NLETS and the individual states provided the bulk of the funds necessary to bring the state representatives together. This was another step toward fiscal independence for the NLETS organization.

The budget adopted for the May, 1975 to April, 1976 program period was set at $1,071,650. Of this, approximately 68 percent was to be provided through LEAA funding with the remainder of the budget shared by user contributions to the system. (NLETS, July 3, 1975) This and other additional budgetary considerations developed in a later phase of the upgrade project were all aimed at complete fiscal independence by the end of 1976.

While many accomplishments took place during Phase II of the NLETS upgrade project, they were in accordance with the original objectives, primarily in "continuing improvement of the management and technical capabilities of the system," and in "making NLETS facilities available to all elements of the criminal justice community at the state and local level" (Ashton, January 6, 1975, p. 3).

Phase II proved to be an extremely profitable period of time in the overall upgrade project. However, a third and final phase was planned to add an even greater level of sophistication to the National Law Enforcement Telecommunications System.

The NLETS Upgrade Project--Phase III

The comprehensive NLETS upgrade project included a third phase which was funded by LEAA in May of 1976. Phase III was planned to run for an eight-month duration, but like the previous grant it became necessary to extend, at no

additional cost, the grant period through June, 1977. Because of the approved extensions, LEAA Phase II and III grants ran concurrently for several months.

The final LEAA grant of the four-year upgrade project was for $443,857. The majority of this money was used to purchase hardware needed to restructure the NLETS network for more efficient operation. Smaller sums of money were used to continue the technical assistance program for the individual states.

The goals for Phase III of the upgrade project were similar to those stated for the other phases. They included (1) a continuing desire to decrease the operating cost of the system so that fiscal independence could become a reality by a target date of December 31, 1976, (2) the development of policies and procedures necessary to decrease threats to personal privacy and confidentiality implicit in the operation of any nationwide telecommunications system, and (3) the insurance that increases in traffic do not degrade service or create unacceptable delays or response times on the system. (NLETS, February 12, 1976)

Upon implementation of the goals and thereby successfully culminating the project, NLETS was to provide a law enforcement telecommunications system capable of supporting projected use through 1981. This system was to use line speeds of 2400 BPS or above and was to provide inquiry response times which met or exceeded those required in the National

Advisory Commission of Criminal Justice Standards and Goals, Criminal Justice System, Washington, D.C., 1973. (NLETS, February 12, 1976, p. 13)

In order to strive toward the goal of fiscal self-sufficiency or of having all operational costs of the system paid from monthly subscriber fees, NLETS was required to redesign the communications network. While savings in line costs had been introduced with the leased seven hub multiplexer system implemented during Phase II, additional money could be saved by utilizing high-speed concentrator circuits. The staff devoted much time to the study of various network configurations. Although a dual concentrator network was originally envisioned, additional study indicated that greater flexibility and benefit could be derived from a three concentrator network. The addition of the third concentrator raised the overall capital expense of the system, and several grant adjustments were required to cover the changes.

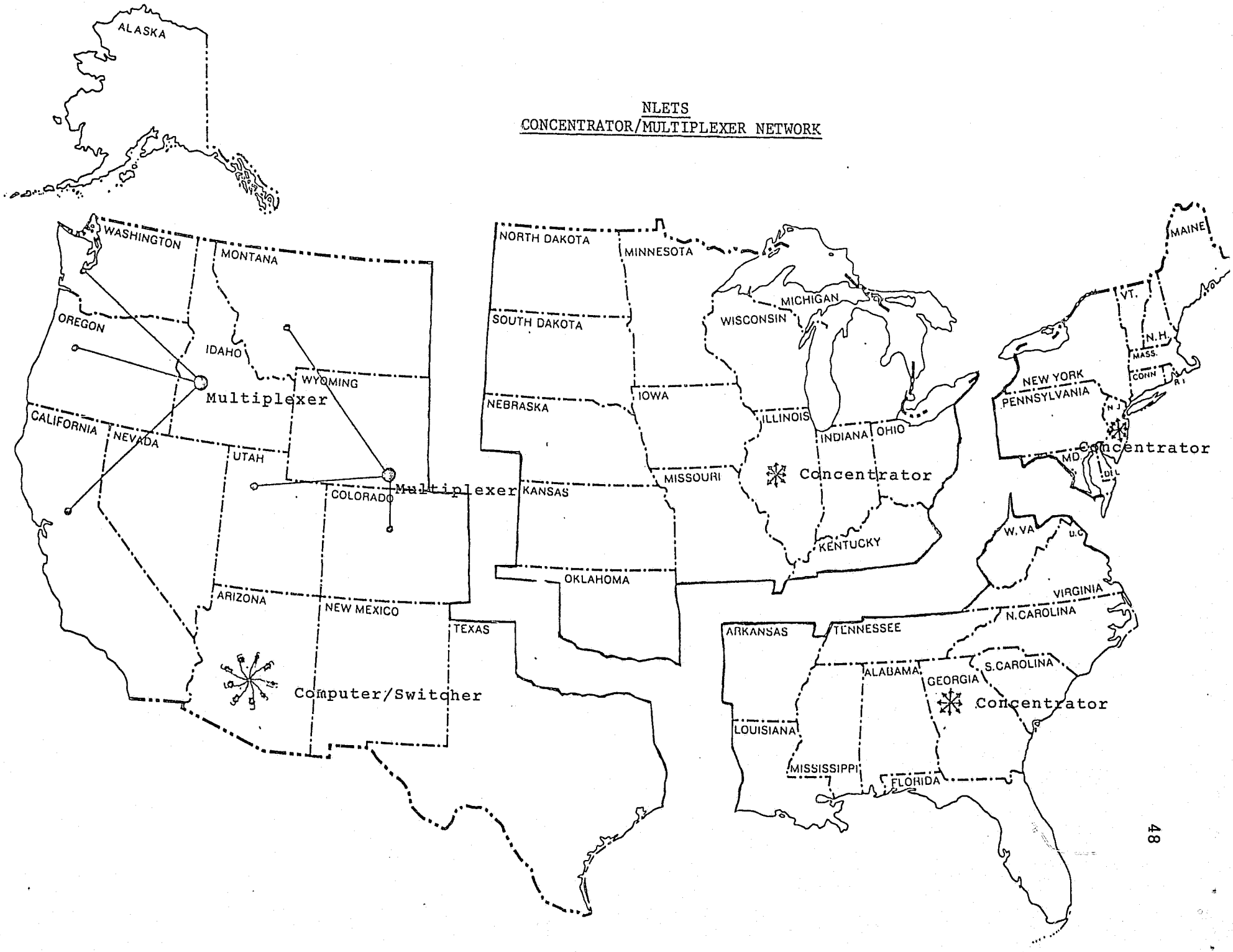
The tri-concentrator design finally adopted provides that the eastern two-thirds of the United States be divided into three separate regions. States located within each of those regions send and receive traffic over dedicated lines from their points of entry to hub sites which serve as concentrator locations. The concentrators, Codex 6030's, are capable of accepting traffic from several states and feeding those individual signals simultaneously onto one high-speed (9600 BPS) single communications line. This line terminates at a Codex 6040 concentrator in the Phoenix switching center.

The tri-concentrator network requires, therefore, only three 9600 BPS long distance lines to interconnect the eastern two-thirds of the country with the computer/switcher, thus saving a considerable amount of money which would otherwise be necessary to lease additional lines. It was projected that the entire cost of the concentrators and related equipment could be paid back from savings in line costs in less than two years. A concentrator site in Trenton, New Jersey serves the eastern and New England states. Southern states are served by a concentrator in Atlanta, Georgia, and the Midwestern states route traffic through a Springfield, Illinois site. The western states continue to be served by a combination of multiplexers and dedicated lines. (The following map is an illustration of the present network configuration including concentrator locations.)

Complete redundancy is provided in the system so that if one of the concentrators should become inoperative, the lines will be switched to a backup concentrator. Therefore, little or no down time is to be expected in the concentrator network.

The concentrators were installed, tested, and in operation by March, 1977. The projected line savings of $300 per day began to accrue. This, according to a February 18, 1977 NLETS report, will amount to a "potential savings of nearly $170 monthly for every one of our users" (p. 1). With the reconfiguration of the network and its subsequent savings in line costs, NLETS was well on its way of realizing fiscal

NLETS
CONCENTRATOR/MULTIPLEXER NETWORK



self-sufficiency.

A second goal of Phase III of the project was to "decrease, to the highest feasible degree, threats to personal privacy, system security, and confidentiality implicit in the operation of a national telecommunications system," (NLETS, February 12, 1976, p. 15). The NLETS organization had become increasingly aware of possible violations of privacy. The staff made several recommendations to the Board of Directors concerning this area.

A committee on privacy and security was formed to investigate the potential for abuse of the privacy of the system and to develop procedures necessary to safeguard the rights of individuals. The committee acknowledged the potential hazards of (1) unauthorized use of the system by unauthorized persons who might transmit or receive illicit data, (2) unauthorized use of the system at legitimate user points of the system, (3) unauthorized use of the system at points of entry other than those authorized for the system, and finally (4) a threat of software alteration being accomplished either through manipulations at the point of entry or the control center or remotely through telecommunications. Specific policy on authorized users and procedures for security were developed by the committee. Policy included housing the control center and the points of entry in secure locations, allowing only authorized users access to points of entry or the switching center, establishing means of identifying false messages through computerized codes, editing all correspondence at the

switching center for originating codes, limiting software manipulation to a specific port attached to the computer/switcher and housing the one console attached to that port in a secure location at the Arizona Department of Public Safety Headquarters. (NLETS, February 12, 1976) The Board adopted these procedures as an interim measure and requested the committee to continue its work of study and evaluation.

Subsequent NLETS quarterly reports issued on November 12, 1976 and July 5, 1977 indicate that the policies and procedures on privacy and security had been reviewed by the NCIC Advisory Policy Board who assured NLETS there were no conflicts evident. The policies previously adopted by the Board and the implementation procedures recommended by the NLETS Operational Procedures Committee were ratified by the membership at the NLETS annual conference held in Atlanta, Georgia in May of 1977. The system procedures on privacy and security go into effect on December 31, 1977.

A third goal of this phase of the project was that of increasing the throughput capabilities of the computer/switcher. The goal as stated was to "insure that the tremendous increase in traffic and state participation through computer-to-computer interfaces does not result in degraded service or unacceptable response times for law enforcement and criminal justice agencies throughout the nation" (NLETS, February 12, 1976, p. 16). Although the computer/switcher upgrade was not

implemented as expected, the goal as stated was met as no significant degrading of service in the immediate future is expected. This is due to the fact that traffic which grew at an astounding rate during early 1976 leveled later in that year. The NLETS Operating Procedures Committee monitored traffic patterns and, according to a July 5, 1977 report, determined that "both the lack of immediate need and the accelerated cost for an upgrade were ample cause to deliberately delay the upgrade program" (pp. 1-2). A substantial portion of the funds for the throughput upgrade program were reallocated in order to provide the additional money needed to implement the third leg of the tri-concentrator network. (NLETS, October 12, 1976)

A continuing goal of all three phases of the NLETS upgrade project was that of "ensuring that all NLETS users may take maximum advantage of the NLETS capabilities." (NLETS, February 12, 1976, p. 14) This was accomplished most notably through continuance of the Technical Assistance (TA) program. The TA program provided reimbursement funds to states who developed advanced computer interfaces with the national system. A large portion of the funds were used to develop the software needed to interface the state systems' driver license and vehicle registration data banks to NLETS. The total amount that could be reimbursed to the individual state varied somewhat with each phase of the project, but it was generally limited to a maximum of $14,000. A provision of Phase III allowed states which had developed interfaces early in the project to receive additional technical

assistance funds so that they could develop the capacity to utilize the more recent automated services.

A grant extension of six months was necessary to provide adequate time for additional states to qualify for the TA program. The Phase III grant terminated, therefore, on June 30, 1977, thus making the entire NLETS upgrade project one of forty-eight months' duration. During these forty-eight months the following states had benefited from the technical assistance program.

EXPENDED TECHNICAL ASSISTANCE FUNDS
September 16, 1977

Alaska	$ 12,130.44
Alabama	13,983.24
Arizona	3,251.09
Arkansas	12,432.74
California	00
Colorado	9,164.85
Connecticut	41,084.82
Delaware	00
Dist. of Columbia	1,328.65
Florida	600.00
Georgia	1,393.16
Idaho	17,763.24
Illinois	1,229.40
Indiana	896.55
Iowa	11,069.00
Kansas	2,321.18
Kentucky	1,792.61
Louisiana	911.91
Maine	14,290.19
Maryland	13,500.91
Massachusetts	1,151.82
Michigan	12,467.00
Minnesota	15,145.96
Mississippi	28,333.39
Missouri	1,442.76
Montana	15,623.25
Nebraska	14,225.23
Nevada	541.02

New Hampshire	535.17
New Jersey	2,291.91
New Mexico	26,990.89
New York	2,510.54
North Carolina	1,174.11
North Dakota	14,028.20
Ohio	926.38
Oklahhoma	15,000.00
Oregon	11,192.56
Pennsylvania	17,249.06
Rhode Island	290.18
South Carolina	10,792.63
South Dakota	00
Tennessee	940.00
Texas	7,474.65
Utah	13,971.81
Vermont	14,249.60
Virginia	4,070.64
Washington	10,665.23
West Virginia	13,250.00
Wisconsin	240.00
Wyoming	290.18
Total	$386,994.28
Miscellaneous Consulting Fees	29,213.87
	$416,208.15

At the successful conclusion of Phase III, the NLETS upgrade project terminated. The goals of the project had been well conceived and articulated. They had been addressed effectively, and the National Law Enforcement Telecommunications System which emerged on that date was substantially different from the one which had applied to LEAA for its first upgrade grant some forty-eight months before. The new NLETS was admirably equipped in philosophy, organization, hardware, and software to effectively serve the interstate communications needs of the law enforcement and criminal justice community.

A Description of the Present NLETS System

The National Law Enforcement Telecommunications System, designed and implemented to serve the law enforcement community of the 1970's and 1980's, is indeed a sophisticated one in comparison to its predecessor. The NLETS "User's Guide" indicates that administratively the system is made up of representatives of law enforcement agencies from each of the forty-eight continental United States, from the District of Columbia, and from Alaska. Hawaii and Puerto Rico, once members, are no longer users of NLETS; however, Puerto Rico has indicated an interest in reapplying for membership. The system is owned and operated by the state users and is incorporated as a nonprofit organization under the laws of the State of Delaware. As such NLETS is entitled to the lower telpak rates. Administratively NLETS acquires its lines from the U.S. General Services Administration.

For purposes of organization, NLETS has subdivided the United States into eight regions. These regions are composed of from three to seven states plus additional users. These states are grouped together by geographic location and by "regional community of interest" (p. 1-3). The regions include the following membership: Region A is composed of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont; Region B is Delaware, New Jersey, Pennsylvania, the FBI (through the National Crime Information Center), the Naval Investigative Service, the U. S. Department of State Office of Security (through their TECS interface), and

U. S. Postal Inspection Service; Region C is District of Columbia, Maryland, North Carolina, Ohio, South Carolina, Virginia, and West Virginia; Region D is Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, and Tennessee; Region E is Illinois, Indiana, Kentucky, Michigan, Missouri, and Wisconsin; Region F is Iowa, Minnesota, Montana, Nebraska, North Dakota, South Dakota, and Wyoming; Region G is Colorado, Kansas, New Mexico, Oklahoma, Texas, and Utah; Region H is Alaska, Arizona, California, Idaho, Nevada, Oregon, Washington, and U. S. Customs. Each state or federal control terminal agency appoints one person to serve as its representative in the NLETS organization. Yearly each region elects one state representative to serve as regional chairman and one state representative to serve as vice chairman. The chairman from each region is seated as a member of the NLETS Board of Directors.

The Board of Directors is required to meet at least once a year to conduct the business of the organization. Additionally, the Board of Directors makes all policy decisions concerning the operation of the system. The state members at an annual conference elect a president and first and second vice presidents. These officers may not be members of the Board. The president has appointed and the Board of Directors has confirmed an executive director whose responsibility is that of managing the company by conducting the day-to-day business of the organization and of carrying out the operational policies promulgated by the Board of Directors.

The NLETS staff also includes an assistant executive director and an administrative assistant for a total of only three full-time employees.

Additional NLETS direction is provided through a standing Operational Procedures Committee, a standing Security and Privacy Committee and a standing Management and Finance Committee. Ad hoc committees are formulated from the membership as required.

The present 1977 administration of NLETS includes three elected officers. President Captain Tony Hansberry of the Tennessee Department of Public Safety succeeded Chief Richard Burns of the Idaho Bureau of Criminal Identification; the first vice president is Lieutenant Irving McAndrew of the Vermont Department of Public Safety, and the second vice president is Captain D. W. Schamp of the Nebrasks State Patrol. The executive director of NLETS is Major C. J. Beddome, a retired Assistant Chief of Administration of the Arizona Department of Public Safety.

Each user state or agency signs an agreement with NLETS to abide by the rules of the organization; each user thereafter is entitled to one point of entry to the nationwide system. Points of entry are to be located in each state capitol and, for the sake of security, generally located in a police facility. The individual state is responsible for distribution of traffic from the one NLETS point of entry to authorized law enforcement or criminal justice agencies within

the state. All states interface directly with the national system except Alaska which interfaces with NLETS through its dedicated line to NCIC. Other federal agencies either have their own line or are connected through the Treasury Enforcement Communications System (TECS).

A monthly service charge is assessed to each state user or federal control terminal agency. During 1977 that charge was $800 per month and was sufficient to take care of all but a few dollars of daily operational expense. Since the termination of the LEAA grant for the Phase III upgrade project, the funding provided by the user service charge is used to finance 100 percent of the operations of the system.

NLETS consists of a pair of Action Communication System Telecontrollers, which are modified Data General 840's. Two computer/switchers are required in order to provide complete redundance in case of failure. They are housed in the Arizona Department of Public Safety Headquarters in Phoenix and are equipped with microprocessor line handlers. Connected to these telecontrollers by 9600 BPS modems are three high-speed lines which terminate in line concentrators that serve the Eastern, Southern, and Midwestern portions of the country. Dedicated lines from each of the surrounding states' points of entries are connected to one of the three regional concentrators. Traffic from the three regions is routed to and from the Phoenix control center by one of three high-speed circuits, thus eliminating the need for dedicated lines from

Phoenix to each state. The use of the concentrators significantly decreases the number of leased lines required to serve the distant regions of the country, thereby greatly decreasing the monthly operating cost of the system.

In addition to the three concentrator circuits, two multiplexed circuits are used. These allow traffic from California, Idaho, Washington, and Oregon and from Wyoming, Colorado, Utah, and Montana respectively to be transmitted to and from the Phoenix control center over two leased lines rather than over eight dedicated lines, thus providing additional savings in monthly line lease fees. Four direct dedicated lines are used to send and receive traffic from adjacent or nearby states. One co-located line serves the Arizona point of entry terminal, and two additional local lines provide access for terminals located at the NLETS switching center and at the NLETS administrative office. (Sweeney, personal interview, July, 1977)

Traffic routing by the computer/switcher is accomplished by a store-and-forward system. A message directed from one state to another state will commonly travel from the originating state over a dedicated line to a concentrator site. From that point it is routed to the Phoenix control center over a high-speed 9600 BPS line. Upon receipt and verification by the computer/switcher as a "legal" message, the information is stored or "written" on a magnetic disk. The message is read off the disk and forwarded to the receiving state as soon as

that state system is free to accept the traffic. Normally, this process is quite rapid. However, should a technical difficulty arise with the system at the receiving state, the message will be stored, and constant attempts will be made for a period of time to complete the transmission of the message. No data bank is operated by NLETS, and no traffic is intercepted or monitored by the control center except for statistical purposes and unrecoverable errors in transmission. Texts of messages sent are normally transparent to the switching system, thereby insuring complete privacy.

The switching configuration allows an originating state to address any other state point of entry individually, collectively as a region, or on a nationwide basis for an "all points bulletin" broadcast. Most states have a computer interface at the point of entry which allows automated message delivery. In other words, an originating agency can address any local police agency within that state and have its message delivered directly. A small number of states, however, require that certain traffic be intercepted at the point of entry and manually routed within the state. This may be required for either technological or philosophical reasons.

Forty-six states and three federal agencies support a computer-to-computer interface with the national system. Most of these also include automated driver license and vehicle registration query systems.

NLETS COMPUTER INTERFACES
August 1, 1977

	STATE/MEMBER	SUPPORTS
1.	Alabama	DQ, RQ**
2.	Alaska (via NCIC)	RQ
3.	Arizona	RQ
4.	Arkansas	DQ, RQ
5.	California	
6.	Colorado	DQ, RQ
7.	Connecticut	DQ, RQ
8.	Dist. of Columbia	DQ, RQ
9.	Florida	DQ, RQ
10.	Georgia	RQ
11.	Iowa	DQ, RQ
12.	Idaho	DQ
13.	Illinois	DQ, RQ
14.	Indiana	DQ, RQ
15.	Kansas	DQ, RQ
16.	Kentucky	DQ, RQ
17.	Louisiana	
18.	Massachusetts	
19.	Maine	DQ, RQ
20.	Maryland	DQ, RQ
21.	Michigan	DQ, RQ
22.	Minnesota	DQ, RQ
23.	Mississippi	DQ, RQ
24.	Missouri	DQ, RQ
25.	Montana	DQ, RQ
*26.	Nebraska	DQ, RQ
27.	North Carolina	DQ, RQ
28.	North Dakota	DQ, RQ
29.	New Jersey	DQ, RQ
30.	New Mexico	DQ, RQ
31.	New York	DQ, RQ
32.	Ohio	DQ, RQ
33.	Oklahoma	
34.	Oregon	
35.	Pennsylvania	DQ, RQ
36.	South Carolina	DQ, RQ
*37.	South Dakota	DQ, RQ
38.	Tennessee	DQ, RQ
39.	Texas	DQ, RQ
40.	Utah	DQ, RQ
41.	Vermont	DQ, RQ
42.	Virginia	DQ, RQ
43.	Washington	
44.	Wisconsin	DQ, RQ
45.	West Virginia	DQ, RQ
46.	Wyoming	DQ, RQ

ASSOCIATE MEMBER

47.	NCIC	N/A
48.	TECS	N/A
49.	Postal Service	N/A
50.	D.O.S. (via TECS)	N/A

*150 baud circuit

These members are served by NLETS through a low-speed line and a 37 TTY.

	State	Upgrade Status
1.	Delaware	Planned for fourth quarter, 1977
2.	Nevada	No planned date
3.	New Hampshire	No planned date
4.	Rhode Island	No planned date
5.	Naval Investigative Svc.	No planned date

**DQ is used to indicate driver's license query; RQ is used to indicate vehicle registration query.

Traffic over the system has been categorized into the following types: (1) administrative message, (2) vehicle registration inquiry, (3) vehicle registration response, (4) driver license inquiry, (5) driver license response, (6) road/weather inquiry, (7) road/weather response, (8) error message, (9) status message. Two new types of messages will be installed on December 31, 1977 to support the transmission of criminal history record information (CHRI). The most frequent messages are those in the administrative area and in the areas of vehicle and driver license registrations. Administrative messages are any free form police communications, including "want" information on suspected subjects. This is a form of electronic mail. Registration inquiries have become almost routine in many police agencies with every motor vehicle stopped. In fact, with the speed of the inquiry and response, the officer in the field can determine registry information and other pertinent data within seconds even from state data banks located across the country.

Traffic on the National Law Enforcement Telecommunications System at the end of June, 1977 was averaging 73,000 messages per day. This is an increase of over 500 percent since 1973. While the message cost depends on volume, systemwide the average cost per message handled is only four cents. This makes the NLETS network an extremely cost-effective communications system. (Beddome, September, 1977) The high-speed NLETS communications network is now an effective weapon with which to

combat a rising incidence of criminal activity. NLETS is a vital link in a total law enforcement communications system by providing interstate police communications services.

A Summary of the Upgrade Project

In December of 1973, while admittedly superior to the system before 1966, the National Law Enforcement Telecommunications System was a relatively slow and inefficient method of transmitting information by teletype. Delays were at times several hours in duration. The system was incapable of being utilized for data bank access. In effect, the system, which only transmitted an average of 13,000 messages per day in 1973, was totally inadequate in capacity. (NLETS, February 12, 1976, p. 16) As the population of the United States increased, criminal offenders also became more numerous and more mobile. Law enforcement data banks were developed to maintain records pertinent to a highly mobile criminal force, but those data banks were only as effective as was access to them. The officer in the field must have ready access to information in order to serve as a deterrent to crime. Because of police communications bottlenecks and the required manual access to data files, the potential suspect could travel thousands of miles by the time information was accessed and made available to the officer.

One method of improving the effectiveness of the police officer is that of providing instant availability to necessary information through remote computer interface to established automated criminal justice data banks. A traffic patrol officer might then, prior to even stopping a traffic violator, obtain registration information on the vehicle. This information could be obtained in a matter of seconds even for out-of-state license plates through a high-speed computerized telecommunications network available to the patrolman through his radio dispatcher. In addition to increasing the arrest ratio of the officer through increasing his knowledge about potential suspects, the increased information might, in reality, save his life. He would be made aware of a potentially dangerous situation prior to his stepping out of his own patrol car through ready access to important operational records.

It was determined in 1973 that with proper equipment and software the existent Law Enforcement Teletype System could be upgraded to serve the function of a much needed high-speed interstate police communications network capable of computer data bank access. To enable the Law Enforcement Teletype System to upgrade its facilities to handle the ever-increasing traffic load and to further serve as a high-speed link between the numerous state criminal justice data banks, a great deal of money was needed.

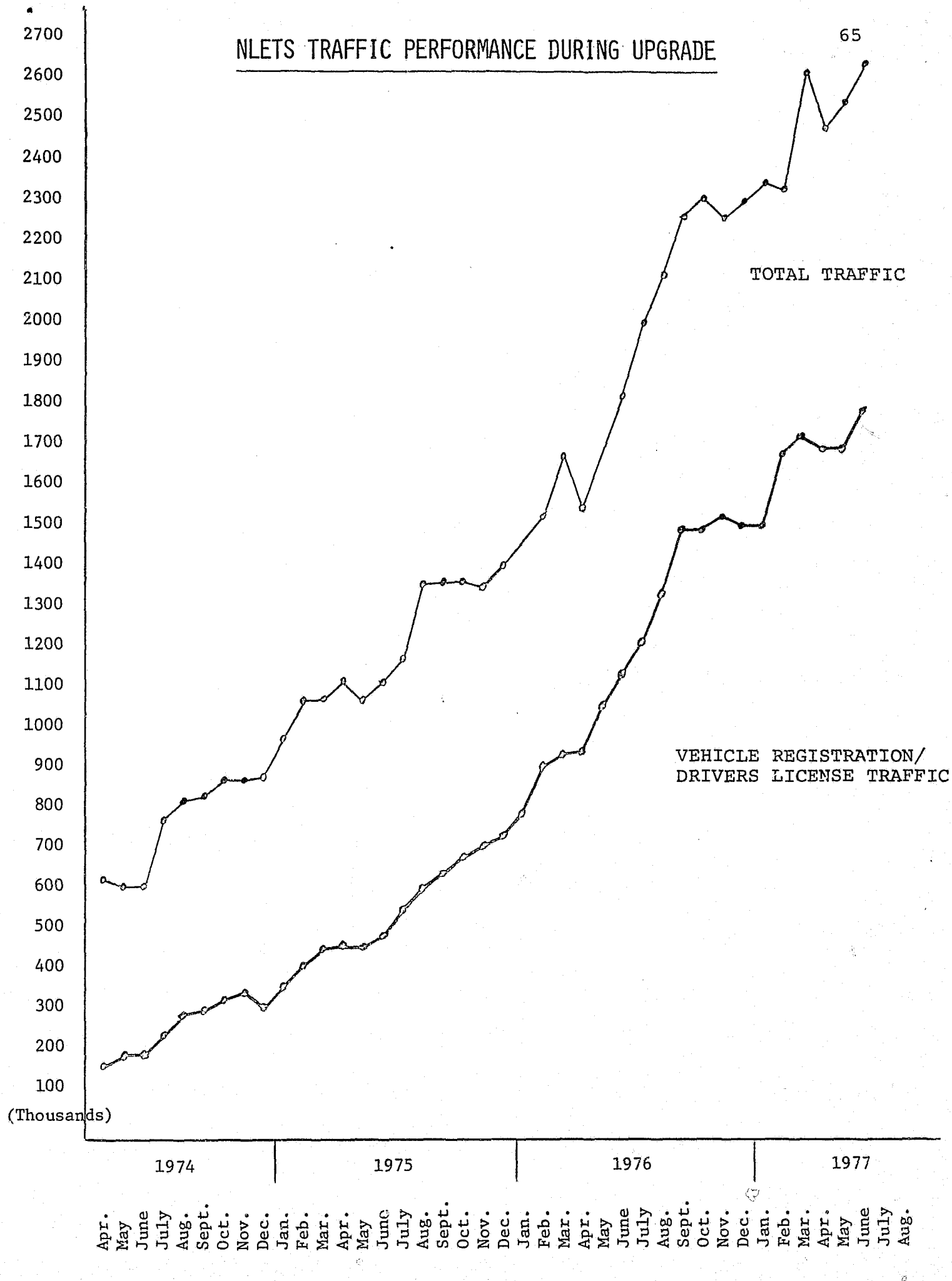
LETS personnel approached LEAA in early 1973 with a proposal for funding such an upgrade project, and on June 29, 1973, LEAA awarded Grant #72-SS-99-3006. This grant was to run

for eighteen months and to serve as Phase I of what was to have been a forty-two month comprehensive project. A total amount of $1,533,957 was approved for Phase I. Most of this money was to purchase the initial computer/switchers needed to serve as a foundation for a high-speed computer-interfaced system and to aid the first states in taking advantage of the network. However, as hardware cost increased significantly and a decision was made to purchase rather than to lease the computer/switcher, additional funds were required. Supplementary Grant #74-SS-99-3307 for $475,413 was approved by LEAA on January 23, 1974 in order to complete funding for Phase I of the project.

The new high-speed NLETS system went into operation on December 24, 1973, and within six months traffic on the system had doubled from the original 13,000 messages per day. By the end of the year, traffic had tripled, (NLETS, February 12, 1976, p. 16), indicating that the new system was, in effect, a graphic picture of an instant success. Traffic growth is shown in the graph on page 65.

Phase II of the project (Grant #75-SS-99-6018) was funded by LEAA on April 23, 1975. The $804,590 approved for Phase II was used to further refine the system technically, to gain greater speed and efficiency, to encourage additional users and uses of the system, and to insure that the NLETS system could return to fiscal self-sufficiency by the end of the funding period.

NLETS TRAFFIC PERFORMANCE DURING UPGRADE



Phase III of the project (Grant #76-SS-99-6032) was approved and began on May 1, 1976. It was scheduled to run for a total of eight months, but like Phase II, grant adjustments increasing the duration of the project were necessary. The $443,857 available in Phase III were used to continue to upgrade the technological capacity and efficiency of the computer/switcher and to fund a high-speed multiconcentrator network. This decreased the number of miles of interconnection lines needed and thereby decreased the monthly operating cost of the system.

Although the grants were adjusted to meet several unexpected contingencies, the upgrade project was completed with a minimum of disruption, and the transition from the old LETS to the new high-speed telecommunications system was accomplished quite efficiently for a project of its complexity and magnitude. The NLETS system which exists today after four years and over $4.1 million bears very little resemblance to the original LETS system. With LEAA funding and support the new NLETS is technologically and philosophically capable of meeting the law enforcement interstate communications and data access needs of the United States into the 1980's.

Conclusions

What was initially intended to be a three-year "interim upgrade" of a then outmoded interstate law enforcement

teletype system has evolved into much more. The NLETS network which has been brought about as a result of that upgrade project is a "healthy" system which should serve the law enforcement community quite well for several more years. Eventually, however, due to ever-increasing traffic demands and new processes for data access and transmission, this now modern telecommunications system will require new technology in order to best serve as an efficient law enforcement weapon. The present upgraded NLETS system, though, will continue to meet law enforcement needs efficiently as new communications technologies are researched and developed.

The money spent from both NLETS and LEAA sources (see list of expenditures on page 69) has been well spent. The funding has purchased a technologically sophisticated telecommunications system which is now completely self-sufficient. This state owned and operated law enforcement network serves, at no continuing cost to any federal agency, as a law enforcement weapon that is available for use by almost every police officer in the United States.

The "up-to-date" NLETS system is capable of providing to the officer in the field the critical data that he might require in a matter of seconds. Police investigators, supervisors, and administrators also benefit by virtue of the economical high-speed administrative message capability. The NLETS high-speed interstate communications system not only serves as an efficient law enforcement tool for nearly every

police officer in the country, but it also serves all law abiding members of our society in our ever-increasing battle to contain the elements of crime.

MONIES EXPENDED
September 21, 1977

LEAA GRANT MONIES EXPENDED

GRANT #72-SS-99-3006	Phase I	$1,189,439.00
GRANT #74-SS-99-3307	Phase I Supp.	417,661.24*
GRANT #75-SS-99-6018	Phase II	642,158.45*
GRANT #76-SS-99-6032	Phase III	328,070.35*
	Total	$2,577,329.04

*Funds approved in excess of these total expenditures have been returned to LEAA.

NLETS MONIES EXPENDED

PHASE I	$ 432,983.41
PHASE I SUPP.	
PHASE II	366,899.00
PHASE III	747,331.00
Total	$1,547,213.41

Total monies expended for the NLETS upgrade project:

LEAA	$2,577,329.04
NLETS	1,547,213.41
Total	$4,124,542.45

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