coverage for 97% of the area of the state. Operation of the system is scheduled for October 1996. A total of 66 frequency pairs in the 821-824 MHz and 846-849 MHz band will be used in the system. The first implementation will include 1500 radios for State functions and 3000 radios for local government functions.

Users on this system include State Police, 911, and all other state public safety functions. Municipal governments are being invited to join. The City of Lansing (the state capitol) will be part of the system. Radio users will buy their own radio, pay a $250 entrance fee, and pay $300/year for service.

Some Federal law enforcement agencies have asked for some access to the system, though this is currently not intended to replace any existing Federal networks.

Racom (Iowa and Surrounding States) Racom is a commercial SMR company that has been supplying analog SMR services using 100 sites covering Iowa, much of southern Minnesota, and parts of Nebraska, South Dakota and Wisconsin. These older analog sites provide telephone interconnect and allow users operation on all sites in the system. Charges are $10/month plus $.25/minute airtime charges for telephone interconnect.

Recently Racom announced plans to build a multisite digital trunked radio system, eventually utilizing 200 sites over approximately the same multi-state geographical area. The new system will provide digital and analog voice and other digital services using Ericsson EDACS technology. The first part of the planned network is operational with 9 sites operating in Polk County (Des Moines area) which are providing services to the 300 radios of the Polk County Sheriffs Department. Cost to the Sheriffs Department is $15/month/radio plus $.30/minute air time for telephone interconnection.

The digital trunked service includes both business and law enforcement customers. Law enforcement radios have "ruthless preemption" privileges and can immediately preempt business user channels if law enforcement needs another channel. The wide area system is targeted toward the "high priority" market, including private and government public safety operations, utilities, and similar customers.

The frequencies for this operation come from the 800 MHz SMR frequencies. Although no encryption is in use at present, the Sheriffs department can encrypt transmissions whenever they feel that it is needed.

State of Louisiana The State of Louisiana is converting a large number of independent radio systems to a single 125-site trunked system based on Motorola SmartZone analog technology. This system will provide coverage to 95% of the state and will include all state communications functions. Frequencies will come mainly from the 821-824 MHz and 866-869 MHz public safety bands. It is anticipated that some municipal governments will also want to coordinate their radio systems with this network. Non-state users will be asked to pay $200/year.

7.2.9 These multi-agency systems, whether done on a local, area-wide or statewide basis, have the clear potential of using the scarce public safety spectrum more efficiently. These systems however take the consent of all the agencies within the given area and, thus, should not be mandated by the government. Public safety is the responsibility of local, county, regional, state, and federal agencies and the public within those government jurisdictions must retain the ability to determine how they want their political bodies to develop and administer communications systems for their benefit. To this end, and as a matter of policy, the government's rules should contain enough flexibility to allow the development of such systems that may include both public safety and related public service (e.g., utilities) entities. Sharing with related public service entities must be done in such a manner as to protect the public safety channels from primary use by public service. A further consideration in all such multi-agency systems is system design which maximizes the use of the spectrum by confining the area of operation of an appropriate number of channels to meet the needs in each specific area.

7.2.10 State Licensing. The Transition Subcommittee observes that in the past the FCC staff undertook a study, entitled *Possible State Roles In The Public Safety Radio Services* (July 1981) to examine whether that agency should create additional roles in which state and local governments could more actively participate in the management of the radio spectrum. The Transition Subcommittee further observes that U.S. Senator Larry Pressler has also suggested that the FCC should delegate to the various political jurisdictions responsibility for assigning and managing radio frequency spectrum allocated for public safety use within their respective borders.

7.2.11 The FCC currently licenses many thousand of individual public safety agencies for radio systems to serve their local areas. A spectrum management option of concern to public safety agencies, is to give the individual States so-called "block spectrum grants." Under this option, the Governor (or his/her appointee) of each State, or other appropriate official within jurisdictions such as the District of Columbia, the Virgin Islands, Puerto Rico, and Guam, would be given a license for all public safety spectrum with authority to sub-license blocks of frequencies to local public safety agencies within their jurisdictions. The task of coordinating between public safety uses, arbitrating among competing applications, and resolving disputes would be vested, in the first instance, in the Governor or his/her appointee or other appropriate official.

7.2.12 If the FCC were to adopt a block spectrum grant approach in the case of public safety licensure, one effect would be significantly to reduce current application processing time and, potentially, costs to users. On the surface it would appear that there are some benefits in that it could (1) encourage and facilitate the concept of state-wide public safety communications systems, shared with local government, (2) possibly relieve the FCC from licensing and allocation duties and (3) have the potential for improving interoperability within an individual state.

7.2.13 It is important not to confuse state licenses for operations for operations with other than state agencies on a shared basis. In discussions during Transition Subcommittee meetings regarding state wide and area wide system licensing and operation there is solid

support. This is based on state and local governments having joint planning, ownership, and operation of such systems. Particularly in trunked mode of operation there could be great efficiency of use. The Transition Subcommittee supports such planning and priority licensing for shared state or area systems. Conversely, in our several discussions regarding states assuming licensing authority presently held by the FCC (State Block Grants) there has been little support for, and an overwhelming response opposed to such a concept. There was only one person voicing support for state block grants from within the Subcommittee. The positive comment from the individual stated that states are closer to the users, have better knowledge of local needs and can aid in the resolution of interference issues. The individual further commented that empowering the states to manage this resource would result in faster processing of applications, reduce costs to users, more direct arbitration, more coordination with efficient use of the spectrum. Although these comments were appreciated by the Subcommittee, no specific were presented to support these assertions. Many have expressed opposition to this particular concept as noted in the following paragraph.

7.2.14 The idea of creating spectrum management roles for states and other United States political jurisdictions creates many complex issues that must be addressed before either the Congress or the FCC should proceed with this concept. Foremost among these issues is whether the states would be willing to accept the role of spectrum manager within their political boundaries and the extent to which such a role would affect the "balance of power" between the state and local governments within their boundaries. Another matter that must be thoroughly examined is how the various political jurisdictions would coordinate the multitude of frequency border frequency assignment issues and any disputes that may arise. Similarly, block grants to States may make even more complex the coordination problems that currently exist between Federal and non-Federal public safety agencies. Just a few concerns expressed are: (1) Requirements vary dramatically from state to state, reflecting size, population, geographical and demographic differences. Blocks would have to be adjusted accordingly. (2) Radio signals cannot be confined to state boundaries and coordination with adjacent states would become much more difficult, particularly if states were free to adopt their own rules and regulations. (3) Most states do not have an organization or structure for administering a program of allocating and managing frequencies. This would be costly and they may be reluctant to assume this responsibility. This could be interpreted as a federal mandate and would require funding. (4) Maintenance of a master data base to reflect the various state blocks and their individual uses would be extremely difficult to create and manage on an individual state basis. (5) Coordination and interoperability would be threatened by disparate use of frequencies by different services and by lack of a uniform state plan. (6) In most states local government, counties and cities would probably strongly object to state control of the spectrum, particularly in states with home rule.. While the FCC is not a user, in most instances the state is the largest user itself and it would be extremely difficult to maintain an objective position. (7) While the FCC presently provides the licensing service at no cost to the applicant, states would be forced to recover costs, probably through charges to users.

7.2.15 The Transition Subcommittee has received no support such a block grant operations. The opposite is true. Many expressions of opposition to such a program were

discussed. The Transition Subcommittee therefore believes that this matter not be pursued.

7.2.16 Privatization v. Federal Licensing. As previously observed, the Communications Act preempts the field of radio transmissions for exclusive Federal control. In all cases where the Communication Act requires the operator to have a license, the Act anticipates that the licenses will be issued by the FCC. Section 307 of the Communications Act, for instance, states that "the Commission, if the public convenience, interest, or necessity will be served thereby ... shall grant to any applicant therefor a station license provided for by this Act." Section 309 of the Act likewise provides that when entities need to operate radio stations on a temporary basis, the Commission shall issue Special Temporary Authority. Thus, any effort to privatize the Commission's functions must first consider whether the delegation involves licensing activities and, if so, to determine ways to insure compliance with Section 307 and similar provisions of the Act.

7.2.17 Additionally, under Section 158 of the Act the Commission is responsible for accepting application fees. Hence, any process that involves the filing of application fees must take into account Section 158.

7.2.18 Nonetheless, it is the Transition Subcommittee's view that the FCC may be able to delegate many of its licensing functions without amending the Communications Act. The Act gives the Commission broad rule making powers and discretion to administer the Act. To this end, the Commission's rules provide that it alone will be responsible for the issuance of all licenses, modifications and renewals, as well as approval of assignments and transfers. Except in those areas where specifically prohibited by the Act, the Commission has the authority to change its rules and thus the manner in which it administers its licensing functions. This is particularly true in situations where the Commission has the final opportunity to review those matters delegated to others.

7.2.19 The Transition Subcommittee believes, therefore, that there are several options which the FCC may exercise in regard to their licensing functions. These include assigning more authority and responsibility to frequency coordinators who are both qualified and representative of the public safety users. Such responsibilities could include: Processing and granting non-mutually exclusive applications for public safety facilities, including but not necessarily limited to, applications for new and modified facilities, renewal applications, station cancellations, Special Temporary Authority requests, and other minor administrative matters (e.g., change of address). The Commission's rules already contain a "safety-value" provision to protect applicants. The Transition Subcommittee observes, in this regard, that an applicant dissatisfied with any action of a authorized coordinator could utilize the thirty-day petition for reconsideration period provided for in Section 1.108 of the Commission's rules.

7.2.20 Non-Federal Licensing Considerations. The non-federal public safety services currently function with authorized frequency coordinators. Inherent in the FCC's PR Docket 92-235 (Refarming) proposal to consolidate radio services is the issue of providing frequency coordination for a consolidated public safety service pool. Four organizations are currently authorized by the Commission to provide frequency coordination to non-federal public safety users: The Association of Public-Safety Communications Officials -

International (APCO) coordinates for police and local government below 512 MHz, and all public safety users above 800 MHz; The International Municipal Signal Association (IMSA) is delegated coordination authority as an extension of the International Association of Fire Chiefs (IAFC) and coordinates for the fire service, emergency medical service, and special emergency service below 512 MHz; The Forestry Conservation Communications Association (FCCA) performs coordination for the forestry conservation service below 512 MHz; and the American Association of State Highway and Transportation Officials (AASHTO) coordinates for the highway maintenance service below 512 MHz. This structure has been built around the FCC's requirement that coordinators be "representative" of their affected user group.

In a pooled environment, each of the four current coordinators would be representative of their current constituency eligible for licensing within the public safety pool. Accordingly, each is qualified to continue coordinating for their current representative user group. Newly generated frequencies within the pool should be footnoted as to their appropriate service.

7.2.21 Electronic Filing and Processing of Applications. As currently structured, the private land mobile radio application process is still heavily paper dependent. The FCC, however, in an effort to eliminate cost and the delay in processing private radio applications, has begun to institute a procedure to file applications electronically. Today, automated data bases and computer software programs that perform all essential task are critical if the Governments wants to establish a modern application processing system. Electronic Data Interchange (EDI) is facilitating a faster and efficient licensing process. It is currently possible for an applicant to upload an application directly to a coordinator for processing. After the coordination process has been completed, an EDI generated application may be delivered electronically to the Commission. There is no reason that the process cannot be reversed and the license delivered to the applicant electronically through the coordinator. and can be transmitted to the applicant simultaneously after ensuring that all obstructions to the license process have been resolved. The licensing process is the final step of the coordination process. An original copy will then be mailed to the licensee if the applicant does not have the capability of receiving the license electronically. We must note that the FCC will remain the final authority in cases of arbitration. The FCC may choose to selectively check applications to ensure compliance to eligibility requirements, its rules and the integrity of the entire process.

RECOMMENDATION: The Transition Committee recommends that the matter of state block grants be studied in much more detail and that the governors of the states be questioned by Congress before any further effort to implement block grants to states is taken.

8.0 Spectrum Management Options For Improving Federal Licensing.

8.1.0 Current Federal Licensing: An Overview.

8.1.1 The functions relating to assigning frequencies to radio stations belonging to and operated by the United States, or to classes thereof, are conferred upon the President

by the provisions of Section 305(a) of the Communications Act. These functions have been transferred to the Secretary of Commerce, which has assigned the responsibility for the performance of them to the Assistant Secretary of Commerce for Communications and Information (i.e., the Administrator, National Telecommunications and Information Administration (NTIA)).

8.1.2 The Interdepartment Radio Advisory Committee (IRAC) is the Federal organization that serves as the focal point for authorizing Federal agency use of the spectrum. Since its inception in 1922, the IRAC functions to assist the NTIA in assigning frequencies to U.S. Government radio stations and in developing and executing policies, programs, procedures, and technical criteria pertaining to the allocation, management, and use of the spectrum.

8.1.3 The Interdepartment Radio Advisory Committee (IRAC) consists of a main committee, 4 subcommittees, a group for notifying frequencies to the ITU, and 12 ad hoc working groups that consider various aspects of spectrum management policy. The FAS also develops procedures for processing requests for frequency assignment. The Spectrum Planning Subcommittee (SPS) develops both recommendations to NTIA, on behalf of the IRAC, regarding agency requests for spectrum support for new systems and plans for use of the spectrum. The Technical Subcommittee (TSC) assists NTIA in developing policies, programs, procedures, and technical criteria regarding the allocation, management and use of the spectrum. The Radio Conference Subcommittee (RCS) prepares for ITU radio conferences, including the development of recommended U.S. Proposals and Positions. The International Notification Group (ING) prepares responses to the International Telecommunication Union (ITU) concerning questionnaires and other correspondence related to the notification of United States frequency assignments; and the Secretariat.

8.1.4 NTIA also represents the following Federal authorities in one or more of the IRAC subcommittees: Architect of the Capitol, Administrative Office of the U.S. Courts, Board for International Broadcasting, Commodity Futures Trading Commission, Central Intelligence Agency, Consumer Product Safety Commission, Equal Employment Opportunity Commission, Environmental Protection Agency, Federal Deposit Insurance Corporation, Federal Mediation & Conciliation Service, General Accounting Office, U.S. Government Printing Office, House of Representatives, Housing and Urban Development, International Trade Commission, Department of Labor, Library of Congress, National Archives and Records Administration, National Gallery of Art, Nuclear Regulatory Commission, Office of Personnel Management, U.S. Peace Corps, Securities and Exchange Commission, Social Security Administration, Department of State, Supreme Court, U.S. Capitol Police, U.S. Senate, and the Smithsonian Institute.

8.1.5 In recent years, however, legislation dictating the "retrocession" or privatization of radio frequency spectrum now apportioned to Federal use has necessitated greater inquiry on the part of NTIA into the basis for agency spectrum requests. Under that legislation, NTIA has undertaken to access both existing and planned Federal spectrum usage. See, e.g., *NTIA Spectrum Reallocation Final Report* (February 1995). NTIA's assessment

was premised in large part upon formal submissions by IRAC-Member departments and agencies, as well as the general public.

8.2.0 **Improvements in Federal Licensing**. Federal agency requirements for use of the spectrum continue to grow simultaneously with an explosive growth of private demand for many types of radio communication services, such as satellite mobile radios, cellular radios, position location and tracking systems, and others. With this rapid expansion of spectrum use and growing competition for scarce spectrum resources, it is of increasing importance that the federal spectrum management community employ efficient, automated techniques to 1) create applications for certification of spectrum support and for frequency assignment, 2) evaluate proposed spectrum use, 3) resolve spectrum requirement conflicts, and 4) assess other spectrum supportability issues. By increasing the level of automation and with logical execution of the engineering analyses necessary, the Federal spectrum management community will be able to continue to accommodate additional users of the spectrum well into the next century.

8.2.1 NTIA and the Federal agencies have established general principles for spectrum management as embodied in the NTIA Manual of Regulations & Procedures for Radio Frequency Management. While adhering to these principles, different methods have developed in the various agencies for the selection of frequencies. These different methods may have been adequate in a time of plentiful spectrum. However, with increased spectrum congestion, it is necessary to adopt standard methods of frequency selection so that the benefits associated with more efficient spectrum use may be realized by all. In particular, standardized procedures are desirable to assess the electromagnetic compatibility of proposed systems with existing environments.

8.2.2 In April 1993 NTIA published a vision of Automated Data Processing (ADP) for Federal spectrum management support in which the appropriate individual in the Federal spectrum management community will have ready access to the latest spectrum environment information and the necessary computer programs to assist in the performance of their job functions, as well as the use of telecommunications to minimize the non-value-added time in the spectrum management process. To this end NTIA has introduced a number of improvements in the process and is currently developing more. One of these developments is the Joint Spectrum Management System (JSMS). The version of JSMS being distributed at the present time (April 1996) is the initial operating capability (IOC) and should be viewed as a work in progress.

This program represents a major Federal Government-wide effort to improvement the Federal spectrum licensing process, while improving spectrum efficiency and service to the user.

8.3.0 Non-Federal/Federal Licensing.

One major area of licensing that can be improved is the coordination between non-Federal and Federal public safety officials. As previously observed, Government policy to date has done little to change the inefficiencies brought about by the separate and distinct

Federal and non-Federal licensing functions. There is growing pressure on public safety radio users at both the Federal and non-Federal level to use their spectrum more efficiently. In this regard, either better coordination between the Federal and non-Federal licensing agencies is needed or there should be a convergence of these functions under one regulatory umbrella.

8.3.2 Current NTIA and FCC regulations for sharing of frequencies between Federal, state and local users for coordinating law enforcement and emergency operations have been developed over many years, and are generally satisfactory for these purposes. However, the use of shared Federal, state, and local government systems would facilitate the close cooperation needed between police and emergency assistance personnel under some circumstances and allow the economic expansion of large wide area land mobile communication systems needed by all three levels of government. A degree of regulatory flexibility in changing these rules could be exercised to enhance future sharing among Federal and non-federal public safety agencies and ease the coordination burden.

9.0 Overview of Commercial Services Available for Public Safety Use.

9.0.1 The need for additional spectrum for public safety use is clearly required over the long term. To this end, public safety users have requested the Federal Government on several occasions to grant them access to additional spectrum. As has been demonstrated elsewhere in this Report, the need for additional spectrum to meet the growing use of voice, data, images, and video in law enforcement and other areas of public safety (e.g., fire fighting) will continue to strain public safety spectrum allocations. Today, perhaps more than ever before, because of the emergence of competition in the commercial marketplace, the availability of a wide variety of commercial services may benefit the public safety user. Moreover, because of the amount of spectrum being "auctioned" to new competitors, which could result in up to ten (10) competing service providers in each market, it is likely that many areas will not have enough customers to support "commercial" services and, consequently, the economic challenges that may face these providers may ultimately result in additional service options for the public safety user.

9.1.0 Mobile Voice Services.

9.1.1 Cellular. There are three commercial mobile telephone services in the marketplace today. Cellular telephone service is the largest and most established. Cellular users can choose between two providers in each market. One of the providers, the wireline carrier, is a subsidiary of the local telephone company, and the other provider, or non-wireline carrier, is usually an independent operator. In recent years, however, some independent cellular providers have entered into agreements or been acquired by other telephone companies. Both the wireline and independent cellular providers have formed arrangements that allow users to make and receive calls from almost any place in the United States.

9.1.2 Public safety uses of cellular telephony as an adjunct to their own communications services take numerous forms. Temporary command centers are frequently established in emergency situations which require telephone service immediately in locations

where regular phone lines and power have been lost. San Francisco's public safety officials made extensive use of cellular telephones during the 1989 earthquake. Similarly, public safety officials in Florida used on cellular telephones to maintain communications during Hurricane Andrew and its aftermath as an adjunct to private systems.

9.1.3 Cellular telephones installed in police officers' vehicles allow an officer to respond to a minor call for service over the phone instead of driving to the scene. This permits a patrol car to be more efficient and more responsive to the needs of the community it serves. And, calls for service that deal with in-progress crimes are dealt with much more efficiently when the officer can speak directly over the telephone to the reporting party or witness.

9.1.4 Other less direct use of cellular telephones by public safety officials have developed as well. Several communities, notably Houston, Boston and St. Augustine, have programs in place in which a victim of spouse abuse will be given a cellular phone that can be used to contact public safety officials if the abusive spouse becomes threatening. In other communities, citizens volunteers will be issued a municipally-owned cellular phone to report suspicious happenings in the neighborhood.

9.1.5 Specialized Mobile Radio Service. The Specialized Mobile Radio Service (SMR) was established in the early 1980's and provides dispatch services to many businesses ranging from taxicabs to public utilities to large corporations. Initially, SMR's provided dispatch communication services -- i.e., brief messages usually with a duration of less than a minute. While dispatch service is still the mainstay of SMR providers, some SMR carriers also provide interconnected mobile telephone service. Some SMR carriers are, moreover, redesigning their systems in a manner similar to cellular providers thus allowing them to use their spectrum allocations more efficiently and the ability to offer a wider array of mobile telephone service.

9.1.6 Personal Communications Services. The newcomer to the mobile telephone service market is the "personal communications services" provider. The FCC has allocated 120 MHz of spectrum for PCS, which has been divided among six licensees in each market. The three 30 MHz blocks are similar to the 25 MHz blocks assigned to cellular carriers. The three 10 MHz blocks can be used for niche services or aggregated with other PCS or cellular providers to provide some type of mobile service (i.e., either interconnected, dispatch, or both).

9.1.7 American Personal Communications' Sprint Spectrum service in the Washington, DC-Baltimore area is the only operating system providing service to paying subscribers. According to industry reports, the wide variety of features offered on the Sprint Spectrum service include caller ID, built-in answering-machine function and numeric paging, voice-mail, text messaging, call waiting, and call forwarding. (see Andy Kellett, *No More Talk About Talk - Broadband PCS Hitting The Airwaves*, RF design, January 1996).

9.1.8 Additionally, RF design reports that "many PCS systems may be adapted to act as a wireless PBX when within a building," and that "when two PCS phones are within

the coverage of each others handset, the two phones can operate as walkie-talkies, completely bypassing the phone network (and tolls)."

9.1.9 PCS services are still in their infancy, and it is unclear how these services will develop. What is clear however is that the companies that have gained access to this spectrum are investing millions of dollars in licenses and hardware and, consequently, the competition for the mobile telephone user or market will be intense. This competition should promote lower prices and further innovation that could lead to a host of new services for all users, including public safety and related agencies.

9.1.10 Satellite Radio Systems. Geostationary satellite systems that also provide telephone servicehave been available for a number of years, and from the present until the year 2010 there will be several operational satellite systems with capabilities to serve non-Federal and Federal public safety agencies. By way of background, commercial satellite systems started in the 1970's when COMSAT offered service for shipboard communications through its MARISAT system. The space segment was subsequently subsumed into the International Maritime Satellite Organization, now called the International Mobile Satellite Organization, (INMARSAT). INMARSAT was initially established to provide communications to ships, but now offers worldwide aeronautical, land and maritime mobile communications services.

9.1.11 Initially, INMARSAT installations costs about $50,000.00 each and tariffs were $10.00 per minute. Both installation and per minute costs have been reduced significantly in recent years, however. Today, even though the telephone equipment is still somewhat bulky and expensive, INMARSAT can provide telephone service almost everywhere in the world and has been used for disaster relief and other purposes. Some interim operations have been allowed in the United States. But, because there is now a domestic alternative, INMARSAT will not be allowed to provide land mobile communications in the United States.

9.1.12 Domestically, the American Mobile Satellite Corporation (AMSC) has been provided an exclusive license to provide mobile satellite communications service in the United States. Because AMSC is now providing advanced mobile satellite service in the United States, INMARSAT will be allowed to offer such services only if they are unavailable through AMSC.

9.1.13 Furthermore, the next generation of mobile satellite services, or Low-Earth Orbiting and Medium-Earth Orbiting satellites, are scheduled to become operational in the late 1990s. In the United States, three big LEO's have been licensed by the FCC that will operate above 1 GHz and provide both voice and data communications services. According to the literature, all three big LEO's plan to offer service late in this century or early in the next with dual mode satellite/cellular telephones.

9.1.14 Currently, one Little LEO is licensed and in operation with two satellites in orbit. To provide continuous coverage over twenty-six satellites are necessary, and this constellation is planned for full deployment by the end of 1997.

9.1.15 Recently, INMARSAT created another organization, ICO Clobal Communications, which will provide non-geostationary mobile satellite communications from an Intermediate Circular Orbit. ICO has received substantial investments and awarded satellite construction contracts to several major corporations. Licensing issues in the United States have yet to be resolved.

9.1.16 The American Mobile Satellite Corporation (AMSC) also launched its first satellite into geostationary orbit in April of 1995 launching an ear of affordable mobile satellite communications. Coverage over the continental United States, most of Alaska, Hawaii, the Caribbean, and over 200 miles offshore is provided. Voice, data, fax and location services are possible through automatic connections to public networks.

9.1.17 Furthermore, the AMSC system is completely digital thereby facilitating National Security Agency encryption systems as well as commercial voice privacy alternatives.

9.1.18 All types of users, including Public Safety agencies, may lease dedicated channels for their exclusive use. Dispatch, push-to-talk, and party-line talk group services are available. Dual mode satellite/cellular, satellite only, transportable and fixed site systems are available to users.

9.1.19 Public Safety Requirements Review. The Transition Subcommittee has reviewed the materials from the Operational and Interoperability Requirements Subcommittees to compare public safety agency requirements against current and future mobile satellite systems and their ability to meet them. Based on this review, the following list of specific needs made be met in whole or in part by commercial mobile satellite systems: basic voice dispatch, air-ground communications, multiple levels of encryption, travel channels for dignitary protection, location data transmission, expandable to allow quick addition of capacity, channel priority assignment, transmission of reports and forms, electronic messaging, transmission to support remote device monitoring, EKG transmissions, access to distant gateway stations when local telephone systems are overloaded, long-range telecommunications, emergency broadcast, media support during incidents, public telephone system access, lightly loaded single channel backbone systems, still photograph transmission, transit management, electronic cargo clearance, and hazardous materials incident response, among others. Only experiment and use under the stress of operational events, of course, will determine the degree of satisfaction with commercial mobile satellite communications systems.

9.1.20 The Transition Subcommittee also notes that the current mobile satellite systems will have no capability to transmit full motion video. Building penetration will also be uncertain because of relatively low link margins. Portable-to-portable hand held transmissions via satellite may be possible with planned LEO satellites and the next generation of geostationary satellites.

9.2.0 Wireless Data Services.

9.2.1 Wireless data services enable users to exchange electronic mail, send and retrieve documents, send and receive messages, and query data bases. These services use either terrestrial or satellite technologies, or both, to serve user needs, and are primarily designed to serve users who "are on the move." Wireless data services are increasingly being used by public safety agencies.

9.2.2 Paging Services. Paging services are the most basic form of wireless data delivery. Paging companies provide service at the local, regional, and national level, and offer a wide range of services -- e.g., tone-only, where the company transmits a signal alerting the user to call in for a message, and tone/voice or numeric pagers, where the user receives a voice message or phone number on his/her pager. Alphanumeric pagers, the most advanced pagers, can also receive short text messages, E-mail, voice mail notification, and information services like traffic alerts or stock quotes. It is also noteworthy, that the FCC has auctioned spectrum for further advances in paging services such as advanced digital and two-way paging. This has allowed many paging companies to offer new enhanced informational services, including computing and other devices.

9.2.3 Two-Way Messaging Services. Similarly, two-way messaging services offer a wide array of interactive low-speed data applications. Many companies use these two-way services to send and receive e-mail messages and to gain access to company data networks.

9.2.4 Narrowband Personal Communications Services. As noted previously, the FCC has provided additional spectrum through its auction process for a host of narrowband wireless data services -- narrowband personal communications services. Narrowband personal communications services currently provide a family of advanced paging and messaging applications to individuals and businesses, including public safety. There will be approximately 3,554 narrowband PCS licensees that will provide traditional mobile data services such as fleet and courier dispatch, locator services, voice paging, acknowledgment paging, and two-way exchange of short messages.

9.2.5 Cellular Radio Services. Cellular telephone systems also are capable of sending data communications.

9.2.6 Broadcast stations are also developing methods to deliver data information services to the public using their existing facilities.

9.2.7 Satellite Data Systems. Satellite data systems are also used to transmit data and other types of information. Satellites can cover large areas, indeed the whole United States, which make them well suited for the transmission of data and information.

9.5.0 Issues and Implications Regarding the Use of Commercial Services By Public Safety.

9.5.1 Commercial wireless mobile voice and data services hold much promise for use by public safety agencies, whether constructed on their own facilities or purchased from a commercial provider. In the past, mobile data services have been hamstrung by the limited amount of spectrum available for their services, which has limited performance and capacity. Slow data speeds, in part due to the limited band width available for wireless data applications, has been a serious drawback, but additional spectrum and advances in technology (digital compression and transmission, for example) will help providers achieve higher throughput. Also, noise, interference, and attenuation are typical technical problems that confront all data service providers.

9.5.2 Nonetheless, the commercial voice and data wireless radio market offers public safety agencies a wide variety of adjunct services.

9.5.3 Today, when the necessary spectrum support is valued to the Government licensee at nearly zero, the opportunity costs tend to be obscured. Contracting out for services thus is a means of ensuring accountability. It affords public officials, and taxpayers, a more accurate gauge of the true cost of spectrum-dependent undertakings. The final cost to Government, moreover, will always be less than the direct outlays because of the tax liabilities which private sector suppliers incur.

Contracting out for specialized communications services may be a way of reducing demands on governmental capital budgets. It must also be pointed out, that contracting increases the demand on operating budgets. The communications needs of the public safety community are significant, and in many instances, the public services involved are critical. Hence, not all mobile radio services offered by the private sector today, or even over the next few years, will meet all of the public safety needs.

9.5.4 A comparison must be made between commercial voice systems and public safety voice system. The typical public safety voice radio system is based on a "team" concept, with all players being ware of each others conversations and instantly in communications. The cellular system and PCS systems use a system that generally interfaces through the public switched network. SMR systems are normally shared between a number of various users. Thus the "fleet call" and "dispatch" approach required for most public safety communications can be provided by some, but not all, commercial services. However, many public safety radio systems regularly handle a communications significant volume of routine administrative type communications that could be handled by private sector alternatives.

9.5.5 It is in the area of "critical" communications however that commercial service providers today fail to fulfill the needs of police, fire safety and other public safety users. Traditionally, public safety agencies have been reluctant to subscribe to commercial mobile voice and data services for their primary public safety functions. When public safety agencies do contract with commercial wireless providers, an array of issues are raised ranging

from control of the system to whether the commercial systems and their components are reliable, sturdy and capable of withstanding "hard use." Security of the communications, in some instances, is also a critical factor[3].

9.5.6 Indeed, it is safe to say that public safety entities will continue to need to operate and control their own communications systems for many years to come. Commercial systems like cellular and newer PCS systems will contribute to carrying out the functions and responsibilities of public safety agencies. They will facilitate routine administrative traffic and, as we observe above, they will also assist public safety agencies in the performance of their duties during both normal and abnormal situations.

9.5.7 However, while many commercial systems may facilitate public safety communications, generally they have not meet the overall communication needs and requirements of the public safety community. Public safety agencies, for instance, cannot wait for a normal dial tone or operate with the danger of jammed circuits during emergencies and other critical periods when instant communications is required. Moreover, public safety agencies must operate with high levels of reliability and interference-free protection, and must have signal quality coverage throughout their jurisdiction.

9.5.8 As noted, new communications technologies and applications are providing new tools for public safety agencies. Many of these technologies and applications may be provided by non-public safety entities. The Transition Subcommittee recognizes that, in the future, public safety agencies must be aware of the availability of such services. Moreover, in their procurement processes, public safety agencies should make efforts to determine whether providers of such services can meet their communication requirements, including considerations relating to control over the system, costs, reliability, coverage, security, and other considerations that now distinguish their own systems from those available in the commercial marketplace. Public safety systems, with sufficient capacity to accommodate peaks in service demand that occur during non-routine periods, to accommodate overall communication requirements.

10.0 Video/Data Services: Overview. (Explanation: Wideband systems pose special problems for licensing and spectrum management. Due to the technical nature of topic, it will be placed into appendix "C" at a later date)

11.0 Transition to Interoperability: Overview of Interoperability Subcommittee Recommendations. (**Explanation**: Questions relating to the need for interoperability, who should be able to talk to whom, and the solutions that are available to achieve interoperability fall within the purview of the Interoperability Subcommittee. How the public safety community migrates to the recommended interoperability solution falls within the purview of the Transition Subcommittee. This section is designed to explore transition/migration

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3 While the majority of participants in this subcommittee strongly agree with the content of this paragraph, it is noted that several commercial representatives in the group dissented.

interoperability issues. This section will also explore interoperability issues that involve non-public safety entities (e.g., utilities).

Outline material follows:

11.1 Backward Interoperability
(a) Issues Identified by Interop/Subcom.

11.2 Forward Interoperability
(a) Issues Identified by Interop/Subcom.

11.3 Requirements of Interoperability For Other Entities (e.g., Utilities)
(a) Definition of Procedures
(b) Training
(c) Funding
(d) Access to PS spectrum
(e) Backward/Forward Compatibility
(f) Other

11.4 Infrastructure Dependent Issues

11.5 Infrastructure Independent Issues

11.7 Summary and Conclusions

12.0 Transition Timeline: Overview of Proceedings Necessary To New Spectrum and Technologies. (**Explanation:** Once all PSWAC recommendations are made, it will be necessary for the government to take specific actions to reallocate the spectrum and to adopt those rules that will implement those recommendations found to serve the overall public interest. This section will examine those actions PSWAC believes that they government may have to undertake and to develop some long term planning objectives (i.e., a game plan) for the government and public safety community as it migrates to new spectrum allocations and technologies. These issues include, among others, rule making or other administrative actions that may be necessary to achieve the PSWAC goals and objectives.

Outline material follows:

12.1 Administrative Proceedings
(a) NTIA Proceedings
(b) FCC Proceedings

12.2 Congressional Action
(a) Legislative Proposals

12.3 Summary and Conclusions

13.0 Funding Options: Overview of Funding Issues.

Transition Funding Options.

This section provides a general plan for funding public safety agencies to move to newly issued spectrum in the event that current public safety spectrum is relinquished to commercial or other private sector entities. In addition the funding of public safety agencies to move to new spectrum without current spectrum relinquishment is addressed.

There are several considerations that this subcommittee examined in its recommendation findings. Local funding, State funding and Federal funding are outlined below. While all of these areas specifically address equipment acquisition, funding for training (both technical and operations) on new systems was also placed in equation.

13.1.0 Local Funding.

Funding on the local level sources (i.e., cities, townships, counties, and other municipalities) will be achieved by local authority revenue raising programs. These include new bond issues, tax levies, citation surcharges, and other programs that are in place throughout the country. These sources of revenue have historically been proven effective funding for public safety systems and will have to be put into place as each agency transitions or migrates into a new spectrum allocation.

These funding options are viable methods in which local governments can move to new bands. However, with governmental downsizing and budget restraints that are facing all levels and branches of government, this is a limited source of revenue. If there is a requirement to relinquish any current public safety spectrum, local funding sources will not be able to absorb all related costs of such relocation.

13.2.0 State Funding.

Funding sources for state radio systems and those state owned systems that operate in conjunction with local governmental bodies will face similar constraints in funding at the local level. State governments do have certain funding advantages that can allow transition with greater ease than those entities on the local government level. This report can only recommend that state governmental agencies and legislative bodies propose funding sources to help those on the local level reach transition goals. Again, many of these funding mechanisms are currently in place and operate effectively to provide new communications systems for public safety agencies on both the state and local level. These sources will be needed to move those agencies to new spectrum as equipment becomes obsolete or the agencies have needs to change to new systems.

13.3 Federal Funding.

13.3.1 Scenario One. No currently held public safety spectrum is relinquished and additional spectrum is allocated for public safety use.

The use of federal money to facilitate transition to new spectrum has been the subject of intense debate among the participants in the Subcommittee. There are numerous suggestions about the use of federal programs to purchase or assist public safety agencies in buying new radio systems as additional spectrum is allocated. If new "virgin" spectrum is granted in addition to the existing blocks of spectrum currently being used by public safety, the agencies who desire to move existing systems, immediately, to that new spectrum (i.e., for interoperability purposes in contiguous spectrum etc.) will need to rely on traditional funding sources that are currently in place.

In the case that no current public safety spectrum is marked for relinquishment, the agencies would have the option of keeping an existing system on current spectrum or building a new system, possibly when the current system was rendered obsolete, to take advantage of characteristics associated with any new spectrum (if any). In any event, traditional funding sources would be employed which may or may not include federal assistance.

It is suggested that the Commission take action to assist federal, state, and local government public safety agencies acquire systems that will provide mechanisms for interoperability among both multi-jurisdictional boundaries and multi-echelons of government. Taking into consideration that the Commission has raised considerable revenue from spectrum auctioning, an initiative should be launched to use some of that money to assist transition into new spectrum. This may require Congressional action to allow the use of auction revenues for distribution to public safety agencies in the form of grants. Financial assistance from the federal government will provide incentive for state and local agencies to build systems that will have much needed interoperability capacity.

13.3.2 Scenario Two. Public safety must relinquish a portion of or all currently held spectrum and move to new blocks.

If public safety must give up currently used spectrum, gaining users of the forfeited spectrum must pay for all relocation costs to the public safety agencies to new spectrum. This should include new equipment (must meet new spectrum efficiency requirements), all associated consulting and legal fees, training, and other services connected with relocating an entire system to a new spectrum block. The recent 2 GHz proceedings can serve as a model for this relocation with several modifications.

If public safety agencies are not displaced by commercial entities, they will continue to operate on those frequencies until that life is exhausted. At that time, no new license in the current band will be issued to that entity. They will then be required to build their new system using new spectrum or public safety spectrum that was not required to be relinquished.

APPENDIX A

NEW CATEGORY PART 90 RULES

Public Safety

Police
Fire
Emergency Medical
Highway Maintenance
Forestry/Conservation
Special Emergency/Government
General Government

Public Service

Special Emergency/Non Government
Power
Petroleum
Railroad
Telephone Maintenance

Business/Commercial

Forest Products
Film/Video Productions
Relay Press
Special Industrial
Business
Manufacturers
Telephone Maintenance
Taxicab
Automobile Emergency
Motor Carrier

EXISTING RADIO SERVICES

Public Safety Radio Services

Police
Fire
Emergency Medical
Highway Maintenance
Forestry/Conservation
Local Government

Special Emergency Radio Services

Industrial Radio Services

Power
Petroleum
Forest Products
Telephone Maintenance
Film/Video Production
Relay Press
Special Industrial
Business
Manufacturers

Land Transportation Radio Services

Motor Carrier
Railroad
Automobile Emergency

NOTE: Intelligent Transportation Systems (ITS) applications may be included as public safety if eligible.

APPENDIX B

The Spectrum Requirements Subcommittee has not completed its Final Report as of this writing of the Transition Subcommittee Final Report. Definitive spectrum recommendations for public safety use of new frequency bands have not been forwarded to the Transition Subcommittee. This appendix contains the draft report outline for Transition Subcommittee Work Group #7 - Transition to New Frequency Bands. In this draft report, questions are posed for which answers are dependent upon those spectrum recommendations. (June 11, 1996)

B.1.0 TRANSITION TO NEW FREQUENCY BANDS.

Explanation:

One of the major endeavors of PSWAC is to determine whether the public safety community needs additional spectrum and, if so, how much and where that spectrum should come from. Once the Spectrum Requirements Subcommittee makes these determinations, the Transition Subcommittee must examine how the public safety community will migrate to the frequency band(s) identified. The purpose of this section is to examine technical, licensing and other considerations that the public safety community may encounter as they migrate to the new frequency bands.

[Overview of new frequency band(s) recommended by Spectrum Requirements Subcommittee (SRS). This area will be dependent upon SRS recommendations which involve frequency bands not presently available under Federal Communications Commission (FCC) Rules and Regulations to Public Safety Radio Services (PSRS) licensees.]

[As of this writing, there are no known Subcommittee plans to recommend that existing PSRS licensees involuntarily relocate from their present operating band to a different PSRS band. However, it is likely that PSRS licensees may wish to voluntarily relocate to a new or different PSRS band for the purpose of developing a new, high spectral efficiency radio system.]

B.1.1 Availability/Time Line

Numerous factors come into play when radio communication systems are moved to another operational band. Not insignificant is the impact which the propagation characteristics of the new band have upon the operational coverage requirements of the impacted public safety licensees. Since it is highly likely that operating systems already exist in the proposed band, those incumbent systems will have to be relocated, which in itself has a significant impact on the overall time line for public safety to begin operations.

(a) Band Clearing Issues

In order to clearly understand the scope of any band clearing issues, it will be necessary to study the impact on incumbents that must be relocated, since their relocation issues must be accommodated before public safety can relocate to achieve its goals.

(1) Identify the systems presently operating in the proposed spectrum, and what geographic areas are served by them?

Identify each entity by name address and contact person, its general area of operation, number of stations and subscriber equipment by type and power, and any other pertinent data.

[This report will attempt to scale a representative impact statement so that an appropriate overall impact can be derived.]

(2) Identify spectrum that will be available for incumbents to relocate to.

(3) Identify the different propagation characteristics of the new band compared to the present band.

(4) Identify any probable change in the number of fixed sites required to meet the public safety requirements of the new band.

(5) Identify if existing infrastructure will support a band change. Quantify any modification of infrastructure that may be required.

(6) Quantify the approximate cost of replacement system, providing same type and quantity of units, and same coverage area. Replacement equipment must comply with present day spectrum efficiency requirements (12.5 KHz).

(7) If band clearing is required, identify the cost and time benefits of any inducements that may be required to expedite band clearing?

(8) How will the cost to incumbents who must relocate from one band to a different band be funded? How will the cost of any inducements be funded? (See Transition Subcommittee Final Report Section 13.)

(9) How will the relocation of the incumbent systems be accomplished and what time line issues pertain thereto?

(10) If an incumbent, who must relocate, chooses instead to use commercial services in lieu of relocating its previous system to another band, what financial consideration for band clearing is appropriate and how would it be funded?

(11) If temporary use of commercial services is a viable method of expediting band clearing prior to an incumbent's cut-over to a new system, how should that be funded?

(b) International Frequency Coordination Issues.

(1) A significant impact on transition to new frequency bands occurs along international borders, where use of frequencies is covered under international treaties and agreements. In the existing FCC Rules and Regulations, there are several different border area definitions which impact the licensing of new transmitter frequencies and locations.

(i) Line A. Begins at Aberdeen, Washington running by great circle arc to the intersection of 48° N., 120° W., thence along parallel 48° N., to the intersection of 95° W., thence by great circle arc through the southernmost point of Duluth, Minn., thence by great circle arc to 45° N., 85° W., thence southward along meridian 85° W., to its intersection with parallel 41° N., thence along parallel 41° N., to its intersection with meridian 82° W., thence by great circle arc through the southernmost point of Bangor, Maine, thence by great circle arc through the southernmost point of Searsport, Maine, at which point it terminates. (FCC)

Line A is a border definition line which generally applies to the use of frequencies below 512 MHz along the northern border of the 48 contiguous states with Canada. Within Line A, frequency coordination with Canada is required.

(ii) Line B. Begins at Tofino, B.C., running by great circle arc to the intersection of 50° N., 125° W., thence along parallel 50° N., to the intersection of 90` W., thence by great circle arc to the intersection of 45° N., 79° 30' W., thence by great circle arc

through the northernmost point of Drummondville, Quebec (Lat. 45° 52' N., Long. 72° 30' W.) Thence by great circle arc to 48° 30' N., 70° W., thence by great circle arc through the northernmost point of Campbellton, N.B., thence by great circle arc through the northernmost point of Liverpool, N.S., at which point it terminates. (FCC)

Line B is a border definition line which generally applies to the use of frequencies below 512 MHz along the southern border of Canada with the 48 contiguous states. Within Line B, frequency coordination with the United States is required.

(iii) Line C. Begins at the intersection of 70° N., 144° W., thence by great circle arc to the intersection of 60° N., 143° W., thence by great circle arc so as to include all of the Alaskan Panhandle. (FCC)

Line C is a border definition line which generally applies to the use of frequencies below 512 MHz along the eastern border of the State of Alaska with Canada. Within Line C frequency coordination with Canada is required.

(iv) Line D. Begins at the intersection of 70° N., 138° W., thence by great circle arc to the intersection of 61° 20' N., 139° W. (Burwash Landing), thence by great circle arc to the intersection of 60° 45' N., 135° W., thence by great circle arc to the intersection of 56° N., 128° W., thence south along 128° meridian to Lat. 55° N., thence by great circle arc to the intersection of 54° N., 130° W., thence by great circle arc to Port Clements, thence to the Pacific Ocean where it ends. (FCC)

Line D is a border definition line which generally applies to the use of frequencies below 512 MHz along the western border of Canada with the State of Alaska. Within Line D frequency coordination with the United States is required.

(v) In the 800 MHz band, sharing arrangements with Mexico and Canada, described in FCC 90.619, restrict which channels may be used by public safety licensees in the United States.

(2) To effectively make new spectrum bands available to public safety along the international borders, appropriate agreements must first be reached with the respective countries. Several states along the Canadian border have indicated a desired to develop shared statewide radio communication infrastructure. In order for such plans to proceed, internation agreement on the use of new frequency bands for public safety use is critical.

(c) Other.

B.1.3 Technical Considerations - public safety licensees moving to a new band.

(a) Propagation characteristics of the new band.

(1) Changing to a new band will have an impact. Identify advantages and disadvantages such a change will have on the present system configuration.

(2) Identify if additional or relocated tower sites will be required to achieve necessary coverage. Quantify the number of sites and cost. Include frequency coordination and licensing cost factors.

(3) If new tower sites are required, Identify the impacts of zoning type restrictions or state environmental quality review processes upon such construction. Quantify the time elements these processes, and frequency coordination and licensing, add to the implementation plans and their additive cost. Should federal legislation be enacted to preempt public safety radio sites from local zoning type restrictions?

(4) If less tower sites are required, will the remaining number of tower sites have to be relocated to optimize system signal coverage and, if applicable, simulcast performance?

(5) Where site relocations are required, identify the modification of infrastructure support links (i.e., microwave, fiber optic cable or leased line systems)and receiver voting, common equipment and control systems that may be required. Quantify the cost and time factors required for these modifications to be implemented.

(b) Other

B.1.4 Voluntary vs. Mandatory Transition

What are the expectations for a timely relocation of incumbent and public safety licensee's radio systems to new frequency bands if only a voluntary transition is required. Past history has shown that if deadlines for action are not imposed, the existing operations will likely go on indefinitely.

For that reason, mandatory transition is required. Since band clearing and public safety transition is a multiple step process, as noted above, the mandatory transition plan should have appropriate milestones established, by which, specific events must be completed. Intrinsic to this entire process is the mechanism for funding the work to be performed and the acquisition of new band equipment for the public safety entity, as well as, the incumbent, if any, being displaced.

(a) Non-Federal

In recognition of the federal initiative to establish a National Law Enforcement / Public Safety Network, IT04, federal and non-federal public safety communications infrastructures should be combined into a comprehensive system meeting the needs of all participants. Such a combined system development can start more easily with statewide systems, interconnected by appropriate gateways for wide area federal use, beginning with construction in the more rural areas and completing in the urban areas.

(1) Urban Areas

In extreme urban areas, such as New York City, NY; Chicago, IL; or Los Angeles, CA; the vast number of channels involved presents a monumental task. It may be possible to simplify the transition by use of cross-band patching of repeaters so that units in transition from one band to another can still communicate with each other. However, for tactical operations, unit to unit simplex operations must require similar equipment in use by all members within a working unit or "detail". Should large scale events occur during the transition period, the magnitude of this equipment-match requirement will present special difficulties. Cross-band repeating will result in a temporary surge in channel requirements since both bands will have to be fully operational during the transition period. Operating essentially two separate radio systems at radio system sites will require duplicate equipment space, infrastructure transmission links, and tower loading

capability. This issue can be directly compared to the current PCS, BAS and MSS displacement of public safety microwave incumbents in the 1.8 - 2.2 GHz bands.

(2) Rural Areas

In rural areas, where radio communication density is much lower compared to the major urban areas, and systems cover larger areas, the transition to higher frequency bands will likely require additional sites and possible relocation of existing sites. In this type situation, the transition is much easier, since new infrastructure links will be required and duplicate existing equipment space and tower loading are not required.

(b) Federal

In recognition of the federal initiative to establish a National Law Enforcement / Public Safety Network, IT04, federal and non-federal public safety communications infrastructures should be combined into a comprehensive system meeting the needs of all participants. Such a combined system development can start more easily with statewide systems, interconnected by appropriate gateways for wide area federal use, beginning with construction in the more rural areas and completing in the urban areas.

[(1) Urban Areas are expected to be similar to non-federal.]

[(2) Rural Areas are expected to be similar to non-federal.]

B.1.5 Cost Considerations

As identified in section 6.1 above, costs are estimated for relocation of incumbents and the transition of public safety entities to new frequency bands. These costs will include the direct costs of new equipment, site relocation, and possibly new infrastructure / common equipment - resulting from a need to reconfigure the system in order to obtain required performance in the new frequency band. Additionally, the special or temporary costs associated with transition will include duplicate systems, possible temporary use of other facilities - including tower sites and commercial wireless services, etc. While any system conversion to a new band, in and of itself presents opportunity to "upgrade" communication capability, the costs described in this section do not include such upgrades, such as adding mobile digital equipment, where it does not presently exist within an agency.