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**Department of Criminal Justice Services  
Commonwealth of Virginia**

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**LAW ENFORCEMENT COMMUNICATIONS  
IN VIRGINIA:**

**A REVIEW**

**JUNE 1990**

**DEPARTMENT OF CRIMINAL JUSTICE SERVICES  
COMMONWEALTH OF VIRGINIA**

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## EXECUTIVE SUMMARY

The Communications Grant Program of 1989 made significant progress in addressing the most critical needs of local law enforcement. The \$5.4 million awarded to 221 agencies met the most pressing needs of these departments. There remain approximately \$16 million in other communications equipment needs which could not be met.

Most law enforcement agencies now have an adequate communication system but future expansion and technological advances will continue to require upgrades. Radio frequencies are extremely difficult to obtain and some method of coordination with the Federal Communications Commission needs to be established to assist in spectrum management.

Virginia is fortunate to have a statewide law enforcement radio system which links local, state and federal agencies. This system needs to be strengthened to protect it from encroachment in the future. There are also two regional systems located in Northern Virginia and Tidewater which provide similar capabilities.

There are presently no minimum standards for the development or operation of a police radio system. Non-binding standards should be developed which are flexible enough to encompass all types of agencies and operational conditions. These standards would serve to guide law enforcement executives in the development or renovation of radio systems.

Technology is advancing rapidly in the communications industry. New products will offer solutions to some problems, but will create others by offering a complex array of components and systems. The State should provide engineering expertise to local police to assist them in choosing the most economical and effective method of solving problems with available technologies. This capability does not exist at present.

**FINDINGS:**

1). There is a lack of objective engineering expertise available to law enforcement officials who are attempting to design a radio system.

2). Communication systems will continue to expand and upgrades will be required as technology advances.

3). Interdepartmental communications are a vital component in modern law enforcement. The single statewide system needs to be formally constituted.

4). There is a need to establish minimum standards for police communications systems to ensure officer safety and enhance operational effectiveness.

**RECOMMENDATIONS:**

1) The Commonwealth should provide engineering assistance to local law enforcement agencies to design radio systems.

2). A periodic survey should be made of the infrastructure of communications systems.

3). The Statewide Interdepartmental Radio System (SIRS) should be officially established by statute or Executive Order.

4). Minimum standards should be developed for law enforcement radio systems.

5). The state should attempt to modify FCC procedures to assure the availability of Police radio frequencies.

In summary, the Communications Grant Program of 1989 made notable progress in providing an adequate local law enforcement communications network. It further surfaced needs which could not be addressed. The greatest benefit of this Program could be the institutionalization of a method of keeping abreast of the status of local police communication systems in the future.

## I. RESULTS OF GRANT PROGRAM

The Communications Grant Program of 1989 was able to address some of the critical equipment needs facing local law enforcement agencies. This program was established by the 1989 General Assembly with an appropriation of \$5.6 million, directing the Secretary of Transportation & Public Safety to formulate a plan to award funds as grants to localities for the purpose of purchasing essential law enforcement communications equipment. The Criminal Justice Services Board (CJSB) was designated to make the grant awards, with the Department of Criminal Justice Services (DCJS) charged with the program's administration.

A survey of local law enforcement agencies across the state conducted by the Department of Criminal Justice Services (DCJS) in early 1989 indicated a need for \$22 million in communications equipment upgrades. These survey results may have actually underestimated the total communications equipment needs, as the survey and the grant program, excluded 34 Sheriffs' offices in jurisdictions where police departments are charged with primary law enforcement responsibilities. These Sheriffs' offices may have substantial needs not reflected in the survey. While these departments do not have the same law enforcement responsibilities, there are legitimate communications needs associated with their constitutionally mandated duties of providing courtroom security, serving civil process and jail operations, including inmate transportation.

Unfortunately, the \$5.4 million awarded met only 55% of the

highest priority, critical needs. There were 262 local law enforcement agencies eligible to participate in this program. Of these, 222 submitted grant applications and 221 received grant awards. Many of the critical needs of some agencies could not be met due to funding constraints. All agencies were classified according to the number of sworn officers employed. Departments with 101+ officers were classified as large, while departments with 26 to 100 were classified as medium. Any department with 25 or fewer officers was classified as small. The appropriation was subdivided by category with 35% each allocated to the large and medium categories and 30% to the small.

Requests for funding critically needed equipment under the Grant Program exceeded \$9.5 million, necessitating substantial reductions in virtually every request. Reductions were based upon the availability of funds within each size category. Whenever possible these reductions were made in accordance with the priorities provided by the applicants. In most cases, the system infrastructure was left intact while reducing the total number of peripheral items such as mobile and portable radios.

A subcommittee of the Criminal Justice Services Board was appointed to oversee this program. In keeping with the legislative intent of the appropriation, (see Appendix A) and working within the limits of available funds, the subcommittee restricted funding to the basic elements of a communications system. These basic elements were identified as the six items most frequently listed on the DCJS survey as critically needed.

These items were; base stations, mobile radios, portable radios, vehicular repeaters, fixed repeaters and recorder/loggers. Other pieces of communications equipment, such as consoles and computer aided dispatch systems; were excluded from consideration due to the lack of available funds and their relatively high cost. These restrictions were established as a method of ensuring that the available funds were expended as cost effectively as possible while addressing the critical needs of the largest number of applicants.

There remain needs in excess of \$16 million for law enforcement communications equipment upgrades across the Commonwealth. Many of the agencies with the greatest needs are those with the least ability to provide the funds to purchase this equipment. Law enforcement communications will always require upgrades to some extent as existing equipment ages and new technologies surpass existing capabilities.

## II. PRESENT STATUS OF LOCAL LAW ENFORCEMENT SYSTEMS

### A. OVERVIEW

As a result of the equipment upgrades made through the Communications Grant Program of 1989, the basic radio systems of most local law enforcement agencies across the Commonwealth have been substantially improved. This grant program could not provide sufficient funds to replace entire existing systems. Therefore, many agencies will need to supplement grant funds to completely modernize their systems. Of course, agencies will need to expand these systems with additional equipment as new officers are employed.

Many agencies are in the process of evaluating present systems to determine the most efficient way to meet future needs. In some cases this may entail an upgrade of the entire system, including the frequency band on which it operates. There is a finite number of frequencies available and these frequencies are becoming increasingly more difficult to obtain.

The radio spectrum is a part of the natural phenomenon of electromagnetic waves. Other examples of electromagnetic waves are infrared, visible light, ultraviolet, x-rays, gamma rays and cosmic waves. Man has defined the electromagnetic waves in the radio spectrum as frequencies, measured in megahertz (MHz). The Federal Communications Commission (FCC) is the sole agency within the United States with the authority to regulate the use of these frequencies. It has designated them for specific uses, e.g., television, commercial radio, business radio, navigation, aviation, public safety and many others. The portion of the spectrum assigned to public safety is very small. Public safety radio frequencies are further subdivided by radio bands which are defined as; Very High Frequency (VHF) Low Band 30-50 MHz, Very High Frequency (VHF) High Band 150-174 MHz, Ultra High Frequency (UHF) 450-512 MHz and

finally 800 MHz.

There is often no reason, other than preference, as to the frequency band chosen. It would seem logical that adjacent agencies which have the same topographical impediments to overcome would utilize the same band. This, however, is not the case. An examination of a public safety spectrum utilization map of the Commonwealth, (See Appendix B) discloses virtually every band in use in all regions of the state. Unfortunately, not every band is suitable for every region. One band may provide ample coverage in one setting and be wholly unsuitable in another region. For example, 800 MHz, may be ideal for relatively compact, urban jurisdictions, but would lack the breadth of coverage needed in a large rural, mountainous county. The 800 MHz signal is largely a "line of sight" signal which is impeded by hills and trees. While this frequency band can be made operational in the rural area, it would require an extensive number of costly repeater sites to boost the signal over obstructions to provide total coverage.

This morass of frequency use and the limited availability of additional frequencies in each band, desperately needs management. These problems could best be addressed by the state having a role in the allocation of these frequencies, thereby insuring that the proper frequencies were available to those public safety agencies which can demonstrate the need. The Federal Communications Commission's current practice of "first come, first served", and the exclusion of state participation in the allocation of frequencies, prevents the formulation of this type of statewide operational plan.

#### B. PRESENT FCC PROCEDURES

One of the most critical factors in law enforcement communications planning today is the unavailability of frequencies. This problem is partially

caused by the policies of the Federal Communications Commission (FCC) which dictate that frequencies be assigned on a "first come, first served" basis without regard for the overall impact on a region or state. Except as noted below, there is presently no FCC requirement for applicants to surrender existing frequency licenses when obtaining new assignments. Most applicants state that they retain the old system to serve as backup in the event of a failure in the new system. This practice eliminates the reassignment of a frequency which remains unused most of the time, to another applicant.

The FCC has recently begun to address the problems described above, but only in the newest group of 800 MHz frequencies to be assigned. The Commission has divided the United States into geographical regions for frequency planning and assignment purposes. Each region appoints a committee to develop a plan for the use and assignment of the new 800 MHz frequencies. As a requirement for licensing in this 800 Mhz band, applicants must surrender some, if not all, of the frequencies presently held in other bands. While this is a noteworthy beginning, it does not cover the vast majority of license holders who are not seeking licenses in the 800 MHz band.

The shortage of frequencies is one of the factors forcing applicants to move to higher frequency bands, e.g. 800 MHz because that is where the available frequencies are. In many cases the new higher range frequencies are not as well suited to the applicant's needs as the existing lower frequencies, e.g. VHF 150-174 MHz. It is certainly more costly to install a completely new system, often with expanded base station and repeater sites, than to add additional frequencies to an existing system. The Virginia State Police system is an example of this problem. The four assigned frequency pairs in VHF are insufficient to meet present needs. Future expansion of the Department will exacerbate this problem and probably lead to a move to another band. Such a

move will entail a vast expansion of an already complex network with the attendant increase in costs.

If an arrangement could be made to require the surrender of presently held licenses as a prerequisite to the assignment of a new frequency, significant portions of the radio bands could be opened for reuse. Another alternative would be to permit the previous licensee to retain the frequency for backup, but co-license the same channel to another agency to be used for primary operations. In those rare instances where both licensees would operate at the same time, there would be interference - but for a limited duration.

These problems are not solvable at the state level but significantly impact the quality and costs of both local and state law enforcement communications systems.

#### C. STATE-WIDE SYSTEM

Virginia has an invaluable resource in the State-wide Interdepartmental Radio System (SIRS). SIRS was created in 1977 by Secretary of Public Safety, H. Selwyn Smith. It functions under the auspices of the Secretary of Public Safety and links local law enforcement agencies with the Department of State Police, the Department of Corrections, primary federal law enforcement agencies and related state criminal justice agencies. The system was created to meet three major needs: (1) provide a direct link between state and local law enforcement agencies, (2) provide Sheriffs with a common state-wide channel for prisoner transport duties and (3) provide a direct communications link between the Department of Corrections and state and local police for use in prison disturbances, escapes and problems arising during prisoner transport.

The System was designed to be used for routine police business and is not

restricted to major crimes or emergencies as are most state-wide systems in other states. SIRS is used thousands of times each day by the 305 member agencies. Membership is divided into two classes - Regular, which is available to all Virginia public law enforcement agencies and Special, which is granted by a vote of the SIRS Advisory Board to state and federal agencies which demonstrate a need to use the System.

SIRS is managed by an eight member Advisory Board, appointed by the Secretary of Public Safety, which consists of two chiefs of police, two sheriffs, one representative each from the Department of State Police and the Department of Corrections, one person representing the Associated Public Safety Communications Officers (APCO) and a person representing the Secretary of Public Safety. The Board meets quarterly to transact System business which includes voting on special membership requests, handling complaints and planning for the System's future.

SIRS is indispensable today due to the variety of non-compatible communications systems in use by law enforcement departments. It is the one system capable of linking Virginia's criminal justice agencies together to handle both routine business and major emergencies.

The future of SIRS lies in the careful management and planning by the Advisory Board. The Board's role needs to be strengthened by statute or Executive Order to assure that this resource will continue to be available for the future.

#### D. REGIONAL SYSTEMS

There are two principal regional law enforcement radio systems in Virginia. The larger of the two, Police Mutual Aid Radio System (PMARS) operates in northern Virginia, Washington D.C., and suburban Maryland. It was

formed under the auspices of the Metropolitan Washington Council of Governments. There are presently 22 member organizations representing state, local and federal law enforcement agencies. The system, which is primarily station to station, can be activated selectively i.e., two or more jurisdictions transacting business related only to each other, or in a general alert mode to all members. The system also provides for a selective connection of mobile units of member agencies which may be responding to a single emergency. This "patching" capability is available to 18 of the 22 members.

The PMARS system is well organized, conducts daily tests to assure operational reliability and performs at a very high level of efficiency. The supervisory committee meets monthly to assess the system and resolve problems. This system serves a key role in coordinating law enforcement operations in this densely populated region.

The other regional network, Tidewater Emergency Communications Association - Police (TECAP) is located in the Hampton Roads area. It serves state, local and federal police (U.S. Navy) agencies. TECAP has 16 members and follows many of the practices described above. The supervisory committee of TECAP meets quarterly as opposed to the monthly meetings of the PMARS committee.

A common problem with both of these systems is the age of the key transmitter equipment. Many of these base stations were purchased with federal grant funds in the 1970's and are nearing the end of their useful lives. Some provision must be made for funding this equipment if the regional systems are to continue to function.

### III. MINIMUM STANDARDS FOR LAW ENFORCEMENT COMMUNICATIONS

When embarking on a plan to enhance and keep abreast of police communications systems one would expect to find a set of standards for guidance. These standards should provide a solid foundation upon which systems can be built, modified and expanded as circumstances dictate. They should also provide minimum thresholds for officer safety and operational effectiveness. Surprisingly, when research was conducted, almost no standards were found.

With the exception of the National Commission for Accreditation of Law Enforcement Agencies, no agency at either the federal or state level has established basic minimum communications standards for law enforcement agencies. The Commission has developed basic communications guidelines for law enforcement agencies as one part of the procedure for obtaining and retaining a Certificate of Accreditation (See Appendix C). Currently, each individual law enforcement agency is responsible for determining its own needs and, with the assistance of private consultants or communications industry representatives, developing a communications system to meet those needs. As a result, there is a great deal of variance in the quality and quantity of communications equipment in use by local law enforcement. The establishment of standards has been inhibited by several factors including the localities' desire to protect local autonomy, purchasing practices, vendor preference, geographical differences and departmental size.

Few localities are willing to relinquish their autonomy in determining and purchasing the equipment they feel will be best suited to their needs. Therefore any minimum standards developed must be in the form of recommended practices, avoiding any mandatory compliance requirements. All communications systems are somewhat unique to the locality and must be developed according to the needs and limitations of the user. When developing the system many factors

must be considered. Among these factors are jurisdictional size, i.e. square miles, topography, population density and department size. These, and other specific communications problems confronting the agency, directly relate to the basic system design and type of equipment chosen. Obviously no one system can possibly address all of the needs facing the 262 local law enforcement agencies in Virginia. However, there are several general minimum standards which apply to all law enforcement agencies regardless of size and locale. The following sections refer to these very basic and general standards, which if followed, would serve to improve law enforcement communications.

Standards, as used in this report, implies a minimum acceptable condition or level of performance. Arlington County and the Town of Haysi have widely differing police communications needs, yet each must meet certain basic criteria to be truly effective. Arlington's population density, interstate traffic and relationships to its metropolitan neighbors will dictate a communications capability four or five levels above the standards whereas Haysi's population may be adequately served at the initial threshold. An effective communications plan must set those crucial minimum standards, but not attempt to determine the final needs of each jurisdiction. As cited above, location, size, crime rate, revenue capacity and other factors will dictate the level of sophistication required beyond the basic standard.

All law enforcement communications systems should provide total radio coverage over the entire jurisdiction. There should be no "dead spots" within the locality where officers are unable to contact either the communications center or, at the very least, other patrol officers. Such "dead spots" place officers responding to calls for service at unnecessary risk and further jeopardize the department's effectiveness. Every departmental vehicle should have a radio installed which is capable of reaching the base station from

anywhere in the jurisdiction.

In addition, the system should provide each vehicle the capability to access an inter-departmental frequency allowing direct communications between patrol officers as well as base stations from adjacent localities. Most often, this standard will be met by adding the inter-departmental frequency to the existing mobile radio or providing a separate mobile radio on the state/regional frequency. Direct inter-departmental communications fosters cooperation between localities and reduces officer risk. This capability is often the key to making expeditious arrests, preventing suspects or escapees from fleeing an area and thus enabling each locality to increase the manpower available on a moment's notice. As every police officer must routinely leave his/her vehicle, each officer should carry a portable radio capable of reaching the main communications center.

A communications plan should provide the framework for periodic briefing of the General Assembly as to the status of law enforcement systems. Consequently, changes in the overall condition of police systems, updates on technological advances and major problems could be reviewed before they assume crisis proportion. The General Assembly could order studies on the most serious problems and seemingly insurmountable roadblocks. Action at the state level, with its broader range of resources, would be more effective, in that it would attack problems system wide, in contrast to individual municipal efforts which would be much narrower in scope. The information gained would certainly be of great assistance to local governments when they undertake planning activities, eliminating needless duplication.

One means of providing the General Assembly with information would be a periodic survey of police communications systems at fixed intervals, e.g. 3-4 years. A single agency could be assigned this task with authority to seek

assistance from related agencies as needed. The survey data could be reported in condensed form, giving emphasis only to those items which required immediate attention or posed unusual problems. A compilation of this data would provide a sound base for predicting future needs and guiding planning to address them.

#### IV. CURRENT TECHNOLOGY

##### A. GENERAL DESCRIPTION

Radio communications technology provides more than adequate technical responses to the communications problems facing law enforcement agencies. The introduction of computer technology has revolutionized the communications industry, making it possible to create superior products with increased speed and reliability. Current models are "smarter" than their predecessors in that they are capable of performing a wider range of functions and have a greater frequency capacity. They can now cover an entire radio band, giving planners more flexibility in developing a system. These improvements have coincided with advances made in miniaturization techniques. Consequently, radios are much smaller and lighter, making them easier to transport without sacrificing range and accuracy. Manufacturers currently incorporate the use of microprocessors, computer chips, intergrated circuit boards and the latest advances in automated manufacturing techniques to produce extremely reliable equipment whose capabilities far exceed those of their predecessors.

The following sections describe the two major advancements which offer the greatest promise to enhance communications systems of law enforcement agencies.

##### B. ENCRYPTION

A problem engendered by technology is the need for secure communications, especially in the areas of drug investigation and surveillance. The current revolution of technical advances in the communications industry has led to multi-channel receivers (commonly known as scanners) which can be programmed to receive all available radio frequencies. In the past, relatively few persons could afford a radio receiver, which in most cases was limited to a

very narrow range of frequencies and could only monitor a single channel at a time. The new receivers (scanners) cover the entire public safety frequency spectrum - i.e. all of the frequencies which are pre-programmed into the device, and move continuously among them to find the channel on which traffic is occurring. It will lock on that frequency as long as it is being used, then begin its ceaseless scanning of the other selected frequencies. This permits anyone to monitor non-encrypted traffic of a law enforcement agency within broad geographical areas. The newest scanners are available in various models which are entirely portable, including some which are carried on the person similar to a pager.

Law enforcement agencies have "horror stories" about the effectiveness of these devices; and, in fact, major drug dealers are known to use them as tools of their trade. Fortunately, technology has provided a means to defeat these devices, namely, encryption. Encryption is available in a variety of modes, the most secure of which is digital encryption. This equipment translates a voice signal into digital impulses, then randomly scrambles the digits. Only a similarly encrypted receiver can turn these signals back into a voice transmission. This equipment is not for sale to the general public, but even if it were, it would be useless because the scrambling code is confidential to the law enforcement agency. There are 78 quadrillion possible code combinations available for encrypting a radio system. Using today's most powerful computer, which can process 1 million bits of information per minute, it would take 1000 years to break the code.

The only disadvantage to digital encryption is that the cost of the equipment which is approximately 3-6 times greater than normal radio equipment. Even so, encryption is a necessity to the safe and effective conduct of important criminal investigations.

### C. VEHICULAR REPEATERS

One of the paramount needs of all law enforcement agencies is the ability to have direct communications with officers when they are away from their vehicles. In metropolitan areas where the service territory is compact, this is often accomplished by furnishing the officer with a portable radio capable of directly reaching the dispatch center. In most suburban and rural areas it is not feasible to provide a portable radio with this range capability. Approximately 15 years ago, a system known as a vehicular repeater was produced which affords the rural officer the above described capabilities. This system consists of a portable radio, a repeater mounted in the trunk of the vehicle, and the vehicle's mobile radio. At nominal distances of one quarter to one half mile, the officer can transmit by portable radio to the repeater which in turn activates the mobile radio which transmits to the dispatch center. Return messages from the dispatch center are similarly relayed to the officer on foot.

The vehicular repeater system provides a safety factor to officers when away from the car. This system has been perfected to the point that the dispatcher is unaware of whether the officer is in the vehicle or on foot, without having been told by the officer.

This capability should serve as the highest priority for consideration when upgrading a communications system. The ability to maintain constant communications with the officer is critical to safety and enhances the effectiveness and efficiency of the agency. This capability, whether by direct portable to base mode or by vehicular repeaters should be one of the minimum standards for all Virginia law enforcement agencies.

## V. FUTURE TRENDS

### A. EXPECTED ADVANCES

As in all areas of electronics, the technology involved with radio communications continues to evolve. The introduction of computer components and capabilities into mobile communications has greatly increased the speed and accuracy of the systems while enabling the manufacturers to reduce the size of the equipment. Computer applications will continue to drive the industry through the foreseeable future. According to industry leaders, law enforcement agencies have sought to enhance their communications capabilities through an increased use of several technologies, including digital encryption packages, digital trunking systems, data transmission, and an increase in the reliance on portable radios.

Digital encryption packages, as discussed previously, enable police agencies to protect the privacy of their more sensitive and important communications. This capability is essential when dealing with well financed and equipped drug operations. While these packages are costly, they provide police with the necessary capability to effectively interdict these operations. Secure communications are virtually invulnerable to eavesdropping utilizing equipment now available to the public. The increased awareness and the importance of drug enforcement efforts will undoubtedly encourage many agencies to seek to add this package to their existing systems.

Digital Trunking systems are computer controlled and operated systems in which a series of radio channels are "shared" with computer selection of the next available frequency. Each time a user transmits and receives radio traffic it might possibly be on a different channel. The users have no knowledge of the channel they are using at any given time. The selection of the channel is made rapidly, in approximately one quarter of a second, so that

there is no significant delay to the users. This system guarantees that a channel is always available, especially in the event of an emergency, by utilizing all available channels in the most efficient manner. Priorities can be assigned to the types of traffic to insure that the most essential traffic receives prompt attention. The trunking feature would be particularly important to a large urban department attempting to provide a responsive communications systems while utilizing a limited number of frequencies. The computer capabilities provide additional benefits in systems management that the more traditional radio systems are unable to provide. In addition to the prioritization of all calls, it can provide, among other functions, instant emergency transmission from every radio, management reports on unit, group and system usage and the ability to remotely disable lost or stolen radios. The only serious drawback with this system is its cost which, like all technology, is high.

Data transmissions are basically operations whereby information is transmitted to an officer in the field via special equipment installed in the patrol vehicle. This can be accomplished utilizing two different types of equipment. The first type is the Mobile Data Terminal (MDT) which allows the officer to make his/her own inquiries into computerized driver's license and wanted files. This equipment is capable of further curtailing radio traffic by dispatching the officer through the same piece of equipment. Therefore the officer only uses his/her radio when requesting assistance or seeking clarification regarding a call. This has obvious benefits to a busy department with a limited number of frequencies, as the reduced radio traffic is much easier to manage.

The second type of equipment capable of using data transmissions is the laptop or portable personal computer. A laptop computer can function in much

the same manner as the MDT but has the additional benefit of being more expandable in its applications. It can also be used to enter accident and incident reports directly into the department's central computer, thereby reducing the amount of time an officer spends on paperwork, away from his/her primary duties. The department would experience additional time savings with the report already in the central records system, as there would be no need for the duplicative efforts of entering the reports into the system by the clerical staff.

Industry insiders believe that police agencies will increasingly rely on the portable radio, particularly in compact urban and suburban areas. The primary reason for this is the small size of the radio and the relative ease with which it can be taken into virtually any situation. If the radio is reliable and has the necessary range to transmit back to the base station, it can increase an officer's mobility without interfering with his communications ability or jeopardizing his safety. In fact, a portable radio will greatly improve officer safety and enhance the department's ability to coordinate operations involving numerous personnel. The large coverage areas in most rural jurisdictions greatly inhibit the portable radio's ability to perform without additional amplification from remote receivers such as vehicular or fixed repeaters. While their restricted range does limit their usefulness in rural areas, the components needed to expand that range are available and they will continue to play an important role in law enforcement communications.

#### B. PROBLEMS FACING LAW ENFORCEMENT

Two of the perennial problems facing police administrators responsible for providing adequate communications systems are finances and the lack of engineering expertise. These problems are inter-related but will be discussed

separately below.

1. Financial Limitations - Most local government budgets are limited and there is fierce competition for available funds. Law enforcement communications, while vital, seldom rises to the priority that warrants the large sum needed to replace or overhaul an entire radio system. More often, an older system is "patched up" from year to year until service levels finally become unacceptable. Only then does the issue attract sufficient attention to merit a substantial sum being allocated in the budget process.
2. Lack of Engineering Expertise - With the exception of the largest municipalities, most local governments do not employ communications engineers or repairmen. Thus, a police executive often faces the dilemma of trying to determine the best and most cost efficient method of implementing a new radio system, without impartial technical advice. In these instances about the only advice available to the department is from communications vendors. Sales personnel from different vendors may approach the problem from different viewpoints and submit entirely different proposals. This leads to a confusing situation which is often resolved in favor of vendor preference. At present the only way out of this situation is to employ an independent communications consultant. By doing so, the administrator aggravates the financial problem, as consultants are expensive.

One solution to this to this dilemma would be for the State to provide engineering expertise at no cost to local governments to assist in system design and bid analysis. Several states have chosen to establish a separate agency i.e., a Department of Communications, which prepares and administers a state communications plan and provides the engineering services mentioned

above to all state and local agencies.

A more cost effective method of meeting these needs in Virginia may be to direct the Department of Information Technology, Division of Telecommunications to employ several engineers and provide the described services. Such a capability would materially assist local governments and lead to overall savings by eliminating superfluous equipment from vendors' proposals, etc.

## VI. FINDINGS

### A. GRANT PROGRAM RESULTS

The Communications Grant Program of 1989 awarded \$ 5.4 million dollars to 221 local law enforcement agencies across Virginia, substantially improving existing communications systems. There remain needs in excess of \$ 16 million dollars to completely upgrade these systems.

### B. PRESENT STATUS

Each of the 262 local police agencies in Virginia has access to a radio system on which to transact its daily business. The funds awarded in the 1989 grant program made needed improvements in some systems and essentially overhauled others. In addition, there are at present one statewide, (SIRS) and two regional, (TCAP in Tidewater and PMARS in Northern Va.), mutual aid law enforcement communications systems operating in Virginia, providing vital inter-departmental communications capabilities.

### C. MINIMUM STANDARDS

There are no minimum standards for police communications systems to ensure officer safety and enhance operational effectiveness.

### D. FCC POLICIES

Current FCC frequency assignment policies exclude state participation in spectrum management and prevent the formulation of a statewide operational plan.

E. TECHNOLOGY

The radio communications industry is constantly developing technology to address the communications problems facing law enforcement agencies.

F. LACK OF ENGINEERING RESOURCES

There is currently no source, at the state level, where local law enforcement officials can seek reliable, objective engineering advice and technical assistance when planning and procuring radio communications systems.

## VII. RECOMMENDATIONS

### 1. TECHNICAL ASSISTANCE SERVICES

The Commonwealth should provide a mechanism to furnish engineering technical assistance to local law enforcement agencies to assist with the design of radio systems. This can be accomplished by employing several (3-4) competent radio engineers whose sole duties would be to assist local and state agencies in obtaining the most efficient and cost effective radio systems to meet present and future needs.

### 2. PERIODIC SURVEY ASSESSING LAW ENFORCEMENT NEEDS

The General Assembly has recognized the critical role law enforcement radio systems play in maintaining public order. To insure this vital resource is adequately maintained, the General Assembly should designate an appropriate agency to periodically survey the condition of the communications infrastructure statewide.

### 3. SIRS

Immediate steps should be taken to strengthen and preserve the one state-wide police mutual aid system. The Statewide Interdepartmental Radio System (SIRS) is an essential link between state and local police operating in many radio bands. SIRS should be formally established by statute or Executive Order and its Advisory Board be granted powers to manage the network and plan for its future.

### 4. MINIMUM STANDARDS

Minimum standards for all law enforcement radio systems should be developed and disseminated. This function could be handled by the SIRS

Advisory Board, the Department of Criminal Justice Services or by appointing a committee composed of nominees from the Virginia Association of Chiefs of Police, the Virginia State Sheriffs Association, and the Associated Public Safety Communications Officers. The SIRS Board would be the most logical choice since it already has the desired operational composition.

#### 5. FCC FREQUENCY ASSIGNMENT PROCEDURES

The State should seek to initiate changes in the current FCC policies to permit state participation in the assignment of radio frequencies for law enforcement. State participation would insure that sufficient frequencies remain available for law enforcement needs across the state.

**VIII. APPENDICES**

**APPENDIX A**

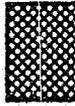
Item	Item Details(\$)		Appropriations(\$)	
	First Year	Second Year	First Year	Second Year
<b>OFFICE OF TRANSPORTATION AND PUBLIC SAFETY</b>				
<b>§ 1-120. SECRETARY OF TRANSPORTATION AND PUBLIC SAFETY (189)</b>				
507.	Administrative and Support Services (7190000) .....		\$434,956	\$438,128
	General Management and Direction (7190100) .....	\$434,956 \$509,956	\$438,128	
	Fund Sources: General .....	\$162,834	\$153,944	
	Commonwealth Transportation .....	\$227,834 \$282,122	\$284,184	
	Authority: Title 2.1, Chapter 5.3 and § 2.1-51.10:1, Code of Virginia.			
	<i>Out of this appropriation shall be provided \$75,000 in the first year for expenses related to the Commission on Prison and Jail Overcrowding, created pursuant to House Joint Resolution 402 of 1989. Unexpended balances from this amount on June 30, 1989, are hereby reappropriated.</i>			
507.1.	Financial Assistance for Administration of Justice Services (3900000) .....		\$100,000	\$5,500,000
	Financial Assistance to Localities for Administration of Justice Services (3900100) .....	\$100,000	\$5,500,000	
	Fund Sources: General .....	\$100,000	\$5,500,000	
	Authority: Discretionary Inclusion.			
	<i>The Secretary of Transportation and Public Safety shall develop a plan for the Board of Criminal Justice Services to administer a program and award grants to selected localities for the purpose of acquiring essential law enforcement communications equipment. The plan shall include an assessment of the highest priority communications equipment needs for local police departments and sheriffs' offices with law enforcement responsibilities, based on an overall statewide strategy designed to assure compatibility and cost effectiveness. The plan shall specify a local matching rate, which may be varied according to local revenue capacity and crime rates. The Secretary shall present this plan to the Chairmen of the Senate Finance and House Appropriations Committees by June 1, 1989. A follow-up report on actual grants awarded shall be presented by December 1, 1989. Unexpended balances from this amount on June 30, 1989, are hereby reappropriated.</i>			
	Total for Secretary of Transportation and Public Safety .....		\$434,956 \$609,956	\$438,128 \$5,938,128
	Maximum Employment Level .....	6-00 7-00	6-00 7-00	
	Fund Sources: General .....	\$162,834	\$153,944	
	Commonwealth Transportation .....	\$327,834 \$282,122	\$5,653,944 \$284,184	
<b>§ 1-121. DEPARTMENT OF CRIMINAL JUSTICE SERVICES (140)</b>				
508.	Administrative and Support Services (3190000) .....		\$1,821,280	\$1,845,475
	General Management and Direction (3190100) .....	\$679,255	\$685,735	
	Planning and Evaluation Services (3191600) .....	\$842,025	\$959,740	

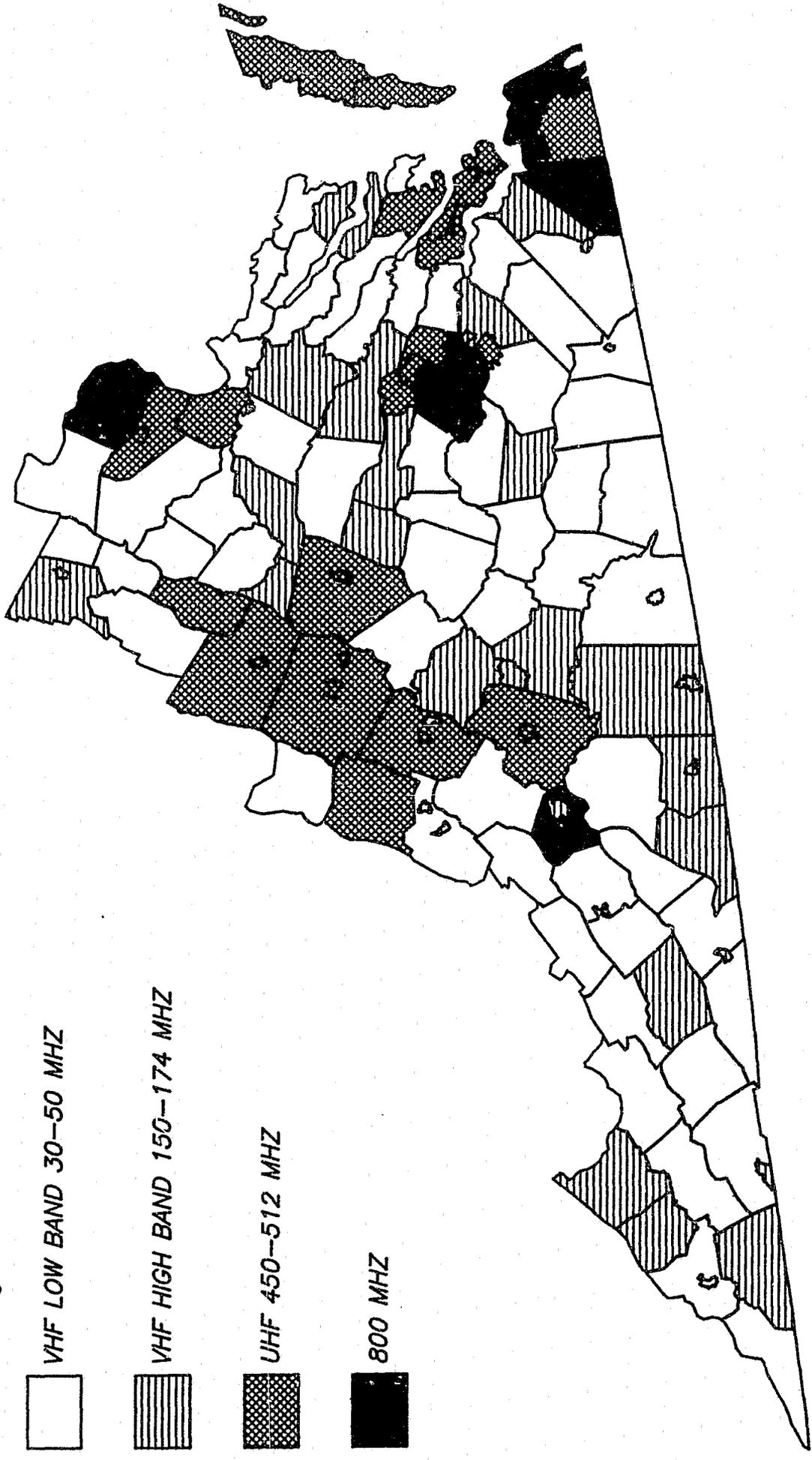
**APPENDIX B**

# SPECTRUM UTILIZATION MAP

LOCAL LAW ENFORCEMENT AGENCIES

Legend

-  VHF LOW BAND 30-50 MHZ
-  VHF HIGH BAND 150-174 MHZ
-  UHF 450-512 MHZ
-  800 MHZ



**APPENDIX C**

# 81

## COMMUNICATIONS

The basic function of the communications system is to satisfy the immediate information needs of the law enforcement agency in the course of its normal daily activities and during emergencies. It is the latter situation that places the greatest demands upon the communications system and tests the capability of the system to fulfill its functions.

The system conveys information from the public to the law enforcement agency through communications personnel, to the officer who responds to the call for assistance, to other law enforcement and public service agencies, and to information storage facilities and retrieval systems. The speed and accuracy with which information flows through each system component are measures of the agency's capability to respond to the needs of the community.

It would be virtually impossible to design a law enforcement communications system that would meet every agency's requirements. Each system must be sufficiently flexible in design to fulfill the needs of the individual agency. However, measures and standards of performance are necessary to assess the effectiveness with which any department, large or small, utilizes available information technology in fulfillment of its missions.

### 81.1 Administration

**81.1.1** *A written directive establishes the agency's communications component.*

**Commentary:** The purpose of this directive should be to place accountability for the communications function within the agency's organizational configuration. In smaller agencies, this function may be combined with others. However, in larger agencies it should be a distinct entity.  
(O O M M M M)

**81.1.2** *A written directive establishes the agency's communications functions, to include:*

- radio communications
- telephone communications
- teletype and automated data communications
- alarm monitoring (if applicable)

**Commentary:** The communications system comprises at least the subsystems listed above. The written directive should establish these functions and specify activities associated with each. In small agencies, one person may be responsible for all functions. In larger agencies, these functions may be separated and staffed accordingly.  
(M M M M M M)

**81.1.3** *A written directive establishes the authority and responsibilities of personnel assigned to the communications component.*

**Commentary:** A written job description should contribute to standardization of service rendered, reduce errors, aid the training effort, and reduce confusion during emergency situations.  
(M M M M M M)

**81.1.4** *A written directive requires that the agency's radio operations be conducted in accordance with Federal Communications Commission (FCC) procedures and requirements.*

**Commentary:** None (M M M M M M)

**81.1.5** *A written directive limits access to the communications center to authorized personnel.*

**Commentary:** In general, access should be limited to those persons who operate and command the center and to others specifically authorized. In regional centers, accessibility should be addressed jointly by participating agencies, with ample consideration given to physical plant location and security. (O O M M M M)

**81.1.6** *A written directive establishes procedures for routine telephone line load studies.*

**Commentary:** Without the proper number of telephone lines, calls placed to the agency may receive a busy signal or go otherwise unanswered due to lack of equipment. (M M M M M M)

**81.1.7** *A written directive establishes procedures for recording agency radio transmissions and emergency telephone conversations within the communications center.*

**Commentary:** These recordings are an indispensable source for criminal investigations, internal investigations, training, and audits of the agency's service delivery system. In regional centers, there should be an agreement among users governing the period the tapes are to be retained and their storage location. A minimum of 30 days is recommended for retention. (O O M M M M)

**81.1.8** *A written directive establishes criteria and procedures for reviewing recorded conversations.*

**Commentary:** Access to recordings should be limited and available only through a specific procedural method. Persons who have access to the tapes should be familiar with the playback requirements and documentation. Care must be exercised to ensure that tapes are not erased in error. (O O M M M M)

**81.1.9** *The agency has access to local, state, and federal criminal justice information systems.*

**Commentary:** The effectiveness of investigative efforts depends heavily upon the quality of information resources. Agencies should have the equipment they need to gain access to information from nearby agencies, regional law enforcement information networks, statewide information resources, and the National Crime Information Center. (M M M M M M)

## 81.2 Operations

**81.2.1** *The agency provides 24-hour, toll-free telephone access for emergency calls for service.*

**Commentary:** The public should be able to contact the law enforcement agency at all times for information or assistance that may be needed in emergencies. Agencies that are unable to maintain 24-hour telephone service should arrange for such service through neighboring departments, sheriff's departments, or the state police. Access to emergency services should be toll free within the agency's jurisdiction or permit free access to the Operator. (M M M M M M)

**81.2.2** *A written directive establishes procedures for performing telephone, radio, teletype and automated data communications functions.*

**Commentary:** The written directive may be a manual on the operations or activities in the communications center. Personnel in the center should have the manual accessible for reference. A model manual is available through the Associated Public-Safety Communications Officers, Inc. (APCO). (M M M M M M)

**81.2.3** *Communications personnel have immediate access to at least the following departmental resources:*

- officer in charge
- duty roster of all personnel
- telephone number of every agency member

**Commentary:** Communications personnel are often required to contact officers for court attendance, to administer special tests (breathalyzer), or to correct reports. They should have immediate access to such information as officers' working hours. They may need to call officers at home on their days off. (M M M M M M)

**81.2.4** *A written directive establishes procedures for procuring necessary services external to the agency.*

**Commentary:** These services should include fire equipment, environmental and human services, ambulances, helicopter or other aircraft, wreckers, cabs, and other services that are not components of the individual agency. The procedures must be specific for each individual service in order to provide prompt assistance in all, but especially in emergency, situations. (M M M M M M)

**81.2.5** *A written directive establishes procedures for prompt handling and appropriate routing of misdirected emergency calls.*

**Commentary:** It is common for one agency to receive emergency telephone calls intended for another law enforcement or public service agency. Although a single universal number system with automatic switching offers a solution to this problem, such a system is still in the future. Meanwhile, agencies should accept any misdirected emergency call and promptly relay information to the agency having jurisdiction. (M M M M M M)

**81.2.6** *A written directive specifies the information to be recorded at the time of a request for service, to include:*

- date and time of request;
- name and address of complainant (if possible);
- type of incident reported;
- location of incident reported;
- time of dispatch;
- time of officer arrival;
- time of officer return to service; and
- disposition or status of reported incident.

**Commentary:** A complaint control "system" can be a card, log, or computer entry that permits a permanent record to be maintained. Such records permit the agency to establish a control system to ensure a comprehensive field reporting program. This information should be recorded for all requests, including those received by telephone, letter, in person; self-initiated by officers; or reported to officers in the field.  
(M M M M M M)

**81.2.7** A complaint control number is assigned to each specific call for law enforcement service.

**Commentary:** The complaint control number should be affixed to a communications center control record and the call disposition or result should be noted thereon. The number should serve as the basis for filing and retrieving subsequent reports of the incident. The number is indispensable for auditing the communications system.  
(M M M M M M)

**81.2.8** A written directive establishes procedures for obtaining relevant information for each call for law enforcement service.

**Commentary:** The procedures should encourage eliciting as much information as possible to enhance the safety of the officer and assist in anticipating conditions to be encountered at the scene. This is particularly important in certain categories of calls, and checklists may be provided to obtain additional information (e.g., for bomb threats, crimes in progress).  
(M M M M M M)

**81.2.9** A written directive requires the recording of the status of officers when out of service.

**Commentary:** An administrative control "system" can be based on a card, log sheet, computer record, or any instrument that permits a permanent record to be retained. Such records should permit the agency to evaluate nonpatrol time for agency planning purposes, maintain a level of security for the officers, and retain records of vehicles and persons stopped by officers.  
(M M M M M M)

**81.2.10** A record is made of back-up officers assigned to assist a primary officer.

**Commentary:** There are two generally accepted methods of recording information relative to a back-up officer: (1) preparing a complaint control document for the primary officer and writing in those officers assigned as back-up or (2) preparing a separate control document for each back-up officer assigned and utilizing the same control number as in the primary document number.  
(M M M M M M)

**81.2.11** In any telephone directory area, the agency uses a single emergency telephone number.

**Commentary:** The ability of citizens to telephone quickly and easily for emergency service is critical. If the jurisdiction does not have a 911 system, it should make every effort to adopt an easily remembered phone number to be used by citizens in emergency situations. The phone number should be prominently displayed in phone books, on agency vehicles, in public phone booths, and in other conspicuous places.  
(M M M M M M)

**81.2.12** The agency has the capability of immediate playback of recorded telephone and radio conversations.

**Commentary:** The citizen requesting service or officer wanting assistance may not be able to repeat an emergency conversation. Therefore, the agency should have the capability to replay a conversation immediately in the event that the original conversation was garbled or too quick for easy understanding. This capability can be provided with a parallel dual-load recorder or a smaller recorder that records only the previous short conversation. (O O M M M M)

**81.2.13** A written directive specifies the agency's role in monitoring and responding to private security alarms.

**Commentary:** The agency should have a formal policy concerning monitoring commercial and private residential alarm systems. The agency should seek regulating legislation for the installation and maintenance of the various alarm systems. Such legislation should specify sanctions for excessive false alarms. Care must be exercised in considering private home alarms that ring into department telephone lines. The agency's policy should also consider the availability of commercial alarm companies to service business alarms.  
(M M M M M M)

**81.2.14** The agency's communications personnel have immediate access to tactical dispatching plans.

**Commentary:** The dispatching plans should include procedures to be followed in directing resources and obtaining information on crimes in progress (e.g., bank robbery) and tactical operations (e.g., roadblocks).  
(M M M M M M)

**81.2.15** *A written directive specifies criteria for accepting and delivering emergency messages.*

**Commentary:** Delivering emergency messages is a legitimate law enforcement function. However, guidelines should be established to define the types of messages to be accepted and delivered.  
(M M M M M M)

**81.2.16** *A written directive requires daily dissemination of stolen vehicle information.*

**Commentary:** The directive should ensure that stolen vehicle information is collected from and disseminated to other enforcement agencies and state/federal crime information systems. Such information should be disseminated to all patrol and traffic officers at least once per shift, either at roll call or by radio or telephone.  
(M M M M M M)

### **81.3 Facilities and Equipment**

**81.3.1** *A written directive specifies security measures for the communications center, to include:*

- limiting access
- protecting equipment
- providing for back-up resources

**Commentary:** The capability to maintain communications in all emergency situations dictates that security measures be implemented to protect communications personnel and equipment. Protective measures may include locating the center and equipment in areas providing maximum security, installing bullet-resistant glass in areas of public access, and restricting access to the communications center. Security precautions should also be taken to protect transmission lines, antennas, and power sources.  
(O M M M M M)

**81.3.2** *A listing of telephone numbers of emergency service agencies is immediately available to communications personnel.*

**Commentary:** Communications personnel often have the need to call other emergency service agencies, such as those pertaining to fire, rescue, ambulance, and animal control. They should have these and other numbers immediately available

by private line, telephone index, book, or other means that will expedite contacting the agencies.  
(M M M M M M)

**81.3.3** *The agency has an alternate source of electrical power that is sufficient to ensure continued operation of emergency communication equipment in the event of the failure of the primary power source and that is inspected and tested weekly.*

**Commentary:** Disruptions in the primary power source frequently occur. The agency should ensure continuous emergency communications capability through an alternate power source, usually a full-powered generator. The readiness of the alternate equipment should be ensured by scheduled and continued testing.  
(M M M M M M)

**81.3.4** *Maps detailing the agency's service area are visually available to communications personnel.*

**Commentary:** Communications personnel should be able to spot a caller's location and dispatch field units immediately. A large map of the jurisdiction with beats outlined is essential to such operations. (M M M M M M)

**81.3.5** *Officer status indicators are visually available to each communications operator.*

**Commentary:** Officer status indicators allow communications operators to know the status of every officer under their control. All officers depend on the communications center to recognize when they may be in danger. By monitoring the officer status system, the operators know where, and how long, each officer has been out on a call. When dispatching calls, the operators also need to know which cars are available for service.  
(O G M M M M)

**81.3.6** *The agency's telephone system is designed to separate emergency from nonemergency calls.*

**Commentary:** The agency should always have enough trunk lines available so that incoming emergency calls do not receive a "busy" signal. The potential for receiving such a signal can be significantly reduced by routing incoming administrative and outgoing calls to a separate line or lines. (O O O O O O)

**81.3.7** *The agency has 24-hour two-way radio capability providing continuous communication between the communications center and officers on duty.*

**Commentary:** Immediate communications capability provides a measure of safety and security

to law enforcement officers and the public.  
(M M M M M M)

**81.3.8** *The agency's radio system is engineered to produce a 12-decibel or greater SINAD ratio to the radio receivers in 95 percent of the agency's service area.*

**Commentary:** The SINAD ratio is a measure of the relationship of the radio signal, noise, and distortion. It serves as a basis for estimating whether a receiver will respond to and reproduce a transmitted signal. The 12-decibel level has been established as the desired minimum for satisfactory reception. Because of terrain and other factors, it may not be economically feasible to provide the 12-decibel SINAD signal level to all areas within the jurisdiction. Coverage of 95 percent is generally considered acceptable.  
(M M M M M M)

**81.3.9** *The agency has multichannel mobile and portable radio equipment capable of two-way operation on a joint public safety frequency or frequencies.*

**Commentary:** The agency's frequencies and joint public safety frequencies provide for an uninterrupted flow of information among law enforcement agencies and among law enforcement and public service organizations, such as fire departments, ambulance services, public utilities, etc. This communications capability is necessary to provide proper coordination and deployment of forces in times of such emergencies as riots, fires, and natural disasters. The capability may range from simple car-to-car arrangements to inter-agency and statewide networks.  
(O O O M M M)