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**Area Wide Telecommunications:
The Need for the Common Link**

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ABSTRACT

This research concerns the feasibility of an area-wide telecommunications system that is current technology, powerful enough to handle modern applications, and yet affordable for small agencies. The study is directed at the Houston/Harris County, Texas law enforcement community, specifically the Jersey Village Police Department, in comparisons with other counties and communities in the United States.

The Law Enforcement Assistance Administration of the U. S. Department of Justice, (LEAA), issued grants to several agencies across the United States for research and development of newer telecommunications systems during the 1970's. Studies found that the need for a more powerful and sophisticated radio system was needed to keep up with the technology. Funding was a major problem, therefore, consolidation of local agencies telecommunications systems became an attractive alternative. The FCC was reluctant to release new channels until legislation introduced into Congress forced the FCC to allocate new frequencies for public safety. The 800 MHz and 900 MHz systems were then allocated for public safety. These systems rely on a method called trunking. This allows the sharing of a small number of communications paths by a large number of users.

Several key issues are addressed such as radio security, the ability of the police department to communicate with the fire department, further expansion to use mobile data terminals, cost, and the use of hand held radios. If it is determined by an independent assessor that the 800 MHz system is needed, then an appraisal should be conducted to determine the equipment requirements before bids are solicited.

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Introduction

Telecommunications, as defined in the American Heritage Dictionary, is the science and technology of communication by the electronic transmission of impulses such as telegraphy, cable, telephony, radio, or television. Throughout the history of law enforcement, police officers have relied on some form of telecommunications. The technology of telecommunication systems today is far superior than it was just five years ago. Police departments are constantly improving radio systems to meet the needs of their departments. As far back as 1974, the Law Enforcement Assistance Administration realized that law enforcement agencies needed modern, high speed, integrated, wide area telecommunications systems to keep up with the policies of LEAA, (Kavanagh 1974). Large agencies tend to have more resources and funds, and are thus able to keep up with ever changing technology. In contrast, small agencies that police small areas or economically poor populations, are not able to purchase the latest and greatest telecommunication equipment. This creates small pockets or islands within certain areas that, because of out dated or less sophisticated systems, are uninformed of on-going crime and other critical occurrences. Natural disasters create an even bigger problem between agencies attempting to coordinate relief and rescue operations.

The purpose of this research is to determine the feasibility of an area wide telecommunications system that is affordable for all the agencies in a sparsely populated area. Such a system would enable agencies to communicate with each other via radio without the need for multiple radios. Additionally, such an advanced system of communications would contribute to public safety as well as officer safety. This study is directed at the Houston-Harris County law enforcement community and compares their agencies with other counties and communities in the

United States. The result will be presented to the City of Jersey Village city council for consideration in securing a better communications system for the police and fire departments.

Sources of information for research include, but are not limited to LEAA research and research conducted by the State of Texas. Research for systems implemented by other law enforcement agencies using the same proposed telecommunications will be conducted within the United States. Other sources will include NCJRS, The Police Chief magazine, the FBI Law Enforcement Bulletin, Law and Order magazine, electronic magazines and personal interviews.

The research proves that such a system is available, effective, modern, futuristic, and most of all affordable by the smallest agency in the county. Since telecommunications is a vital part of the police officer's equipment, it is mandatory that it be kept up to date, effective, and reliable in the interest of officer safety. The link created between the agencies will further enhance the manpower of even the smallest department as well as the security of every citizen in that community.

Historical and Legal Context

Many law enforcement agencies in the early 1970's were already experiencing an overload on their communications systems. The Law Enforcement Assistance Administration of the U. S. Department of Justice, (LEAA) issued grants to several agencies across the United States for research and development of newer telecommunications systems during this time period. One such study conducted by Associated Public-Safety Communications Officers, Inc. (APCO) was labeled Project 13. This study realized that an ever growing need for modern telecommunications was needed to meet the demands created by the sophistication of agencies due to policies created by LEAA. Seeing the need for newer more powerful communications, funding was a major issue.

This was due to the fact that the moneys being allocated for procurement were taking a large part of the budget. To help offset this cost, the consolidation of local agencies telecommunication systems became an attractive alternative. This offered the possibilities for increased law enforcement capabilities in these areas at the same or lower cost. However, it was noted that there was very little thought given to combine law enforcement with fire and emergency medical service (Kavanagh 1974).

Most law enforcement agencies relied on the low band or high band frequencies during the early 60's. While the high band, or Very High Frequency (VHF) was the best at the time, it was already being replaced with Ultra High Frequency (UHF) band in the early 70's. Law enforcement agencies were not the only public service using these bands. Fire departments, private ambulance services, emergency medical services, and local public works were competing for the airways as well. The private sector was also utilizing VHF and UHF at the same time. FCC refused to release the UHF 800 MHz or the 900 MHz band for public service, choosing to reserve these frequencies for future expansion of television and radio, (Block 1984). By the mid 70's the UHF band in the 400 MHz range was already becoming congested by public service. The Chicago Police Department conducted a survey in 1976 concerning the UHF 400 MHz band. At the time, some zones were experiencing 96 percent use or actual air time, but no additional allocation requests could be granted since the department's share of the public service radio spectrum was completely filled (Alexander, Banks, Stapnick 1978). According to a survey conducted by the Tempe, Arizona Police Department, crowded communications channels had become a nationwide problem by the 1980's (Lesce 1989).

In an article written in The Police Chief magazine in 1984, Sheriff Sherman Block of the Los Angeles County Sheriffs Department found in 1981, that the Federal Communications Commission (FCC) had not planned on releasing radio channels at that time for public service. The FCC instead was reserving new frequencies for new entertainment services. In August 1981, the Los Angeles County Sheriffs Department submitted a petition to the FCC. It was called RM-3975. This petition called for the release of the then currently available UHF frequencies and future frequencies for public service. In December 1982, Congress passed Public Law 97-259. This law directs the FCC to give higher priority to public safety agencies in the assignment of radio channels that are land mobile services (Block 1984).

The FCC was aware of the 800 MHz and 900 MHz bands in the early 70's. FCC Docket 18262 was a rather comprehensive attempt at managing the finite radio frequency resources in the 800 MHz band (Block 1984). This docket also introduced the trunking concepts in radio system usage efficiencies. Trunking can be defined as the sharing of a small number of communications paths by a large number of users (Pagano 1986).

APCO's Project 16 addressed the opening of 900 MHz band by the FCC . Thus, in 1984, both the 800 MHz and the 900 MHz band became available to public safety agencies. Because of the support of APCO, LEAA, Los Angeles County Sheriffs Department, International Associations of Chiefs of Police, House Energy and Commerce Committee, and many law enforcement agencies throughout the United States, the 800 MHz and 900 MHz bands are now available for public safety (Block 1984).

Review of Literature

Without a doubt, communications is vital to effective law enforcement. As many law enforcement professionals recognize, rapid controlled response and secured communications is better enabled through encrypted 800 MHz and 900 MHz trunked radio systems (Lutz 1996). "The technology is complicated enough that many departments don't feel comfortable or don't even know where to start." (Hunter 1992). Crystals have been replaced by microprocessors, and where once an eight channel system was considered sophisticated, today's equivalent may boast as many as 300 channels (Pilant 1992). Therefore, an agency needs to be wary of vendors that want to sell your department the system it needs. Instead, it is suggested many times over that it is better to hire a financially stable and technically knowledgeable consultant to assess needs and assist in the procurement of equipment. "Its a lot cheaper to pay travel expenses than to get a system that's not going to meet your needs." (Layne 1992).

One radio manufacturer looked to public safety professionals in designing its new basic model. Few radio design engineers are familiar enough with public safety operations to know what an ideal radio is for that kind of work (Clede 1989). All agree that most of the problems associated with VHF bands and UHF 400 MHz bands is the overcrowding of the frequencies with no room for expansion. VHF bands also have a major problem with skip, that nearly all agencies reported. "We are looking at the 800 MHz frequency because it is a wave of the future. Most of the agencies in the Austin, Texas area are meeting with the Austin Police Department to discuss the possibility of merging on the 800 MHz system." (Hooker 1996). In Tempe, Arizona, an important decision was to assign radios to each officer. Individually assigned radios promote

accountability and an officer is more likely to take better care of equipment assigned to him personally instead of drawn from a pool (Lesce 1989).

Trunking systems in the 800 MHz and 900 MHz band would provide the technology for the future. In an article by Harry Edwards in 1984, he discusses the history and the future of trunking. The concept of trunking is not new. The telephone company has been using it for almost a hundred years. It will offer improved communications because of faster system access, privacy, simple operation, and improved reliability (Edwards 1984).

In researching the articles written concerning the 800 MHz and 900 MHz radio frequencies, only one agency reported a problem with the 800 MHz system. In the Los Angeles, California area, due to geographical coverage equipment locations, there were many who could not use the 800 MHz system (Block 1984). The difference between the two bands is the frequency. Both bands are able to handle current and near future technology such as Mobile Data Terminals(MDT's) and Lap Top Computers. The clarity of these bands is beyond compare. The most popular frequency is the 800 MHz. This band could become just as crowded as the 400 MHz band (Cicero 1989). Current trends are for most agencies to continue converting to the 800 MHz band reserving the 900 MHz band for future expansion.

In contrast, the VHF band has been found unable to keep up with technology. A low band MDT system was installed in 12 patrol vehicles in Long Beach Police Department, California. It was discovered that the system required an 8 foot antenna. It was also found that the VHF band did not have enough power to support the MDT. The frequency issue was addressed by procuring a 800 megahertz frequency, which solved both the radio and the antenna problems (Clark-Maus 1988).

Discussion of Relevant Issues

In terms of officer and public safety, the old VHF and UHF 400 MHz bands are no longer able to handle the load placed on them. This can be contributed to crowding of the frequencies. VHF is strictly a line of sight frequency which creates a sub-standard communication level with the current radios and an extremely low level of distance with hand held radios. The skip that is received at times, makes communications from the base station to the mobile radios almost impossible to understand. There is a lack of communication distance with the VHF radios because of the lack of adequate power from the mobile and hand held radios and the absence of repeater towers.

The 800 MHz and 900 MHz radio bands are the current standards for radio requirements of most departments. The 800 MHz system is in place in Harris County, Texas and is currently available to other law enforcement agencies. There is adequate power and repeater tower sites to handle all of the trunked radio traffic. With the implementation of the MDT units in Harris County, small departments will be able to utilize the same system for their MDT's. There have been no reports of bleed over or skip with the current 800 MHz and 900 MHz systems. This is not a trait of the UHF radio band because of the way the FCC allocates frequencies in the UHF bands. There is a greater separation between channels. Each channel is one MHz apart from the others, minimizing interference by intermodulation (Lesce 1989).

At the current time, the 800 MHz band is the most utilized of the two. But like the 400 MHz band of UHF, it too can become crowded as more and more agencies turn to the standard of today's communications. The 900 MHz band is slowly beginning to be used by public safety departments across the United States but is not yet in place in the Houston / Harris County area.

While the Harris County Sheriffs Office offers a lease program to other agencies in the Harris County area to use the 800 MHz, most agencies are slow to participate. The Jersey Village Police Department (JVPD) has already leased one channel on the 800 MHz system. At the present time, there are no mobile units in any of the patrol cars. A bank of 6 hand held 800 MHz radios is available to the patrol officers. This frequency is used mostly as a car to car and sometimes, for security measures, as a car to dispatcher.

The major drawback in using the 800 MHz system is the loss of communications with the Jersey Village Volunteer Fire Department (JVFD). The concerns of the JVFD have been the lack of tone out capability for the department. This is a volunteer department with no stand- by manpower at the fire station. Therefore, all members are issued pagers or two way, hand held, radios to be able to respond to emergency call outs.

Recommendations to Hennepin County MN. suggested 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 (Vegemast-Rooney 1973).

The anticipated cost to convert JVPD to the 800 MHz system to be fully operational is approximately \$100,000. This would include an independent assessment of the needs for the department. In comparison, the Pflugerville, Texas Police Department, is anticipating spending approximately \$125,000 to convert their department and all of the 16 city vehicles to the 800 MHz system (Hooker 1996).

An assessment of all city vehicle's with the City of Jersey Village must be made to determine the needs of each department. Is it vital for the JVPD to be able to communicate with JVFD. Yes, this is a very important issue that must be addressed. On most of the calls for the

fire department within the city, the police are the first to arrive on the scene. Once there, an assessment is made of the situation and then reported to the fire personnel while they are en route or soon after they arrive. This can mean the difference of life and death. Therefore, it is important to include the JVFD in the new system so that public safety will remain the forefront.

In an effort to offset the initial cost, the old equipment can be auctioned. The cost of the new equipment is not as great as other communities might experience since the HCSO is already on line with the 800 MHz system and has channels for lease. The ability for the police and fire departments to communicate with the dispatcher with hand held radios, even from across town is the greatest feature of the system. Also, the security of the radio channel from eavesdroppers or monitors is an equally important aspect. Most certainly the JVPD will be able to utilize MDT's in the future with very little modifications.

Conclusion/Recommendations

The research purpose is to determine the feasibility of an area wide telecommunications system that is affordable, up to date with current technology, and contributes to public and officer safety. A system that allows the agencies to communicate with one another with ease and is MDT ready is a must for consideration. The current VHF system is antiquated, not secure, lacks power, a safety hazard and is not able to handle current technology.

In any city, whether it is one million population or two-thousand population, cost of goods is a very viable concern not only by city officials, but with the citizens in the community as well. How can anyone place a dollar value on a life, be it a police officer, fire fighter, public works personnel, mom, dad, daughter, son, aunt, uncle, brother or sister. We certainly want the first line of defense to be able to adequately defend the citizens and maintain safety. Radio

communication is often not thought of in defense terms. More than likely, it is taken for granted, a necessary evil. More, now then ever before, technology is growing in leaps and bounds. We expect, moreover we demand, that our police and fire fighters have the necessary equipment to take care of the problems that arise so that we may lead a safe and secure life in our own homes. The radio is the first line of defense. We must continue to stay one step ahead of the criminal element and in order to do a more efficient job, we must be able to communicate with one another without interference, without eavesdroppers and with confidence that the last transmission made was definitely received, because at times it could be the only time an officer or a fire fighter can call for help.

The City of Jersey Village should implement an assessment of the current VHF radio system in place, in comparison with the 800 MHz UHF band available. A fair and equitable assessment should be made of all departments by an independent company and should include public works, fire department, and police department. If the assessment concludes the UHF 800 MHz system is the best for all city communications, then an appraisal of the quality and needs of a new system must be completed before bids can be advertised. This will insure that the departments will have the right equipment for their jobs. A bi-annual evaluation of the system should also be implemented to insure the department that common technology has not passed our agency.

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