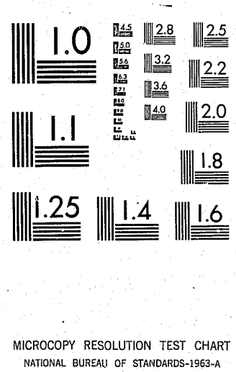

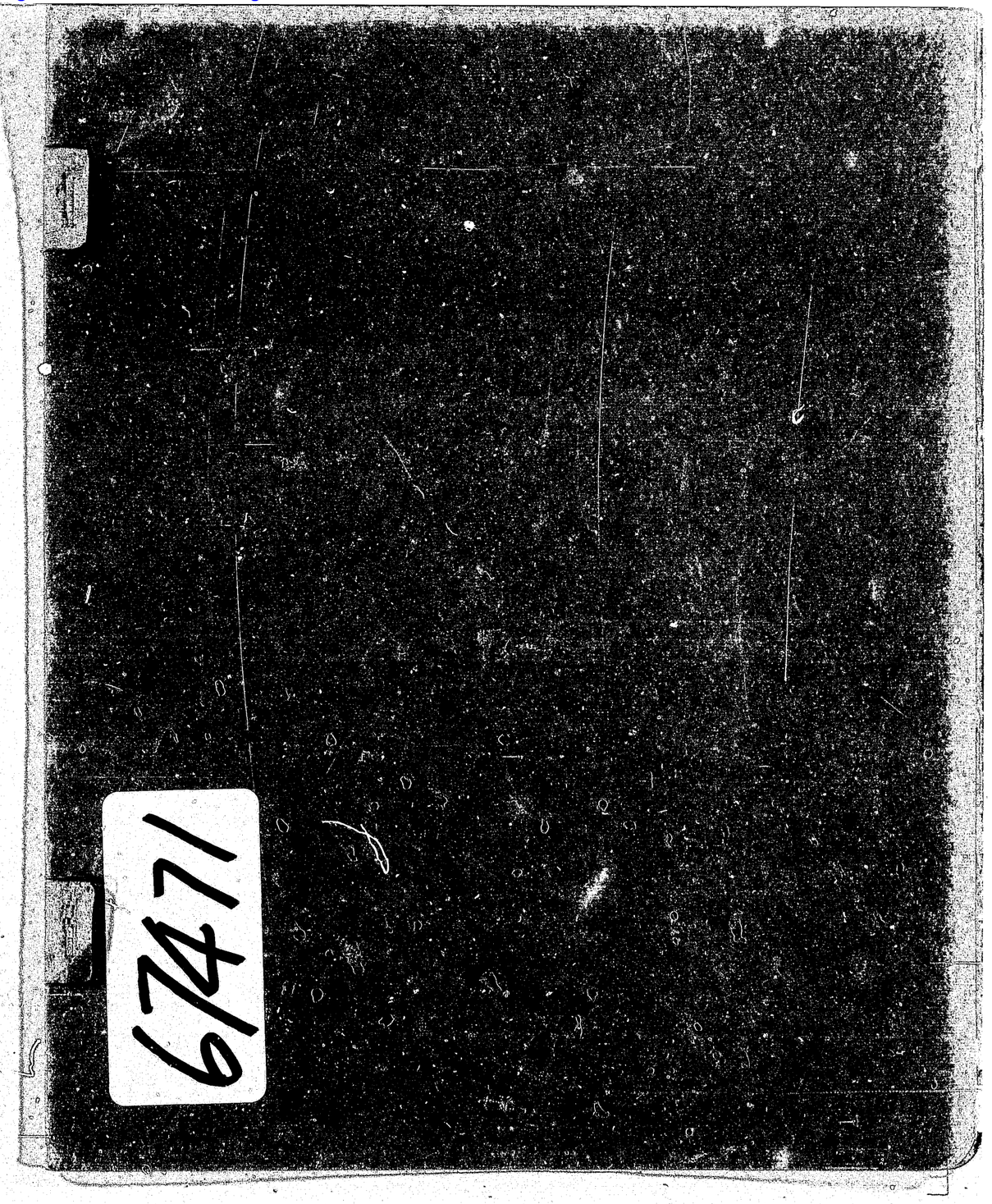

A REPORT

PREPARED FOR

THE HENNEPIN COUNTY CRIMINAL JUSTICE COUNCIL

DESCRIBING

AN ADVANCED PUBLIC SAFETY COMMUNICATIONS SYSTEM DESIGN FOR HENNEPIN COUNTY

MICHAUD, COOLEY, HALLBERG, ERICKSON & ASSOCIATES, INC.
Consulting Engineers
310 Plymouth Building
Minneapolis, Minnesota 55402

Commission No. 05405 April 30, 1973

Prepared by Ronald G. Vegemast, P.E.

Assisted by Dennis M. Rooney

I hereby certify that this Report
was prepared under my direct supervision
and that I am a duly registered Engineer
under the laws of the State of Minnesota.

Ronald Vegemast

Registered Engineer No. 6192

Enclosure B

MICHAUD.COOLEY.HALLBERG.ERICKSON & ASSOCIATES.INC.

CONSULTING ENGINEERS
310 PLYMOUTH BUILDING • MINNEAPOLIS, MINN. 55402 • (612) 339-4941

April 30, 1973

This Report describes an advanced Public Safety Communications System design developed by our firm under contract with the State of Minnesota Department of Administration. The system is designed to be flexible enough to accommodate new electronic systems as they become available, and to expand with the substantial population growth expected in Hennepin County. The design implements the Minnesota Police Communications Plan as it pertains to Hennepin County.

The most prominent feature of the Plan involves advanced concepts included in a major central dispatch facility. This control central has substantial support among public safety agencies. The system is designed, however, to also accommodate those public safety agencies who choose to remain independent in their dispatch operations.

This work was assigned to the Communications Systems Department of our firm under the direction of Mr. Ronald Vegemast, P.E. Mr. Dennis Rooney performed much of the work involving the dispatch facility. We also acknowledge the important assistance provided by the Special Steering Committee of the Hennepin County Criminal Justice Council which consists of Chief Wayne Bennett of the Edina Police Department, Dr. John DuBois of Hennepin County, and Mr. Dick Richardson of the City of Minneapolis.

Sincerely yours,

MICHAUD, COOLEY, HALLBERG, ERICKSON & ASSOCIATES, INC.

Robert L. Michaud, P.E.
President

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SECTION 1A

RECOMMENDATIONS

TWO-WAY RADIO SYSTEM

A new, expanded two-way radio system planned to meet the needs of Hennepin County for many years is recommended. This radio system features these improvements:

1. Communications capability to permit improved coordination of activities between law enforcement agencies from different jurisdictions and between law enforcement agencies and civil defense, fire and ambulance agencies.

2. A clear emergency channel dispatched from a separate console position and continuously available for use in high intensity, short duration incidents involving law enforcement units from several agencies covering every law enforcement mobile unit in Hennepin County, including those of the Minneapolis Police Department.

3. Two 4-channel radios in every mobile unit to accommodate simultaneous, routine voice dispatch and digital communications capability due to the growth of digital communications that is expected.

4. Dispersement of base station equipment to minimize the chance that the entire system might become inoperative for any reason.

911 EMERGENCY TELEPHONE SYSTEM

It is recommended that a 911 emergency telephone system be implemented for every citizen of Hennepin County by January 1, 1976. The equipment and software needed to provide the kind of system that will be needed in the county for many years to come will be available by the end of 1975, and therefore there is no longer any reason to wait before designing and implementing this system. Furthermore, since a new major dispatch center is going to be constructed, that dispatch center should be designed with interface between a 911 system and radio dispatch as a primary design criteria. If the 911 system is not instituted with the new dispatch center, that dispatch center will require extensive redesign when a 911 system is implemented.

CENTRAL DISPATCH

A centralized dispatch capable of handling the dispatch operations of all sheriff, police, and fire activities in Hennepin County is recommended. In addition, the following features are recommended for use within the dispatch center:

1. Central response location for all 911 calls within Hennepin County.

2. Use of a central computer to handle the following real-time capabilities.

   a. An automatic locator-identifier file for all telephone locations in Hennepin County.

   b. Additional computer files to store and provide specific functional information for use of the sheriff, police and fire dispatchers.

   c. The use of Cathode Ray Tube (CRT) displays to visualize the file information in front of the operator/dispatcher positions.

   d. Automatic transfer functions to transfer all recorded information from the 911 operator to the dispatcher, as well as to connect the dispatcher to the calling party when required.

3. Trunking capabilities to extend calls to emergency services not located in the central dispatch.

4. Automatic log capabilities to operate a log for each location, as well as summary capabilities for management use.

5. On-line connection to existing law enforcement information systems at state and federal levels.

DIGITAL COMMUNICATIONS

It is recommended that the presently planned one-way and two-way digital programs in suburban Hennepin County and the City of Minneapolis be continued.

Experience gained from operating these two programs--combined with studying developments in the field of digital communications as they are reported--will make it possible to specify the kind of system or systems which should be adopted in the future.

The equipment in the central dispatch facility will be planned to accept whichever digital communications system or combination of both types is adopted.

TELEVISION SITUATION SURVEILLANCE

It is recommended that a television situation surveillance subsystem be incorporated to bring back live pictures of major incidents such as large fires, civil disturbances (such as an incident like the New Orleans sniper) to the central dispatch center to provide additional information for the command function.

SECTION 1B

COST SUMMARY

Two-Way Radio System	$1,034,200
911 Emergency System	27,133
ALI Computer Information System	1,757,323
Central Dispatch Facility	532,000
TV System	48,000
TOTAL	$3,398,656

SECTION 1C

BACKGROUND

About five years ago, the Governor's Commission on Crime Prevention and Control expressed dissatisfaction with the then existing law enforcement communications available in Minnesota and particularly with the lack of coordination ability available through communications. As a result, the Commission allocated 6.5 million dollars of LEAA funds for upgrading law enforcement communications systems in all 87 Minnesota counties.

The firm of Kelly Scientific was engaged to determine what actually existed in Minnesota and to propose a coordinated statewide communications system. The Kelly plan, as it turned out, did not go far enough in that it did not show how law enforcement radio frequencies should be allocated so that all jurisdictions could be adequately served. In addition, there was a general feeling that the regional radio district concept recommended by Kelly would not meet the needs in Minnesota.

As a result, Ward Montgomery, P.E., was engaged to rework the Kelly proposals into a more workable plan and to include a statewide arrangement for available law enforcement radio frequencies. The result of this work is the Minnesota Police Radio Communications (MPRC) Plan, which has been followed in all Minnesota counties.

When fiscal year 1973 LEAA funds became available, it was time to design a system to meet the needs of Hennepin County that is in compliance with the MPRC Plan. To create that design, the firm of Michaud, Cooley, Hallberg, Erickson and Associates, Inc., Consulting Engineers, was selected by a special communications steering committee appointed by the Hennepin County Criminal Justice Council. That steering committee consists of:

Dr. John DuBois, Hennepin County Communications Engineer
Mr. Dick Richardson, City of Minneapolis
Chief Wayne Bennett, Edina Police Department

Work on the design began in November 1972 and proceeded as follows:

1. Every police department in Hennepin County was contacted to learn as much as possible about the existing system, communicating problems and suggestions.

2. Police patrol "ride alongs" were performed with seven police departments to observe first hand how police officers use communications in their work and to learn what problems they have.

3. Thirteen of the seventeen public safety dispatch centers' operations were observed for a total of over thirty hours.

4. The results of this educational process were reported to the steering committee and a plan outline began to develop.

5. The design plan was then further developed through meetings with representatives of law enforcement agencies, suburban municipality city managers, the Minneapolis Fire Department and the Hennepin County Civil Defense Agency.

The design described in this report was explained to the police chiefs and city managers of Hennepin County on April 23, 1973. General approval of the design concepts was indicated, with no opposition.

SECTION 2
SYSTEM CONCEPTS

SECTION 2A

TWO-WAY RADIO SYSTEM

RECOMMENDATION

A new, expanded two-way radio system planned to meet the needs of Hennepin County for many years is recommended. This radio system features these improvements:

1. Communications capability to permit improved coordination of activities between law enforcement agencies from different jurisdictions and between law enforcement agencies and civil defense, fire and ambulance agencies.

2. A clear emergency channel dispatched from a separate console position and continuously available for use in high intensity, short duration incidents involving law enforcement units from several agencies covering every law enforcement mobile unit in Hennepin County, including those of the Minneapolis Police Department.

3. Two 4-channel radios in every mobile unit to accommodate simultaneous, routine voice dispatch and digital communications capability due to the growth of digital communications that is expected.

4. Dispersement of base station equipment to minimize the chance that the entire system might become inoperative for any reason.

CHANNEL ARRANGEMENT

The channel arrangement of Table 2A-1 was planned with these objectives in mind.

1. The need for a radio communications system with which it is possible for law enforcement agencies from different jurisdictions to better coordinate their activities. In the recommended arrangement, all mobiles outside Minneapolis would have the current Channel 2 car-to-car simplex frequency crystalled, with a scanner between their main dispatch and the simplex channels. With this arrangement officers in the Sheriff's Department and suburban Police Departments will be able to monitor traffic activity in surrounding communities, and will be able to communicate with other mobiles who are dispatched on a different main dispatch frequency. All mobiles outside Minneapolis will have the new state-wide vhf coordination channel which will permit car-to-car communication with any law enforcement mobile in the State of Minnesota, except those of the Minneapolis Police Department and the St. Paul Police Department. All mobiles, including the City of Minneapolis, will have the uhf coordination channel to permit car-to-car communications between any mobile in Hennepin County, including the City of Minneapolis and all St. Paul Police Department mobiles. In addition, there will be a cross-band repeater

CHANNEL ARRANGEMENT (Continued)

between the uhf coordination channel and the vhf coordination channel to permit Minneapolis Police Department mobiles to talk car to car with any other law enforcement mobile in the State of Minnesota that is in range of the mobile repeater site. In addition, the design recommends that all mobiles in the Metro area having uhf radio equipment also have crystals for the Minneapolis Police Department utility channel.

2. The need for a clear channel reserved for instantaneous service for high intensity, short-term emergency situations involving mobile units from different jurisdictions such as a bank robbery. In the recommended channel arrangement, uhf Channel F6 will be available for this purpose and will be dispatched from a separate emergency law enforcement console in the central dispatch facility.

3. The need for a common radio channel which can be used by law enforcement units from several jurisdictions during long-term incidents such as a tornado disaster or civil disturbance. The design recommends that uhf Channel F8 be used for this purpose, and that F7 be a reserve channel in the event one channel is insufficient for the traffic volume need. It may be observed that the long-term incident and high intensity, short-term incident can be accommodated simultaneously with routine communications in the proposed channel arrangement.

4. The need for a utility radio channel to handle radar operations, parades, and other special tasks. Uhf Channel F7 will normally be reserved for use by the Minneapolis Police Department for this purpose. Vhf Channel F3 is available for this utility function by jurisdictions outside the Minneapolis Police Department.

5. The need for control and coordination of law enforcement agencies and other agencies during certain kinds of emergency situations. The recommended design proposes both an emergency operations center with radio communications capability to civil defense, common ambulance channels, fire intersystem channels, public works channels, and public utilities channels and a revised channel arrangement for the civil defense mobile van which may be used as a field command post.

6. The desirability to use as much of the existing Hennepin County net as possible and the need to provide a channel arrangement which utilizes only those radio channels assigned to Hennepin County in the Minnesota Police Radio Communications Plan.

The channel arrangement recommended is not a substantial deviation from the arrangement proposed in the Minnesota Police Radio Communications Plan.

SYSTEM LAYOUT

The central feature of the system is a centralized dispatch operation from which all Minneapolis Police Department mobiles, all Minneapolis Fire Department units, sheriffs' mobiles, and most suburban Police Department mobiles will be controlled. While each mobile unit in suburban Hennepin County will have only one main dispatch channel position on its control head, there will actually be several main dispatch channels in use.

It is anticipated that bay stations and antennas will be dispersed at as many as six (6) locations in Hennepin County, including possibly the three (3) now in use by the Minneapolis Police Department, the sheriffs' tower in Golden Valley, the backup tower at Parkers Lake, and possibly one (1) additional tower located in the southern part of the County. This last site may be chosen to solve some special dead spot problems described in the Special Situations Section.

All mobiles outside the Minneapolis Police Department will have a 4-channel vhf radio and 4-channel uhf radio. It is anticipated that the uhf radio will normally be on Channel F5 so that the mobile is prepared to receive a digital message and the vhf radio will be scanning between the dispatch channel and the simplex car-to-car channel for routine communications capability. It is recommended that Minneapolis Police Department mobiles have two (2) 4-channel uhf radios so that those units can have one radio tuned to Channel F5 to be ready to receive a digital message and the other radio tuned to the appropriate dispatch channel for the area being patrolled.

BACKUP SYSTEM

When the central dispatch facility becomes operational, those presently used dispatch consoles which will not be used can be converted to form a dispersed backup dispatch capability to be utilized in the event something puts the main dispatch facility out of operation.

It is recommended that there be a 7-digit emergency telephone system to backup the 911 system. The 7-digit lines should go to the dispersed backup dispatch centers and normally be switched continuously to a central dispatch facility to act as the 911 backup. In the event that the central dispatch facility is not operational, then the backup emergency calls on the 7-digit system can be intercepted at the dispersed backup dispatch locations. Emergency power units and towers, as well as radio control consoles and tape recorders, are already available at these dispersed backup dispatch locations.

MINNEAPOLIS FIRE DEPARTMENT

Because the 911 system will be used to report all emergencies including fire, it is recommended that the Minneapolis Fire Department be dispatched from the central dispatch facility. It is recommended that provision be made for control of a large fire from a separate console. It is further recommended that information from this emergency control console be extended to the Minneapolis Fire Department offices for command information purposes and that a fire radio system control also be available as a backup at the Fire Department offices.

Section 2B

911 EMERGENCY TELEPHONE SYSTEM

RECOMMENDATION

It is recommended that a 911 emergency telephone system be implemented for every citizen of Hennepin County by January 1, 1976. The equipment and software needed to provide the kind of system that will be needed in the county for many years to come will be available by the end of 1975, and therefore there is no longer any reason to wait before designing and implementing this sytem. Furthermore, since a new major dispatch center is going to be constructed, that dispatch center should be designed with interface between a 911 system and radio dispatch as a primary design criteria. If the 911 system is not instituted with the new dispatch center, that dispatch center will require extensive redesign when a 911 system is implemented.

This section contains basic information on the 911 concept and ends with a description of the system recommended for Hennepin County.

THE 911 CONCEPT

As early as 1967, a number of federal agencies including the Federal Communications Commission and the Congress of the United States suggested the establishment of one easy to remember, emergency telephone number for use everywhere in the United States to summon assistance for emergencies. After a series of hearings, AT&T announced in January, 1968 that it would make the number 911 available as that emergency number in any community or area that requested it.

Two major studies of 911 as the universal emergency telephone number were completed in 1970. Both studies concluded that the availability of 911 is a significant improvement over a myriad of 7-digit numbers and is better than dialing 0 for operator when fast emergency assistance is needed.

MAJOR ADVANTAGES OF 911

The major advantages of 911 can be grouped into two categories.

A. Faster communication to the public safety agency dispatcher when an emergency event occurs.

   1. Use of 911 eliminates time spent searching for the number of the appropriate public safety agency by persons who are frequently under severe stress and need help quickly. Studies show this to be a significant part of the total time between the recognition of the emergency and the arrival of public safety assistance

   2. 911 is an easily remembered number, even by children who are too young to read.

   3. 911 can be dialed in the dark.

   4. 911 is faster than dialing 0 because the operator must determine the type and location of the emergency, find the appropriate 7-digit number, extend the call and then the caller must repeat his emergency information to the public safety agency.

B. 911 can provide features not available from any other telephone system to the public safety service.

   1. The 911 system can route a call automatically to a dispatcher serving the area from which the call originated even if the boundaries of that area are different than telephone exchange boundaries.

   2. With 911 it is possible for a dispatcher to hold a line open even if the caller hangs up.

   3. With 911 and the above call hold feature, it is possible for the dispatcher to ring the calling phone after it has been hung up.

   4. With 911 it is possible to disconnect lines if someone attempts to tie up all incoming lines by dialing the emergency number from many phones and leaving them off the hook.

   5. With 911 it is possible to diplay the customer name and address and other information about the calling telephone at the time a 911 is answered.

   6. With 911 it is possible to arrange pay telephones so that the emergency number can be dialed without a dime.

In addition to these features, 911 is unlikely to be random dialed by young children playing with the telephone.

911 TRENDS

As of January 1, 1973, five years after AT&T made 911 available, 10 of the 50 largest cities in the United States have or will soon have 911 emergency telephone service. No major California city has 911, however the California legislature passed legislation requiring 911 service for every citizen of California by 1982. The Massachusetts legislature recently passed legislation requiring 911 service throughout the state as soon as it can be implemented.

Only Austin, St. James and Windom in Minnesota have 911 service.

The FCC and Congress within the past year have begun taking testimony for the purpose of determining how the trend toward use of 911 can be accelerated so that 911

service will be available everywhere in the United States at the earliest possible date. Recently, the federal government established a national clearinghouse for 911 information in the Office of Telecommunications Policy.

In Minnesota, the Metropolitan Council and other political bodies have repeatedly stated strong support for the establishment of 911 service at the earliest possible date.

It is clear that 911 is on the way not just in Hennepin County but everywhere in the United States.

A 911 SYSTEM FOR HENNEPIN COUNTY

The following system considerations and components describe a 911 system configuration that will both meet the needs of Hennepin County and is within the existing state of the art.

1. The system should include a dedicated telephone trunk network from all local exchanges in Hennepin County to selected ESS centers which will be designated as hub centers of the 911 system. This dedicated trunk network is required to retain calling number identity for rering and automatic location identification purposes.

2. All 911 call answering positions should handle calls for police, sheriff, fire and ambulance-rescue agencies and should have call extending capability to poison control center, suicide prevention center and to the appropriate hospital emergency room. Capability to extend calls to dispatchers must be included in the central dispatch facility.

3. The system should include call hold, rering and disconnect features.

4. Pay phone dial tone first should be evaluated.

5. The system should include automatic location identification capability at the central dispatch to display information about the calling telephone number when the 911 call is answered.

6. If one or more municipalities choose to maintain their own public safety dispatch at a site remote from the central dispatch, then the 911 system should include a 911 version of Centrex 7 in the 911 hub ESS centers so that 911 calls originating from within a particular municipality may be automatically routed to the remote dispatch location.

7. There should be a 7-digit back-up telephone capability in the event the 911 system becomes inoperative.

8. The system should begin operating on January 1, 1976. The system can be constructed by that date if go ahead is given now. January is the best time to begin using a 911 system because traditionally it is at the time of year when the lowest rate of emergency calls is experienced and when 911 is available, public safety agencies should be prepared for a substantially larger number of emergency calls.

Section 2C

CENTRAL DISPATCH

RECOMMENDATION

A centralized dispatch capable of handling the dispatch operations of all sheriff, police, and fire activities in Hennepin County is recommended. In addition, the following features are recommended for use within the dispatch center:

A. Central response location for all 911 calls within Hennepin County.

B. Use of a central computer to handle the following real-time capabilities.

   1. An automatic locator-identifier file for all telephone locations in Hennepin County.

   2. Additional computer files to store and provide specific functional information for use of the sheriff, police and fire dispatchers.

   3. The use of Cathode Ray Tube (CRT) displays to visualize the file information in front of the operator/dispatcher positions.

   4. Automatic transfer functions to transfer all recorded information from the 911 operator to the dispatcher, as well as to connect the dispatcher to the calling party when required.

C. Trunking capabilities to extend calls to emergency services not located in the central dispatch.

D. Automatic log capabilities to operate a log for each location, as well as summary capabilities for management use.

E. On-line connection to existing law enforcement information systems at state and federal levels.

RATIONALE

There are several advantages to having a centralized dispatch. Perhaps the greatest advantage is being able to purchase modern automated facilities for one location which would be too expensive on an individual basis. The automated central dispatch provides the public with direct access to all of the emergency services available to them simply by dialing 911. The response time to these emergencies by public safety officials is shortened due to the readily available information provided by the system, and rapid transfer of responsibility. Participants will save costs in manpower and facilities required, as well as being able to take advantage of building block addition of capabilities as they become available, building on the most up-to-date system available. Supervisors will have automatic management reports provided which will allow analysis and improvement in the use of existing manpower and resources. The central operation will provide better interjurisdictional coordination and a larger overview of total emergency operation.

DESCRIPTION

A. Functions and Decisions

In any operational facility, there are basically two types of actions; those actions which are decisions, and those actions which are functions performed to support the decisions made. The direction that each decision takes starts a chain of function actions which stop upon completion, or reaches another decision point. These functions and decisions can be logically presented by drawing graphic representations of these functions and decisions. When these decisions and related functions are depicted graphically, it is called a flow chart. Such a flow chart for a centralized dispatch is at Figure 2-C-1.

B. Use of the Flow Chart

The flow chart method by use of symbols and arrows describes functions, decisions, and the logical sequence of these functions and decisions. Analysis of the flow chart allows several elements to be examined:

1. Which functions and decisions can be eliminated.

2. Which functions and decisions can be combined.

3. Which functions and decisions occur most frequently and at what point of action.

4. An evaluation, based upon experience, can be made to determine which functions and decisions can be automated, and which should be automated.

5. An evaluation, based upon experience, can be made to determine which functions and decisions can reasonably be performed by one person at one location.

6. An evaluation can be made to decide how many positions of each type should be established.

7. An evaluation can be made to determine at which point supervisory control must be initiated, and what additional reports can be initiated for supervisory purposes.

8. An evaluation can be made to determine which functions are to be of limited access and where they will be controlled.

C. Assumptions

In the flow chart at figure 2-C-1, the following assumptions were made:

1. 911 system is operational.

2. Automatic Locator Identifier (ALI) computer is installed.

3. Cathode Ray Tube (CRT) displays are installed.

4. Files for Police and Fire are automated and stored in the computer.

5. On-line to the computer printers are installed for automatic log and message record.

6. Only police and fire will be located in the central dispatch. All other normal activities will be extended calls.

7. Purchase of a separate computer proves to be the best approach to automation.

D. Application

1. In the analysis of the flow chart, there are three main functional areas:

   a. 911 functions.

   b. Police dispatch functions.

   c. Fire dispatch functions.

2. At the 911 position, when a call is received, the operator answers and the following functions occur simultaneously:

   a. The telephone number, address, name of the person under whom the phone is listed, any locator identification code, log number and time appear in the CRT in front of the operator. Any additional information can be manually typed in from the console.

   b. If the call is an emergency, the operator can electronically transfer the information which is recorded on the CRT to the appropriate dispatcher who can initiate action even before the caller hangs up. Under certain conditions, the operator can transfer the calling party to the dispatcher. If the call is to be extended, the operator can read the information over the trunk line or telephone to the appropriate agency, or connect the caller to the emergency facility when required. If the call is not an emergency, the operator handles appropriately. Once a call is extended, transferred or cancelled, the operator presses an indicator to describe the call (fire, police, poison control, ambulance, false alarm, etc.) and closes the log by pressing a button which again records the time. The operator is then ready for another call. Several calls can be listed on the CRT simultaneously but only one handled at a time.

3. At the police dispatch location, the operator handles calls coming from two locations--the 911 operator and the patrol car. When the call is received from the 911 location, the operator is alerted and the information appears simultaneously on his CRT display, along with added log digit numbers to identify a police call and the time. The dispatcher then decides whether to search the file to add information to the CRT display, or to dispatch first and add information later. If the car dispatched is equipped with a digital receiver, such as a teleprinter, the operator can transmit electronically to the patrol car; if not, the information can be read over the air or telephone as appropriate. When the CRT is cleared by the operator, the log is printed and the dispatcher is ready to receive another call. If calls are coming faster than the dispatcher can clear them, the computer will store them in sequence unless the 911 operator gives a call priority. In that case the new call--if not also a priority call--will interrupt the call being handled and will be stored until the priority call is cleared, at which time it will appear on the CRT. If units are not available for dispatch, the computer can file the priority status of units on call to see if they can accept a priority request over a routine one. The patrol call will be received by radio and will be a follow-up action or a request for assistance. If the call is a follow-up action, the operator will add the information to the CRT and transfer to the appropriate log item, or close the log and automatically record the time closed and the time from initial log entry to close-out action. If the call is a request from the patrol, the operator may search the regular file on a separate CRT or the confidential file. If the information can be transmitted based upon operational instructions from the supervisor of the area being covered, it will be transferred to the first CRT and either transmitted digitally or read over the radio. The use of the second CRT is to keep the first CRT ready for emergency calls, and to prevent sensitive information from inadvertently being transmitted.

4. At the fire dispatch location, there will be two ways that the fire call is received--either transferred from the 911 operator, or from call boxes and secondary alarms located throughout the area. Call boxes are telephones located throughout the Metropolitan area and are used for police calls as much as or more than fire calls. This function could be integrated into the 911 system, either by using the existing call boxes or asking the telephone company to place more booths in the Metro area. Secondary alarms are located in building complexes or critical fire areas, and a call from one of these alarms is routinely responded to by a fire unit. In the case of the secondary alarm, the fire file stored in the computer could immediately add information to the CRT to assist the fire dispatcher. The information could be dispatched automatically by teletype, or by radio or telephone. As the information is added to the CRT, fire log digits and times are added to the log; or in the case of the secondary alarms, an original log number is assigned. The log would be closed in the same manner as the log for the police dispatcher.

5. The files as indicated in the flow chart need to be described as to content, controls, etc. These files are intended to be integral parts of the computer system, available only at the locations authorized and only used according to the instructions of the supervisor (sheriff, police chief) responsible for each dispatch area.

   a. File 1: (ALI)--This, of course, is the largest and most expensive of the files since it will hold the telephone number, address, name, and locator code for every telephone number in Hennepin County. It will be the single most costly item in the central dispatch. Its purchase justifies the existance of all the other files, CRT's and printers in the system as they can be added at a nominal cost after the purchase of the main computer. Although it is not intended to indicate that automatic locator identification as a function is the most important part of the central dispatch, its cost advantages when considering the associated capability of automating the rest of the consolidated dispatch highlights its consideration.

   b. File 2: This file is intended to be the working file for police dispatch. It will contain information on local ordinances, warrants, etc. Information in this file is not intended to be the sensitive type that could violate civil rights, etc. There should be little or no controls to access of this information. This file would be the one to which direct access from patrol cars would be feasible. This file is intended to augment and link to other information already available in state and federal computer systems, and not a replacement.

   c. File 3: This file is intended to be that information which is sensitive or confidential in nature with limited access. The dispatcher would be required to make a decision on an individual case-by-case basis whether it should be transmitted. This file would be under limited control so that only the dispatcher who handles calls for the area being covered would have access to this information, and the information could only be used based upon his instructions from the sheriff or police chief of the area which is covered.

   d. File 4: This file is intended for the use of the fire dispatcher and would contain such information as location of secondary alarms, units available, area covered, etc. Information on this file will contain the administrative information required to dispatch fire units and would have little or no access control.

6. There are associated management capabilities which do not directly apply to the function of the 911 central dispatch system, but will be capabilities of the manager.

   a. Summary information can be compiled by the computer to give reports on the number of calls, the number or percentage of which were actual emergencies; how many were police and fire, ambulance, etc., by types (robbery, assault, murder, etc.); how long it took to respond to a call and complete the action, the busy periods, etc.

   b. Handling of routine calls after hours could be accommodated by switching the regular police station numbers to the 911 operator or dispatcher who would handle under instructions given by the sheriff, police or fire chief. If the positions are occupied by emergency calls, a tape-recorded intercept could give appropriate instructions and record a message for follow-up action.

   c. Several dispatch positions could be connected to one dispatch position during slack periods to allow more efficient use of personnel. Additional positions could be added to assist a dispatcher who was crowded with traffic.

   d. The system will also be capable of handling 2-way digital transmission with direct access to certain computer files from patrol vehicles, should such a system become available.

   e. Although there can be no real back-up to the ALI computer, all of the switching and answering functions--along with the capability to manually enter information into the CRTs and electronically transfer such information to the dispatcher--will remain intact, even in case of a power failure as battery power back-up is normally good for over 12 hours.

7. There are several options which could be added to the system to expand capabilities; although these options are discussed, there have been no cost figures proposed as they are only intended to show the flexibility of the system.

   a. A CRT or teletype could be extended by trunk to the extended call locations, thus cutting down on voice transmissions by the 911 operator.

   b. An automatic alarm could be set off if a log item were not closed within a specified period of time. (Example - a lone policeman is away from his car for longer than 20 minutes investigating an open door in a warehouse). The dispatcher could then set off the sirens and lights of the police car to attract attention and scare off an intruder who may have injured the policeman.

   c. Activities could have emergency operations centers extended off the consolidated dispatch computer to handle single, large-scale emergencies.

   d. Direct access to certain files from patrol cars could be accommodated.

E. Central Dispatch Facility

Figure 2C-2 shows the layout for the central dispatch.

1. Assumptions: In the conceptual design of the central dispatch facility, the functions of the flow chart were matched with the density of operations for an optimum system for Hennepin County. Several assumptions, of course, had to be made to achieve an optimum facility. These assumptions are in addition to those of the flow chart.

   a. All sheriff, police and fire facilities in Hennepin County will join the central dispatch. (The allowed space will not be changed if this assumption does not originally come true, since accommodation for these other facilities must be planned if they join later.)

   b. Space for the dispatch facility will be available in an existing building. (Costing estimates for a separate building will be presented.)

2. Requirements: In the design of the facility, several requirements must be considered. These are:

   a. The facility must be expandable. In an area of known population growth, the services provided for that area will expand. Sound planning dictates prudence in designing the ability to expand the facility without major modification.

   b. The facility must be adaptable. Changing requirements, new techniques, and new methods of operation are constantly appearing within the area of any profession. The utilization of these techniques is often delayed because the current system will not readily accept changes.

   c. The dispatch locations must allow maximum response to the operational direction of the sheriff, and police or fire chiefs for whom they dispatch, as they are ultimately responsible for the performance of their team of professionals.

   d. The system must provide all of the information necessary for operation of the dispatch, but provide limited access to sensitive or confidential information, and protect that information from intentional or accidental disclosure to unauthorized persons.

   e. The facility must provide maximum utilization of personnel and equipment.

3. Description of the Layout of the Dispatch Facility

a. Due to investigations of current density work loads in other central dispatches, the following features were designed into the dispatch.

(1) 911 positions were established as separate positions. (One primary reason--if a major disaster happens in one dispatch area, all operators will be available to screen respective calls.)

(2) Police and fire dispatch positions were combined.

(3) The number of 911 positions are equal to the number of police/fire dispatch locations.

(4) A separate position was established for law enforcement emergencies.

(5) A separate position was established for civil defense, utility channels and other civilian agencies for use during major disasters such as tornadoes, floods, war or other emergencies where close coordination is required with agencies not normally functional in the dispatch center.

(6) A separate area off the main floor was established for various supervisors who would be present.

b. The center--as shown in figure 2C-2--is an all electronic transfer, recording, logging, file searching system. The locator identification information is automatically displayed from the computer to the CRT at the 911 position when the call is answered. The log is automatically printed at the same time. Only when additional information is supplied verbally by the caller must the operator type to add to the information. He presses a button to transfer the information displayed to the dispatcher. The extended calls would either be by trunk or computer activated telephone numbers. The dispatcher position is also automatically controlled except that he will have to press to transmit on the radio, or press selector buttons to search the files and close the log.

c. The computer would provide automatic locator identifier information for every telephone in Hennepin County--displaying the number, address, name of the customer under whose name the telephone is listed, and a locator code on the CRT of the 911 position or the CRT of the dispatcher--when the information is transferred. The computer would automatically record all log information and tape all conversations. The computer would, upon request, automatically summarize the activities at each 911 position, dispatch position, or total operation, for number of calls, number of emergency vs. non-emergency, dispatch time for each call, time to close each action, location of action, and type of action. The computer would also store or connect to other computer systems for various additional files such as local ordinances, active warrants, criminal information, fire units available and locations, as well as a confidential file with limited access controls for each dispatch area.

d. Initially, based upon a study of the number of mobiles that can reasonably be handled by one dispatcher, seven dispatch locations are indicated in figure 2C-2. Since other central dispatches in operation find the proper dispatch telephone answering position ratio is 1 to 1, seven 911 positions and seven dispatch positions are indicated in the facility. During slow traffic periods, or when one operator needs to take a break and no replacement is immediately available, one dispatcher could handle two or three positions from one location. Figure 2C-2 shows room for expansion of both 911 positions, dispatch positions and additional computer capacity.

e. The functions and layout shown are intended to be conceptual only, and represent an optimum system. Detailed engineering, budget decisions, and operational organization will modify this concept considerably before implementation.

Section 2D

DIGITAL COMMUNICATIONS

In many areas, law enforcement personnel experience some special difficulties with two-way voice radio communications. Among these difficulties are channel congestion and monitoring of communications by unauthorized persons.

Recently, a new kind of non-voice radio communications by digital means has become available which, when used along with regular two-way voice channels, promises to relieve the difficulties with voice communications. In the future, it is likely that many other valuable law enforcement uses will be found for this digital kind of communications.

Two programs involving very different forms of digital communications will be operational soon in Hennepin County.

One of these programs, in suburban Hennepin County, will employ digital communications from the dispatcher to mobile units only; while the other, in the City of Minneapolis, involves a two-way digital system.

RECOMMENDATION

It is recommended that the presently planned one-way and two-way digital programs in suburban Hennepin County and the City of Minneapolis be continued.

Experience gained from operating these two programs--combined with studying developments in the field of digital communications as they are reported--will make it possible to specify the kind of system or systems which should be adopted in the future.

The equipment in the central dispatch facility will be planned to accept whichever digital communications system or combination of both types is adopted.

Section 2E

TELEVISION SITUATION SURVEILLANCE

RECOMMENDATION

It is recommended that a television situation surveillance subsystem be incorporated to bring back live pictures of major incidents such as large fires, civil disturbances (such as an incident like the New Orleans sniper) to the central dispatch center to provide additional information for the command function.

SUBSYSTEM DESCRIPTION

The subsystem should consit of at least two good resolution, black and white cameras with zoom lenses, two microwave links, two monitors and two video tape recorders. In addition, another monitor should be located at the offices of the Minneapolis Fire Department with a switch at the control center permitting extension of any picture to that fire department monitor.

The system should be designed so that one camera can be carried aboard a helicopter.

The system should also be designed to accept signals made available over a CCTV loop from any commercial TV station willing to make part of their equipment available during an emergency.

SECTION 3

SPECIAL SITUATIONS

SECTION 3

SPECIAL SITUATIONS

METROPOLITAN STADIUM AND METROPOLITAN SPORTS CENTER

The Minnesota Police Radio Communications Plan designated a second vhf radio frequency for the Bloomington Police Department for the purpose of handling traffic and crowds at the Metropolitan Stadium--Sports Center complex. That frequency was to occupy position F2 on the Bloomington vhf radios.

It is recommended that Bloomington Police Department units have the Hennepin County vhf car-to-car simplex channel in the F2 position, provided that another suitable communications channel can be found for the Stadium--Sports Center complex.

Possibilities for a suitable channel include a private channel with equipment purchased and maintained by the Stadium--Sports Center management or a uhf channel.

DEAD SPOTS

Eden Prairie Police Department reports a general lack of communications between mobile units and the Hennepin County dispatcher in several areas in the southern part of the village. Bloomington Police Department reports spotty dead spot problems west of Mt. Normandale.

These dead spot difficulties may be solved by locating a new Hennepin County repeater near the southern edge of Hennepin County.

INFORMATION

Several kinds of information not currently readily available to police officers in the field are desirable. They include the following:

1. The motor vehicle registration file should contain information about the prime drivers of leased vehicles.

2. A file by serial numbers, cross-checked to owner's name and license number, should be maintained for boats, motors, and snowmobiles.

3. Maps of rural mail routes should be readily available to radio dispatchers.

ST. ANTHONY POLICE DEPARTMENT

St. Anthony is located between Minneapolis and Anoka and Ramsey Counties, and is physically separated from Hennepin County suburban law enforcement agencies by a considerable distance. It is, therefore, necessary for St. Anthony to coordinate activities with the Minneapolis Police Department and the Ramsey and Anoka units more often than suburban Hennepin units.

In the recommended channel arrangement, St. Anthony will be able to establish car-to-car communications on the vhf and uhf common coordinating channels--F4 and F8.

WATER PATROL

Law enforcement agencies from jurisdictions around Lake Minnetonka have shown the need to have direct unit-to-unit communications between their mobile units and units of the Sheriff's Water Patrol. This is, and will remain, possible on the Hennepin County Simplex Channel F2.

SPECIAL AGENCIES

Because of their unique operations, most police patrol work of the University of Minnesota Police Department and the Airport Police Department is done on foot. As a result, these agencies need to be equipped primarily with portable radios rather than mobile radios. Strong consideration should be given to use of new, small size, light weight, portable radio equipment for these agencies.

ROCKFORD AND DELANO

In the past, Delano (which is in Wright County) has included a Hennepin County mobile radio in its police cruiser in order to communicate with Hennepin units directly across the Crow River from the village. The Village of Rockford is in a similar situation in that while it is in Wright County, it is directly across the Crow River from Hennepin County. With the channel arrangement recommended, it will be possible to communicate with Delano and Rockford police units on the vhf common coordination channel F4. Therefore, there is no need to equip these Wright County villages with Hennepin radios. This idea was transmitted to the Police Departments in both villages by letter with an invitation extended to express an opinion. Neither Police Department expressed any objection or concern about this recommendation.

GENERAL HOSPITAL AMBULANCE SERVICE

It is recommended that General Hospital ambulances continue to be dispatched from the ambulance garage at the Hospital since much ambulance activity is closely tied to the hospital routine, and dispatching is done verbally on the site rather than by radio.

SECTION 4

COST ESTIMATES

SECTION 4A

COST ESTIMATE - TWO-WAY RADIO SYSTEM

Assume that Hennepin County has 302 4-channel vhf mobile radios; 302 4-channel uhf mobile radios with three crystals in 179, and two crystals in 133; 150 vhf 4-channel portables and 179 scanners.

Assume that both Minneapolis police department, the suburban police departments and the sheriff's department will have 10% more mobiles in 1976 than now.

Item	Quantity	Description		Cost
1	30	4-ch vhf mobile radios	(1,200 ea)	$ 36,000
2	295 (265 for Minneapolis PD)	4-ch uhf mobile radios	(1,200 ea)	354,000
3	66	4-ch uhf portables, Minneapolis PD	(1,200 ea)	79,200
4	163	Scanners	(160 ea)	26,000
5	133	Ch 2 suburban crystals	(60 ea)	8,000
6	435	uhf suburban crystals	(60 ea)	26,000
7	42	U of M crystals	(60 ea)	2,500
8	1	Crossband repeater, antenna, and transmission line		5,000
9	7	Control consoles	(20,000 ea)	140,000
10	11	Repeating base stations	(3,000 ea)	33,000
11	1	Base station		3,000
12	12	Antennas		4,000
13	11	Duplexers		4,000
14	1	Towers		5,000
15	11	rf remote control stations with transmission lines and antennas	(1,000 ea)	11,000

Item	Quantity	Description	Cost
16	-	Monitor receivers, misc. equipment	$ 25,000
17	1	Emergency console	15,000
18	1	EOC console	25,000
19	10	EOC remote control stations	7,500
20	10	EOC base stations with antennas and transmission lines	30,000
21	-	Patch equipment	5,000
22	-	Minneapolis Fire Department remote control station	2,000
23	-	Labor - mobiles	3,000
24	-	Labor - installing consoles	10,000
25	-	Labor - antennas and base stations	10,000
26	-	Labor - backup control stations	10,000
27	-	Labor - miscellaneous	10,000
28	-	Labor - EOC	40,000
29	-	Contingencies	100,000
		TOTAL ESTIMATED COST	$1,034,200

SECTION 4B

COST ESTIMATE - 911 EMERGENCY SYSTEM

NON-TARIFF ITEMS - (HOLD, RE-RING, AND FORCED DISCONNECT)

	Installation	Monthly
1. Selectors	$ 7,000	$ 5,090
2. Penalty Trunks	3,500	4,915
3. 911 Trunks	2,500	1,865
NON-TARIFF TOTAL	$13,000	$11,870 mo.

TARIFF ITEMS - (HOLD, RE-RING, AND FORCED DISCONNECT)

	Installation	Monthly
1. 911 Trunks	$ 1,253	$ 6,613
2. Incoming Trunks	2,880	7,728
TARIFF TOTAL	$ 4,133	$14,341
TOTAL	$17,133 inst.	$26,211 mo.
Contingencies	10,000	
TOTAL	$27,133	

SECTION 4C

COST ESTIMATE - ALI COMPUTER SYSTEM WITH INFORMATION FUNCTIONS

Item	Quantity	Description	Estimated Cost
1	1	Central Processing Unit	$ 657,840
2	1	CPU Timer	4,800
3	1	Floating Point Arithmetic	N/C
4	1	System Control Unit	55,200
5	1	Console Adapter	9,070
6	1	Console Printer Keyboard	8,000
7	1	Power Unit	16,800
8	1	Disk Storage and Control	65,000
9	1	Tape Control	25,820
10	3	Magnetic Tape Unit	40,740
11	3	Single Density	9,780
12	1	Control Unit	37,180
13	1	1100 ipm Printer Adapter	2,400
14	1	Universal Character Set Adapter	610
15	1	Printer	33,070
16	1	Universal Character Set	380
17	1	Interchangeable Train Cartridge	2,910
18	1	Card Read Punch	32,930
19	2	Control Units	16,400
20	12	Device Adapters	12,900
21	25	1920 Character CRTs	110,000
22	25	Data Entry Keyboards	15,000
23	25	40 CPS Printers	164,000

Item	Quantity	Description	Estimated Cost
24	2	Card Data Recorders	$ 22,050
25	1	Card Sorter	7,275
		TOTAL	$ 1,350,243
		Software @ 30% of Cost	407,080
		TOTAL	$ 1,757,323

SECTION 4D

COST ESTIMATE - CONSOLIDATED DISPATCH FACILITY

150' X 100' @ $25/sq. ft. (existing building)	$375,000
150' X 100' @ $40/sq. ft. (separate building)	600,000
Telephone Consoles and Equipment	132,000
Additional Miscellaneous Equipment	25,000
TOTAL for Existing Building	$532,000
TOTAL for New Building	$757,000

SECTION 4E

COST ESTIMATE - TELEVISION SITUATION SURVEILLANCE SYSTEM

Item	Quantity	Description	Estimated Cost
1	2	Cameras with Zoom Lenses	$ 3,000
2	2	Microwave Links	20,000
3	2	Field Power Packs	1,000
4	3	Monitors	1,500
5	1	Console with Switcher	2,500
6	2	VTR One Inch Helical	10,000
7	-	Labor	5,000
8	-	Contingencies	5,000
		TOTAL Estimated Cost	$ 48,000

SECTION 4F

COST SUMMARY

Two-Way Radio System	$ 1,034,200
911 Emergency System	27,133
ALI Computer Information System	1,757,323
Central Dispatch Facility	532,000
TV System	48,000
TOTAL	$ 3,398,656

FOLLOW-ON WORK

5

SECTION

SECTION 5

FOLLOW-ON WORK

Following is a description of additional work recommended. The work is divided into task blocks.

1. Determine details of the systems.

   a. Determine how the centralized dispatch operation will be organized and administered.

   b. Determine the location for the centralized dispatch facility.

   c. Determine locations for base stations, antennas and dispersed back-up dispatch facilities.

   d. Study major dispatch facilities for ideas.

   e. Secure approvals from MCR board, the Minnesota Department of Public Safety and the FCC.

   f. Determine if existing computers can be shared or if a computer needs to be purchased for ALI.

   g. Determine solutions to problems associated with eliminating a dispatcher from an independent police department.

   h. Describe the specific system to be constructed.

2. Determine the ongoing operating expenses of the system.

   a. Personnel.

   b. 911, 7-digit back up and after hours routine call telephone systems.

   c. Computer including maintenance and repair, programming and up dating daily.

   d. Utilities.

   e. Facility maintenance.

   f. Who will pay what part of these costs?

3. Determine who will join the centralized dispatch operation.

4. Determine a reasonably accurate capital cost for each system.

5. Assist in seeking funding.

   a. LEAA grant application for radio equipment.

   b. LEAA discretionary grant for computer..

   c. Civil defense funding for van and EOC.

   d. H.E.W. funding for 911.

6. Detailed design of all components of all systems.

7. Bidding assistance, construction and installation supervision, continuing engineering and acceptance inspection of T.V. system, telephone systems, computer and facility.

END