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As part of our evaluation of the development of the Navy's $3 billion Cooperative Engagement Capability (CEC) program, we reviewed the transfer of certain frequency spectrum, within which CEC operates, to the Federal Communications Commission (FCC) for reallocation to the private sector. Originally, the Department of Defense (DOD) did not concur with, but accepted this transfer. Recently, DOD officials have expressed concerns to the Department of Commerce and the Congress that the loss of specific frequency bands from exclusive military use could seriously impair how well CEC and other DOD systems will eventually operate.

This report discusses our analysis of whether (1) the capabilities of the CEC program could be adversely affected by this transfer, (2) other systems could also be adversely affected by this transfer, and (3) DOD, FCC, and the Department of Commerce are taking appropriate and adequate steps to prevent or minimize such impairment. We also discuss potential actions that could more effectively achieve the intent of the Omnibus Budget Reconciliation Act of 1993 to minimize negative impacts of frequency reallocation on the federal government. This review was performed under our basic legislative responsibility and contains recommendations to the National Security Council, the Department of Commerce, FCC, and the Department of Defense. The report also includes a matter for congressional consideration.

Background

The Navy began developing the CEC system in the 1980s as part of general research on battle group self-defense but converted it to a regular acquisition program in 1993. The CEC program originated as an improvement in ship self-defense capabilities in an open ocean environment, but migrated to a self-defense capability for engagement in areas close to land. CEC is designed to distribute the same radar and other data to all ships and aircraft (cooperating units) in the battle group to provide each unit with the same near real-time composite picture of the battle space.

Each ship and aircraft transmits its own sensor data to every other ship and aircraft within line of sight. In turn, each ship and aircraft receives sensor data from every other ship and aircraft and combines that data with its own data to form a composite picture. This capability is expected to

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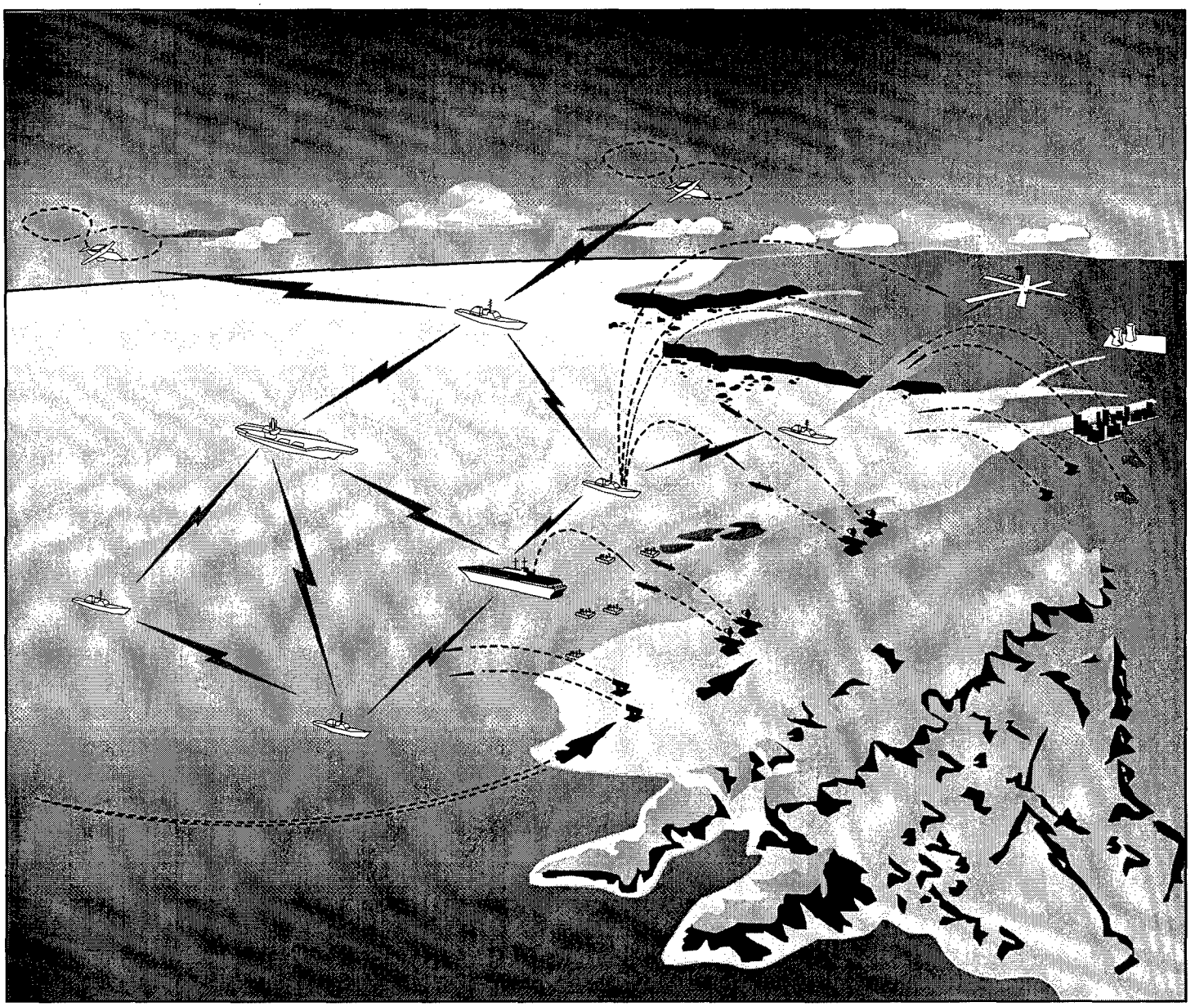
enhance performance against air threats to a battle group through longer intercept ranges and improved reaction time. CEC remains a Navy program, but in 1993 the Congress directed the Army and the Air Force to study CEC's potential to perform joint air defense operations and theater ballistic missile defense missions.

Figure 1 shows the complex environment of the littoral battlefield in which the CEC system is expected to operate. The environment includes friendly, hostile, and neutral forces; advanced cruise missile, electronic-warfare, and tactical ballistic missile threats; and a multitude of allied combatants with multiple sensors and weapons that must be closely coordinated.

Figure 1: Cooperative Engagement Capability System



Source: Johns Hopkins Applied Physics Laboratory.

In 1993, the Congress passed title VI of the Omnibus Budget Reconciliation Act, which requires the federal government to provide a span of frequencies aggregating to not less than 200 megahertz (MHz) for allocation to the public. The intent of the act was to benefit the public by promoting the development of new telecommunications technologies, products, and services that use the frequency spectrum and by increasing the sharing of frequencies by federal and nonfederal users. According to a Congressional Research Service report,[1] the auction of federal spectrum[2] is also viewed by lawmakers as a potential source of funds for the U.S. Treasury to help balance the federal budget. This is also the view of the administration. For example, the administration estimates it will receive about $8 billion in auction receipts from the auction of frequency spectrum licenses in fiscal year 1997 and about $9.4 billion in auction receipts in fiscal year 1998.

To minimize negative impacts on the federal government, the act requires that the spectrum to be reallocated must not be "required for the present or identifiable future needs of the Federal Government" [emphasis added] and should not result in costs to the federal government that exceed the benefits gained. Title VI allowed federal agencies to provide justification showing why their frequencies should not be subject to reallocation. If a spectrum is found to be necessary after reallocation, the President has the authority to substitute alternate spectrum provided that the requirements of the 1993 Omnibus act are still met.

Management of the frequency spectrum in the United States is divided between FCC and Commerce. The Communications Act of 1934 established FCC and gave it (1) authority to assign frequencies to all radio stations, except for those owned by the federal government and (2) broad regulatory powers in both wire-line and radio-based communications. The act reserved authority for assigning frequencies to federal government stations to the President. The President's responsibilities for managing the federal spectrum have been delegated to the Assistant Secretary of Commerce for Communications and Information, who is also the Administrator of the National Telecommunications and Information Administration (NTIA).

The NTIA Administrator is the principal advisor to the President on telecommunications policy. NTIA establishes policies concerning the use of federal spectrum based, in part, on input from the Interdepartment Radio

[1]CRS Report for Congress, FCC Auctions: Legislation in the 104th Congress, (95-923 SPR, Oct. 11, 1996).

[2]Federal spectrum refers to that portion of the frequency spectrum used primarily by federal agencies.

Advisory Committee and the Spectrum Planning and Policy Advisory Committee. The Interdepartment Radio Advisory Committee consists of representatives from 20 major federal agencies who, when in committee, are supposed to function in the interest of the United States as a whole.

In February 1995, NTIA identified 235 MHz of government spectrum (instead of the required 200 MHz) in its final spectrum reallocation report for transfer to the private sector. This 235 MHz included 50 MHz from within the CEC operating frequency band. The transfer of this 50 MHz may result in the loss of up to 200 MHz of CEC's usable operating frequencies because the Navy may have to place guard bands[3] of up to 75 MHz on each side of the 50 MHz commercialized frequencies to protect commercial systems from potential CEC interference. The size of the actual guard band needed will depend on technical and regulatory factors such as CEC deployment scenarios, design of the commercial receivers in the 50 MHz reallocated band, and applicable spectrum management regulations. The 200 MHz represents a significant portion of the frequencies CEC was originally designed to use.

Results in Brief

National security and cost implications of the federal frequency losses to CEC and other military systems were not fully considered in 1995 and have still not been adequately assessed. The loss of the portion of the frequency spectrum used by CEC could reduce its capability in peacetime training operations and make it incapable of joint (multiservice) operations similar in size to Operation Desert Storm. Other current systems could be adversely affected by an increase in mutual interference problems. In addition, new spectrum requirements for information warfare systems could suffer from a lack of needed frequency spectrum. However, the full DOD-wide cost and operational impact from the frequency loss has not been established because spectrum management planning in DOD is fragmented and inadequate.

In some instances, prior NTIA assessments of requirements and availability of frequency spectrum for transfer to the public could be incomplete because of security issues. Security classifications restrict release of pertinent technical information about many DOD programs. As a result, transferred spectrum is threatened by potential interference problems. DOD has cleared key NTIA, FCC, and other federal spectrum personnel to promote better spectrum planning. However, we believe more effective

[3]A guard band is a set of unused frequencies used to guard a system against interference to or from a system on adjacent frequency spectrum.

and cooperative actions to exchange data and establish commercial standards can be taken by DOD, FCC, and Commerce, thus ensuring that sufficient frequency spectrum is available to operate major national security systems with minimal interference to, and by, commercial systems.

The licensing of frequencies affecting CEC and other DOD programs should not begin until DOD has completed an ongoing assessment of its total requirements and reported its findings to the Congress and the President.

Frequency Transfer Could Impair CEC Operational Potential

The Navy initiated the CEC program as an improved ship self-defense system. DOD and the Congress added joint and ballistic missile defense missions to the system during its development. These additional missions will require an increase in the number of frequencies over those needed for ship self-defense. However, according to DOD officials, the loss of up to 200 MHz[4] required to protect non-DOD users could prevent CEC from functioning in a joint environment or against tactical ballistic missiles during a war similar to Desert Storm.

Program Expanded Beyond Initial Scope

The CEC program initially was developed to improve the Navy's ship self-defense capability against air threats. Subsequently, in his testimony on the fiscal year 1997 budget, the Secretary of Defense singled CEC out as a high-priority program and directed its accelerated development because of its great potential for increasing the war-fighting capability of joint service operations.

DOD has also received congressional direction to include theater air defense and theater missile defense as CEC missions. The conference report on the National Defense Authorization Act for 1997 urged the continued acceleration and expansion of joint service integration efforts between CEC and several Air Force, Army, and Marine Corps theater defense programs. The House Committee on Appropriations also directed the Secretary of Defense to submit a detailed joint service cruise missile defense master plan that specifically addresses the role CEC could play compared to the role of the Joint Tactical Intelligence Dissemination

[4]According to DOD officials, recent data have shown that the size of the guard bands could be as small as 15 MHz. Therefore, the amount of useable frequency the CEC could lose ranges from 80 MHz to 200 MHz. DOD also said the President has the authority to permit CEC to operate over the 200 MHz without concern for interference to civil systems in the event of a national emergency in the United States. DOD said in an operation like Desert Storm, the host country will determine how much spectrum CEC uses.

System.[5] In a 1995 memorandum to the Secretary of the Navy, the Chief of Naval Operations also noted potential international interest in the CEC system.

Limitations on Air and Missile Defense Roles

Our review indicated that as a Navy only, battle group sized system, CEC could work in peacetime as it was originally planned, but with some limitations on the number of participants. However, Navy documentation shows that with a loss of up to 200 MHz, CEC most likely will not be a viable system in a joint environment or against tactical ballistic missiles during a war similar to Desert Storm.

The Chief of Naval Operations, other Navy officials, and officials from the Office of the Secretary of Defense said that CEC probably would have difficulty supporting joint air defense missions under presently planned scenarios with the loss of up to 200 MHz. For example, the Navy expects about 100 CEC cooperating units on the East Coast by the year 2008, including battle group assets and air defense units. The Navy said about 39 units are required for joint air defense operations in a Desert Storm sized engagement, not including amphibious units engaged in self-defense operations. According to a CEC program official, CEC will not have enough spectrum to support 39 cooperating units after losing such a significant portion of its operating band.

Navy officials said that this loss of frequency could be accommodated in normal Navy operations in the United States. But, they added that joint operations cannot be supported because such applications greatly expand the number of cooperating units required for training and tactical operations. These officials were concerned about premature licensing of frequencies under the 1993 act because, once licensed for nonfederal use, frequencies cannot easily be converted back to military use. They favored either delay or deferral of the licensing of the 50 MHz until the number of joint users was determined.

However, FCC has begun the process of allocating and assigning frequencies transferred from the federal government, as required by the 1993 Omnibus act. It has completed a rule-making action to allocate the first 25 MHz transferred from the CEC operating frequency range to the General Wireless Communication Service. FCC officials said the Omnibus act requires FCC to have issued licenses by August 4, 1998, for at least 10

[5]The Joint Tactical Information Distribution System is a communications system that supports the positive identification and precise location of all participating platforms, reducing the possibility of engagements on friendly units.

MHz of the total spectrum reallocated from the federal government to nonfederal use, and FCC has identified the subject spectrum (or some substitute) as necessary to fulfill that mandate. FCC officials said they need to know very soon what spectrum will be available to auction to meet this statutory requirement so that appropriate rule-making proceedings can be conducted, proper notice can be given, an auction conducted, and licenses issued.

As FCC proceeds with auctioning and licensing commercial operations in the CEC operating band, Commerce officials believe the likelihood of the President initiating the reclaiming procedures outlined in the 1993 Omnibus act will become remote. Therefore, according to Commerce officials, since CEC system concepts have changed and new information is becoming available, it is prudent to consider a delay in the reallocation process until the results of an ongoing comprehensive DOD spectrum study are available.

In the conference report on the National Defense Authorization Act for 1997, the Congress directed the Secretary of the Navy to prepare a detailed report on progress made in resolving CEC frequency spectrum interference resulting from loss of frequencies caused by title VI of the 1993 act. The Navy prepared a report in response to the congressional direction. However, our review indicated that the Navy's report has significant deficiencies.

First, it does not provide a detailed description of efforts underway to identify means to increase the number of operating units that could operate at any one time. At present, total bandwidth requirements depend on the number of users because each user requires its own specific bandwidth. Navy officials said they are investigating methods of using the same bandwidth more than once through power management and frequency scheduling techniques.

Second, the Navy's report does not reach any conclusions on what training restrictions would be imposed because of the lost frequencies. Assessing training impacts from the loss of frequencies is important because DOD believes it must train jointly in order to fight jointly. The Director of the

Joint Spectrum Center[6] told us an approved joint training plan is required to fully analyze potential interference problems. As of March 31, 1997, DOD had not prepared a formal training program stipulating numbers of participants and training scenarios for joint operations because CEC is not an approved joint program. Navy officials expect joint program certification after a full production decision is reached.

DOD also said the Navy's report does not analyze which spectrum could be substituted for the 50 MHz in question without impairing other DOD spectrum dependent systems. Because the federal government identified 235 MHz for reallocation to the private sector, only 15 MHz would be needed to reach the legally mandated 200 MHz.

Adverse Effects on Other DOD Programs Likely

DOD has indicated that current and future spectrum reallocations could result in significant degradations in the capabilities of many major weapon systems and cost DOD hundreds of millions of dollars to modify systems and/or rent frequencies from the private sector or foreign governments.

In his fiscal year 1998 posture statement before the House Committee on National Security, the Chairman of the Joint Chiefs of Staff expressed a strong concern about reductions in the availability of frequency spectrum for DOD systems. He said:

> The military is also facing a new challenge from the commercial and international sectors over an issue no one anticipated 20 years ago: availability of the frequency spectrum. In the rush to provide 'bandwidth' ... it is critical that future spectrum sales take the impact on defense systems into account. There is potentially a significant dollar impact involved in this issue. If DOD has to yield portions of the spectrum to new commerce, existing military equipment operating within these frequencies must be replaced with systems that can operate on other portions of the spectrum.

Officials from the Air Force Frequency Management Agency said operational degradation must be accepted in many systems because no other frequencies are available to replace the transferred frequencies. For example, they anticipate the loss of test range frequencies (1452-1525 MHz) to constrain a wide range of DOD and civilian aircraft flight tests, potentially delaying the aircrafts' development schedule. They also

[6]The Joint Spectrum Center serves as the DOD center of excellence for electromagnetic spectrum matters in support of the Director for Command, Control, Communication and Computer Systems of the Joint Staff; the Office of the Assistant Secretary of Defense for Command, Control, Communications, Computers, and Intelligence; the Unified Commands; military departments; and defense agencies. It also supports the electronic protect missions of information warfare as they relate to spectrum supremacy.

anticipate problems in high power, highly mobile, air defense radar operations caused by the loss of frequencies now used as guard bands to prevent interference with civilian users. According to DOD officials, this, in effect, moves the frequencies of widely deployed civilian and commercial systems closer to frequencies of these radars. They said this increases the likelihood of interference unless adequate steps are take by the private sector, such as establishing receiver selectivity standards.

In commenting on our draft report, the National Security Council said the issue is potentially much broader in scope than the impact of the planned federal spectrum auction on the Navy CEC program. The Council said the U.S. armed forces are rapidly moving toward an information-intensive style of warfighting as described in Joint Vision 2010,[7] which will generate much greater demands on the radio frequency spectrum through high communications connectivity requirements. The council said current problems could be but a prelude to much larger and more difficult problems in the future.

Thus, a more critical problem for DOD is identification of frequencies needed to support new information warfare requirements. For example, Army spectrum management officials told us that frequency requirements for the Army digitized battlefield were not considered during the frequency reallocation review process in 1993 because this effort was not even a concept at that time. They said the Army is studying frequency availability issues for the digitized battlefield, but the results are not available at this time. Army frequency needs for the digitized battlefield could be significantly increased over prior requirements. An Army summary of the March 1997 Advanced Warfighting Experiment at the National Training Center said the Army used many new systems, which resulted in a 42-percent increase over normal requirements at the training center. The Army obtained sufficient spectrum by special, one-time arrangements with FCC and other federal agencies.

Full Effects of the 1993 Act on DOD Undetermined

DOD has not completed a comprehensive frequency spectrum requirements analysis of its weapon systems to support its claims of adverse operational impact on these systems from loss of frequencies. Consequently, DOD's cost and operational impact estimates to implement changes resulting

[7]Joint Vision 2010 is the conceptual framework intended to provide dominant battlespace awareness, mobility, and accelerated operational tempo. The basis for this framework is found in the improved command, control, communications, and intelligence that can be assured by information superiority. Information superiority is based upon the capability to collect, process, and disseminate an uninterrupted flow of information, while denying this capability to the energy.

from the act vary widely; however, even the lowest estimate is significant. In large part, this problem exists because DOD's spectrum management is fragmented and inadequate.

Full Implications Not Yet Known

The 1993 act required the government to prepare a plan identifying which parts of the radio frequency spectrum could be made available to the public within 15 years. This plan was prepared by NTIA with input from DOD and other federal agencies and provided to the agencies, the Congress, and the public for comment. A Deputy Director for Communications in the Office of the Secretary of Defense for Command, Control, Communications, Computers, and Intelligence said DOD did not fully concur with the plan, but it dropped its objections even though it appeared inevitable that spectrum vital to the military would account for the majority of the spectrum transferred from the government sector to the private sector.

DOD did not have an adequate planning and management process in place in 1993 to assess the full implications of the 1993 act. DOD still does not have an adequate planning and management process today to assess impacts of the 1993 act and prepare plans to mitigate negative impacts to operational readiness where they may occur. According to Joint Staff officials, DOD did not initiate a comprehensive spectrum requirements analysis until 1995 when the Chairman of the Joint Chiefs of Staff asked his staff what the impact of the lost spectrum would be on all systems, and they did not know. Joint Staff members told us the Joint Spectrum Center has a DOD-wide data collection effort underway to prepare a database that will be used as a "tool" to allow DOD management to make better decisions on operational impacts to DOD systems caused by frequency spectrum transfers. According to Joint Staff officials, the database will be used to identify frequencies that DOD (1) must retain for exclusive use, (2) can share with the private sector, or (3) can give up to the private sector.

According to DOD officials, effective use of the database the Joint Spectrum Center is preparing could be very limited because DOD acquisition personnel are not generally aware of mandated DOD, national, and international spectrum management processes and policies. DOD officials also told us that the study was undertaken to respond to future legislation, not to measure the impact of the 1993 Omnibus act. However, our review of the data collection instrument showed the instrument can be used to examine the impacts of the 1993 act. As noted in our November 13,

1996, correspondence to DOD,[8] the Joint Spectrum Center had identified 154 systems as key or representative (including CEC) out of over 2,000 systems operating in 15 frequency bands, during initial phases of this study.

DOD officials said final policy decisions on the Joint Spectrum Center study will be made jointly between the military departments and the Office of the Assistant Secretary of Defense for Command, Control, Communications, Computers, and Intelligence. However, at the time of our review, DOD had not written a formal directive establishing the purpose of the study, who will implement any findings and recommendations, or when it will be completed.

In addition, DOD is not coordinating ongoing studies by the Ballistic Missile Defense Office and the Navy with the Joint Spectrum Center effort. At the time of our review, the Navy report on CEC interference had not been coordinated with the Military Communications Electronics Board or the Joint Spectrum Center.[9] According to DOD officials, the Spectrum Center should be involved in the deliberations about mutual interference between CEC and other Navy systems. The Joint Spectrum Center is responsible for the DOD joint electromagnetic compatibility program, which includes providing analyses to DOD components and other federal agencies on a reimbursable basis.

In another example, the Navy has proposed reusing or sharing frequencies still available to CEC within a battle group using geographic separation and power management techniques. As of February 1997, Communications Board staff said the Navy was not working with them to develop any methods to resolve the spectrum sharing requirements for CEC, nor were they aware of the Navy's proposals. For example, the Navy's CEC program plan to reuse frequencies in separate geographical areas of the battle group and/or theater was not known to the Communications Board staff. Spectrum Center staff told us they had discussed this proposal with the Navy several years ago, but the Navy was not interested at that time. According to Communications Board and Spectrum Center staff, the proposal is a good idea if it can be properly managed.

[8]Numbered correspondence to DOD regarding the CEC sale of frequency spectrum, GAO/NSIAD-97-40R, dated November 13, 1996.

[9]The Military Communications Electronics Board, and its substructure, is the organization within the Joint Chiefs of Staff where the executive military Communications Electronics personnel determine joint operational spectrum policy.

A September 1996 Office of the Secretary of Defense message noted that many of DOD's frequency spectrum management problems stem from the lack of compliance by the individual services with the frequency spectrum management and analysis requirements called for in the DOD acquisition directives. The message also stated that the information required in the certification process is critical to the defense of DOD frequency needs and requested that the Air Force and the Navy duplicate an Army action to ensure that frequency certification procedures were followed.

DOD's Estimated Costs Due to Reallocation Vary Widely but Are Potentially Significant

Cost estimates within DOD to implement changes resulting from the 1993 act vary widely, but even the lowest cost estimate is significant. For example, a Joint Staff official believes that the actual cost of implementing the act will be substantially more than the original DOD estimate of about $240 million. The Commerce Department's final spectrum reallocation report contains DOD-supplied data showing DOD's direct costs to redesign system frequencies could be about $930 million. The report emphasized that these direct costs did not include costs associated with operational impact or program delays that might result from redesign of systems. An official from the Office of the Assistant Secretary of Defense for Command, Control, Communications, Computers, and Intelligence said the estimated cost to CEC could be $1 billion and could cause a 5-year delay in the program.

DOD officials are reluctant to provide specific estimates because they believe the total cost of the frequency reallocations on DOD systems cannot be known accurately until the use of the frequencies is actually lost and the new commercial user is known. According to the Assistant Secretary of Defense for Command, Control, Communications, Computers, and Intelligence, problems with mutual interference between commercial and DOD systems will require that some DOD equipment be modified to accommodate new frequencies. In other cases, DOD might have to acquire new equipment because the old equipment cannot be modified. In addition to the equipment changes, logistical and training support must be changed and requirements to support new equipment must be added.

DOD's planning process is inadequate because it hinders development of accurate cost estimates for current or future frequency transfers. For example, we asked representatives of the Air Force Frequency Management Agency for information on the cost to comply with the 1993 act and actions taken to move affected systems to other frequencies beyond what was previously provided to NTIA. They said they did not have

documentation for much of the information requested concerning cost and schedules for changes to equipment that must be transferred to another frequency because it was not required under the 1993 Omnibus act. They said the frequencies of several systems had been transferred, but they only knew of some planning for other major defense systems because the systems are not scheduled to transfer until 1999.

Potential actions by foreign countries to charge for use of their frequencies also complicate the development of accurate estimates. Military Communications Electronics Board staff characterized the issue of foreign restrictions and charges for their spectrum use as a minor problem today that could become much worse unless adequate measures are taken soon. These officials believe that if other countries also sell government spectrum to their commercial users, the United States may have to pay hundreds of millions of dollars in charges for spectrum use worldwide. In a 1995 survey of military theater commanders, the Military Communications Electronics Board found several examples of foreign governments considering charging the United States for the use of the frequencies. A Joint Chiefs of Staff official said the United Kingdom and a number of other nations have proposed charging fees for use of their frequencies. These officials said that during Operation Joint Endeavor, the United States and the North Atlantic Treaty Organization had to negotiate with the host nation to prevent being charged for frequency use.

DOD Spectrum Management Responsibility Fragmented and Inadequate

DOD must have a good planning process to document its requirements and present a coherent DOD-wide strategy to satisfy these requirements in the face of competing interests for available spectrum and introduction of new and more efficient technologies. Technological advances are fueling a worldwide demand by the private and commercial interests for increased use of the spectrum through such uses as entertainment broadcasts, wireless personal communications, and public health and safety devices. The Congress and the executive branch have responded to these demands, and, at the same time, are attempting to address the budget deficit by reallocating spectrum from the federal government and licensing it to nonfederal users.

However, a DOD study[10] commissioned to the Institute for Defense Analysis concluded that DOD's top-level spectrum management structure for planning, policy, and oversight was diffuse and weak. The study found no single high-level DOD point of contact for spectrum management matters. According to the study, the current management structure has many management organizations with complex interactions and inadequately documented procedures. It said that the Communications Board Frequency Panel should be the central authority for frequency matters but that most influence is vested within the individual services. The study said the current arrangement presents problems in coordinating and exercising oversight within DOD and interfacing with outside organizations because each service represents itself directly to NTIA and other organizations outside DOD. According to the study, the Office of the Secretary of Defense and the Joint Staff also lack adequate staff and resources to implement long-range planning.

The study said more communications, coordination, and cooperation are needed among the different spectrum organizations within DOD and between DOD and non-DOD organizations to develop and enhance spectrum sharing procedures. The study found that prior efforts to consolidate DOD spectrum organizations tried to do too much in one step. For example, in September 1994 the Joint Spectrum Center was established to consolidate DOD spectrum management activities. Service frequency management offices and resources were merged into the Center, with the Defense Information Service Agency designated as the executive agent.

The study said, however, that while this consolidation was technically feasible, it was politically unattainable because of perceived unreconcilable differences among service approaches to spectrum management and opposition to joint management. Thus, in November 1995, spectrum management activities were "deconsolidated" because the chiefs of Army, Navy, and Air Force Command, Control, Communications, Computers, and Intelligence organizations requested that each service retain its own frequency management office. The Center did retain responsibility for supporting theater commanders, developing a DOD-wide spectrum management information system, and maintaining a DOD electromagnetic effects program.

[10]An unpublished study prepared by the Institute for Defense Analysis, entitled An Evaluation of DOD Spectrum Management Organizational Structures, August 16, 1996. The study was commissioned by the Assistant Secretary of Defense for Command, Control, Communication, Computers, and Intelligence to evaluate current spectrum management organization, identify any weaknesses, and recommend organizational solutions, but it was never officially published by DOD.

The study laid out an alternative, phased approach to full consolidation by establishing a series of steps directed to a long-range objective. Under this approach, the Communications Board frequency panel would be elevated in stature to a joint board within the Joint Staff and given more focus on long-range planning and policy development. A second step would consolidate service frequency management responsibilities in the United States. A third step would merge individual service organizations into a single DOD organization. A fourth step would merge this organization with the Joint Staff frequency board, and a fifth step would create a Defense Spectrum Management Agency. DOD told us that steps one and two are viable at this time, but did not indicate when action will be taken. DOD also did not specify exactly what authority and responsibility the new board will have or when and whether a full consolidation of individual service responsibilities was intended.

Inadequate Actions Taken to Prevent or Minimize Impact on Operations

The 1993 act requires the Department of Commerce and FCC to conduct joint spectrum planning for issuing licenses and sharing spectrum between federal and nonfederal users. These agencies are specifically required to take actions necessary to promote the efficient use of the spectrum, including spectrum management techniques to promote increased shared use that does not cause harmful interference as a means of increasing commercial access.

Increased spectrum sharing is hindered by a lack of full cooperation among DOD, FCC, and Commerce. National security concerns in DOD programs have impeded a full evaluation of security implications in an unknown but significant number of major programs affected by the 1993 act. National security implications in future reallocations could be similarly affected. Steps to prevent or minimize negative impacts to DOD programs from frequency losses have been inadequate because (1) DOD, FCC, and Commerce have not fully cooperated with each other to exchange necessary technical data and (2) no consensus exists among these agencies about the need for performance standards for commercial receivers and how such standards should be established.

National Security Restrictions Can Limit Full Evaluation of DOD Programs

Specialized classification of programs and data within those programs can present impediments to a full assessment of national security concerns during strategic frequency spectrum planning. For example, DOD and Commerce officials told us that the initial impact and costs of the frequency loss on special access military systems were either

underestimated or not fully considered when DOD approved the 1995 NTIA reallocation plan. One reason this problem occurred, according to DOD officials, was that frequency managers were not aware of many "special" program frequency requirements. An Air Force frequency management official told us that in prior years, many spectrum managers were not properly cleared to discuss the technical issues of frequency management in classified programs and managers of these classified programs were reluctant to talk to spectrum managers about frequency use requirements. However, according to DOD officials, more DOD, FCC, and NTIA spectrum management personnel have been granted clearances to these classified programs, which has improved coordination among agencies.

A Navy official told us CEC program officials did not initially identify their full spectrum requirements to the civilian agencies in 1993 because these frequencies were classified wartime requirements. The official is concerned that the same security concerns are also limiting a full review of other programs that are highly classified and whose frequencies cannot be reflected in public records. However, the Navy said it is important that wartime operations be taken into account to preclude disruption of any vital civil services that may be placed into the reallocated bands as a result of the 1993 act.

Concerns with releasing classified or sensitive information to the public have affected FCC and NTIA studies of federal and nonfederal spectrum requirements. In a September 1996 report written by the Public Safety Wireless Advisory Committee[11] on spectrum requirements for public safety, DOD objected to any reallocation of the 380-399 MHz band to public safety uses, even on a shared basis, because it is a North Atlantic Treaty Organization common use frequency band. DOD stated that this band is standardized with U.S. military allies throughout the world for interoperability during combined actions and that national security considerations preclude its use domestically.

DOD also stated this spectrum supports many diverse and high-powered tactical requirements critical to DOD command and control operations and that it was concerned about the potential of electromagnetic interference to public safety users. In addition, public safety use could severely limit DOD's ability to "train as it fights" due to concerns of interfering with public safety operations. The Public Safety Wireless Advisory Committee did not hold detailed discussions of this issue because some of the information

[11]A joint federal advisory committee sponsored by FCC and NTIA. The committee is tasked with providing advice on specific wireless communications requirements of public safety agencies through the year 2010 and making recommendations for meeting these needs.

was classified. This committee recommended that representatives of the civilian agencies with appropriate security clearances discuss this issue further with DOD.

Exchange of Technical Information Between Federal and Nonfederal Users Is Ineffective

The Assistant Secretary for Communications and Information of the Department of Commerce and the Chairman of FCC are required to conduct joint spectrum planning. These officials are charged to promote the efficient use of the spectrum, including spectrum management techniques for increased shared use of the spectrum on a non-interference basis. Both Commerce and FCC acknowledge that a major cause of frequency interference between federal and nonfederal users is the lack of information sharing about the technology used in equipment and agree that this information should be collected and shared. Two key problems impair the ability to share this information.

First, FCC and NTIA officials disagreed on what information is needed to minimize mutual interference and who is responsible for providing this information. NTIA officials said highly technical data on spurious emissions and harmonic outputs requiring special equipment and costly testing are required. FCC officials say only general data on emissions, such as power levels and geographical location of emissions, are required. With respect to who is responsible for collecting this data, DOD and NTIA officials indicated that frequency sharing between DOD's systems and nonfederal systems would be more effective if DOD had more information on nonfederal licensees and the technical characteristics of their equipment. However, FCC took an opposite position and said,

> In most ... cases where military systems have caused interference to commercial systems there was inadequate information available to guide the commercial system designers with regards to signals from adjacent bands. We believe the timely information on the general nature and strength of (DOD) signals in adjacent bands will result in robust commercial system design.

Second, no matter how they define it, FCC and NTIA agreed the information they seek is not available, and no mechanism exists to collect and transfer this information. Although NTIA collects some data on federal agencies' requests for frequency use, which is made available to FCC, both agencies agreed that the data they deem necessary for FCC and NTIA coordination to reduce mutual interference is not collected for approval of federal frequency requests.

No Consensus on Establishment of Commercial Receiver Standards

DOD and Commerce believe that effective receiver designs and standards are needed to promote efficient use of the radio spectrum; there is, however, no clear consensus on how this should be accomplished. FCC lacks the specific authority to mandate commercial receiver standards, and FCC officials believe that the disadvantages of imposing such standards outweigh the potential benefits.

The Undersecretary of Defense for Acquisition and Technology stated that for the CEC system, a 75-MHz guard band is required on both sides of the reallocated 50 MHz to prevent interference with new commercial users.[12] However, he stated that most of these guard bands could be recaptured by initiating technologically feasible requirements for improved selectivity and spectral control for commercial receivers. According to the Undersecretary, the time to initiate these requirements is before or simultaneously with the allocation of a frequency band to new commercial users.

DOD officials later said recent information indicated that the guard band might be as little as 15 MHz. However, the Commerce Department said the guard band required to limit interference to commercial receivers is a complex issue and has not been resolved. The Commerce Department said only minimal FCC regulations will apply in upcoming auctions, and worst case assumptions must be used in spectrum management decisions. Commerce also said one factor is the design of commercial receivers in reallocated bands. Commerce agreed with DOD that efficient spectrum use is predicated upon adopting effective receiver designs that reduce the need for large guard bands. According to the February 1995 NTIA spectrum reallocation final report,

> Several bands identified for reallocation in the final plan are adjacent to bands that will continue to be used for high-power Federal systems, including megawatt radars. Numerous case histories exist where commercial or consumer radio systems received interference and failed to operate properly because of inadequate receiver filtering. In order to achieve the goals set by Title VI for development of new technologies, adoption of effective receiver standards, either regulatory or established by industry, is essential for bands identified in the final plan that are adjacent to high-power Federal systems.

Commerce said NTIA, in its spectrum management role for federal radio communications systems, has adopted stringent receiver standards applicable to most federal radio receiving equipment. Commerce said

[12]Memorandum dated Jan. 27, 1996, to the Assistant Secretary for Communications and Information at the Department of Commerce.

these standards have proved effective in ensuring efficient use of federal spectrum resources.

Although the Communications Act of 1934 gave FCC broad authority to regulate radio transmitters, the Congress has acted to provide specific authority to FCC where the public interest required the regulation of nontransmitting receiving equipment. As the conference report on the Communications Amendments Act of 1982 observed:

> Many believe that the Commission does not now have authority to compel the use of protective devices in equipment that does not emit radio frequency energy sufficient in degree to cause harmful interference to radio communications. Manufacturers and retailers also believe that the Commission cannot require a label on equipment or the supplying of a pamphlet of the possibility of interference and outlining corrective measures. The Commission has thus far acted in consonance with this belief. The Conference Substitute would thus give the FCC the authority to require that home electronic equipment and systems be so designed and constructed as to meet minimum standards for protection against unwanted radio signals and energy.[13]

In this act, the Congress granted FCC specific authority to establish minimum radio frequency reception standards for electronic home entertainment equipment. Similarly, the Congress has granted FCC specific authority to regulate scanning receivers and require that televisions be able to receive all television frequencies, provide a closed captioning capability, and have the capability to block programs having a certain rating. There is, however, no similar provision in the Communications Act of 1934 that gives FCC specific authority to regulate commercial receivers.

Moreover, FCC officials questioned why regulatory standards were needed. FCC believes that setting such standards would hinder flexibility and innovation in design and production, increase the cost to manufacturers and consumers, and reduce the number and scope of technically and economically feasible applications. As we noted in the preceding section, FCC officials said if adequate information about government systems were made available to commercial manufacturers, the private-sector industry could design systems to avoid interference without regulated standards.

Conclusions and Recommendations

Implementation of the 1993 act by DOD, FCC, and the Department of Commerce leaves many risks and unanswered questions. First, DOD has a study underway to determine its frequency requirements; but until that

[13]H. R. Conf. Rept. 97-765, 1982 U.S. Code Congressional and Administrative News 2261, 2266.

study is completed, it is not in a position to fully assess the implications of the 1993 act or future legislative actions to transfer additional federal spectrum to non-federal users. Most importantly, without the study DOD cannot fully assess the risks of inadequate frequency spectrum to support its central warfighting strategy—information dominance—through the year 2010.

Second, DOD does not have an adequate planning process to evaluate study findings and translate them into a coherent DOD policy. Thus, DOD risks using a negotiation process between itself and the individual services that does not guarantee full protection of its high-priority requirements.

Third, transfer of the federal spectrum under the 1993 act before FCC and Commerce have resolved their differences on key issues runs unnecessary risks of mutual interference between users, operational degradation of DOD communications systems, and unrealized potential for frequency sharing. For example, the FCC position is that government imposed standards on commercial receivers is bad public policy. This is in direct contrast to the Commerce position that, in the absence of industry standards, governmental standards are necessary to prevent mutual interference and to promote frequency sharing. We note that reduction of mutual interference and increased frequency sharing are key objectives of the 1993 act.

A fourth, and overriding risk is that the above issues may not be subjected to a governmentwide evaluation that encompasses both national security issues and public benefits.

The following recommendations are made to minimize these risks.

Recommendations to the Secretary of Defense

In our opinion, fragmented DOD management responsibilities have resulted in inadequate coordination within DOD on spectrum issues and preparation of long-range plans. We also believe DOD's ongoing analysis of spectrum requirements for critical systems needs to address the extent operational effectiveness of these systems will be affected by loss of frequency spectrum from the 1993 act. Therefore, we recommend that the Secretary of Defense take the following actions:

- Assign responsibility for overall DOD spectrum management to a specific organization.

- Expand and complete the ongoing DOD study. The study should include analyses on how (1) the transfer of the 50 MHz in the CEC band and other transfers of federal frequency spectrum to the commercial sector could affect CEC and the other critical military systems in its study and (2) DOD plans to modify CEC and other critical systems, including estimated costs and schedule, to compensate for operational degradation caused by the transferred spectrum.
- Submit the results of the study to the President for his use in considering whether to reclaim the transferred 50 MHz spectrum.
- Submit the results of the study to the Congress including, if necessary, proposals for legislative modifications.

Recommendation to the Chairman, FCC

We believe DOD should be permitted a reasonable time to complete its study and for the Congress to consider the study's conclusions and recommendations before additional auctions of licenses for transferred frequencies continue. Therefore, we recommend that the Chairman, FCC, suspend plans for auctioning the 50 MHz from the CEC operating band and other transfers of spectrum until the Congress and the President have reviewed the DOD report transmitting the results from the ongoing review of its frequency requirements.

Recommendation to the Secretary of Commerce and the Chairman, FCC

We believe FCC and Commerce need to resolve outstanding issues concerning the exchange of technical information associated with lowering mutual interference and increasing frequency sharing with specific focus on the desirability of FCC having the authority to regulate commercial receivers. Therefore, we recommend that the Chairman, FCC, and the Secretary of Commerce submit a joint report to the Congress on their progress in implementing the 1993 act requirements on joint spectrum planning, any unresolved issues, and impediments to the resolution of these issues, including proposals for legislative modifications.

Recommendation to the National Security Council

The single body able to provide a governmentwide overview of security concerns and public benefits is the National Security Council. Therefore, we recommend that the Assistant to the President for National Security Affairs, in his role of integrating all aspects of national security policy (1) review actions taken as a result of the above recommendations for national security implications, and (2) on the basis of his findings, advise the President whether he should exercise his authority to recover the 50

MHz in the CEC program for federal government use and how he should proceed with any future proposals for transfer of DOD-assigned federal spectrum.

Matter for Congressional Consideration

As expressed by the National Security Council, the problems discussed in this report could be a prelude to more problems in the future. The absence of a consensus by key federal agencies on spectrum management issues—most recently illustrated by the divergent views expressed in their comments to a draft of this report—suggests the need for a comprehensive evaluation on their part. Furthermore, full and complete consideration of technical options that could better achieve congressional objectives of increased frequency sharing and more efficient use of the frequency spectrum are perceived by some agencies as being hindered by legally required actions, and lack of authority.

We are making recommendations in this report aimed at establishing agency consensus and identifying, if needed, any proposals for legislative modifications these agencies feel are necessary. Accordingly, to allow these agencies time to complete their evaluations, the Congress may wish to relax FCC's deadline of August 4, 1998, for issuing licenses for 10 MHz of the reallocated 50 MHz of CEC spectrum.

Agency Comments and Our Evaluation

The National Security Council, FCC, and the Departments of Commerce and Defense were given the opportunity to comment on a draft of this report. Their comments indicated that the individual agencies have a wide range of views on how to deal with the problems we have identified and reflect the fact that they have not reached a consensus on what to do.

The National Security Council fully concurred with our conclusions and recommendations and stated that the problems we identified could be a prelude to much larger and more difficult problems in the future. Commerce indicated that our report provided a thorough review of the issues and stated that it had no specific objections to any of our recommendations. DOD stated that it was "extremely concerned" with our recommendations and cited concerns about meeting the criteria in the 1993 act. FCC expressed concern that (1) the overall thrust of the report incorrectly implies that the primary problem was a result of its action or plans, (2) the report glosses over key elements of the 1993 act that require it to issue licenses for the use of at least 10 MHz of the spectrum by

August 1998, and (3) the report does not identify meaningful solutions to the fundamental problems of federal government spectrum management.

Our analysis of the comments from DOD and FCC indicates that both agencies are concerned about complying with the 1993 act. DOD stated that it had considered recommending outright delay or deferral of the auction of the CEC band but decided that this would require the identification of another band that met the criteria of the 1993 act, an action that would impact other critical DOD programs. FCC also stated its concern about complying with the statutory requirement, indicating that delaying the decision on auctioning the spectrum would impair its ability to comply with the explicit language of the 1993 act.

The following illustrates the differences in responses of DOD and FCC. DOD stated that it had an initiative underway to assess its spectrum requirements focusing on bands that may be targeted for future reallocation and that any further study of bands already reallocated would be nonproductive. However, FCC indicated that the option for the President to recover the spectrum according to the criteria and rules laid out in the 1993 act should be more fully analyzed in conjunction with the DOD study of its spectrum requirements.

In another example, FCC indicated that (1) the benefits of new performance standards for commercial receivers would be outweighed by their disadvantages and (2) even if it were to determine that such standards were in the public interest, imposing them would do nothing to improve the management of the federal government system. DOD, on the other hand, asserted that it was working with FCC to recapture most of the CEC frequency spectrum as well as improve utilization across all frequencies by having FCC institute improved, stringent performance requirements for commercial receivers.

To help identify the statutory obstacles that agencies may perceive as standing in the way of successfully resolving these issues, we have added a matter that the Congress may wish to consider.

The comments from the four agencies are reprinted in appendixes I through IV, along with our evaluations of them. DOD, Commerce, and FCC also provided suggested technical and editorial changes, which we incorporated in the text where appropriate.

Scope and Methodology

To determine if the capabilities of the CEC system would be affected by the transfer of 50 MHz to private users, we interviewed officials from the Office of the Secretary of Defense, the Navy, the Department of Commerce, FCC, the Joint Spectrum Center, the Military Communications Electronics Board, and Johns Hopkins Applied Physics Laboratory. We also examined pertinent documents on the specific impact of frequency reallocations on CEC operations. We discussed plans the program office was developing to mitigate the impact of the reduced frequency spectrum on the operational performance of the CEC system.

To determine whether other combat-related military systems would be adversely affected by the transfer of frequencies under the 1993 act, we interviewed officials from the Office of the Secretary of Defense, the Department of Commerce, FCC, the Joint Spectrum Center, the Military Communications Electronics Board, and Johns Hopkins Applied Physics Laboratory. In addition, we met with frequency spectrum managers from all of the services to discuss the procedures followed during frequency reallocation discussions in 1993-1995, which led to the development of the final frequency reallocation plan produced by Commerce. We discussed the rationale for making the reallocation decisions, as reflected in the reallocation report.

To determine what actions DOD, FCC, and NTIA were planning to minimize impairments to DOD systems, we interviewed officials from the Office of the Secretary of Defense, the Army, the Navy, the Air Force, the Department of Commerce, FCC, the Joint Spectrum Center, the Military Communications Electronics Board, and Johns Hopkins Applied Physics Laboratory. We reviewed agency documents, statutes, regulations, and federal laws regarding frequency applications by military and commercial users. We discussed the impact of the reallocations on these systems and identified actions these programs intended to take to compensate for the frequency reallocations.

We performed our work from July 1996 through May 1997 in accordance with generally accepted government auditing standards.

We are sending copies of this letter to other appropriate congressional committees; the Director, Office of Management and Budget; and the Secretaries of Commerce, Defense, the Army, the Navy, and the Air Force. Copies will also be made available to others upon request.

This report was prepared under the direction of Thomas J. Schulz, who can be reached at (202) 512-4841 if you or your staff have any questions. Other major contributors to this report were Allen Li, Charles F. Rey, Robert R. Hadley, Richard H. Yeh, and Keith A. Rhodes.

Henry L. Hinton, Jr.
Assistant Comptroller General

List of Congressional Committees

The Honorable Strom Thurmond
Chairman
The Honorable Carl Levin
Ranking Minority Member
Committee on Armed Services
United States Senate

The Honorable Richard Shelby
Chairman
The Honorable Bob Kerrey
Vice Chairman
Senate Select Committee on Intelligence
United States Senate

The Honorable Ted Stevens
Chairman
The Honorable Daniel K. Inouye
Ranking Minority Member
Subcommittee on Defense
Committee on Appropriations
United States Senate

The Honorable John McCain
Chairman
The Honorable Ernest Hollings
Ranking Minority Member
Committee on Commerce, Science, and Transportation
United States Senate

The Honorable Fred Thompson
Chairman
The Honorable John Glenn
Ranking Minority Member
Committee on Governmental Affairs
United States Senate

The Honorable Floyd Spence
Chairman
The Honorable Ronald V. Dellums
Ranking Minority Member
Committee on National Security
House of Representatives

The Honorable Porter J. Goss
Chairman
The Honorable Norm Dicks
Ranking Minority Member
Permanent Select Committee on Intelligence
House of Representatives

The Honorable Robert L. Livingston
Chairman
The Honorable David R. Obey
Ranking Minority Member
Committee on Appropriations
House of Representatives

The Honorable Thomas Bliley
Chairman
The Honorable John Dingell
Ranking Minority Member
Committee on Commerce
House of Representatives

The Honorable Dan Burton
Chairman
The Honorable Henry A. Waxman
Ranking Minority Member
House Committee on Government Reform and Oversight
House of Representatives

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Abbreviations

CEC	Cooperative Engagement Capability
DOD	Department of Defense
FCC	Federal Communications Commission
MHz	megahertz
NTIA	National Telecommunications and Information Administration

Comments From the National Security Council

NATIONAL SECURITY COUNCIL
WASHINGTON, D.C. 20504

May 5, 1997

Dear Mr. Schulz:

In response to your letter of April 10, 1997, your draft report, "Defense Communications: Planned Federal Frequency Spectrum Sale Could Undermine Military Operations," is an excellent report that accurately analyzes the issue and makes sound recommendations for improvement in radio frequency spectrum management.

This issue is potentially much broader in scope than the impact of the planned Federal spectrum auction on the Navy cooperative engagement capability (CEC) program addressed in this report. The U.S. Armed Forces are rapidly moving toward an information-intensive style of warfighting that will generate much greater demands on the radio frequency spectrum. *Joint Vision 2010* and the future warfighting visions of all the services require a high degree of communications connectivity among widely dispersed forces and the ability to transmit a large volume of intelligence data to warfighters in the field, in the air and on the seas. Warfighting experiments conducted to develop these concepts, such as the Army's Force XXI wargame at the National Training Center, have already shown that future operations will require greater bandwidth over larger portions of the spectrum than were required in the past.

If the first Federal spectrum auction generates the revenues that have been projected, and if the companies that buy that spectrum make the profits they anticipate, there will probably be increased demand for further access to the Federal spectrum. That increased demand is likely to generate conflicts with the increasing DoD requirement for spectrum access. Thus, the problems identified in your draft report could well be a prelude to much larger and more difficult problems in the future.

Sincerely,

Robert G. Bell

Robert G. Bell
Special Assistant to the President
for National Security Affairs

Mr. Thomas J. Schulz
Associate Director for Defense Acquisition Issues
U.S. General Accounting Office
Washington, D.C. 20548

Comments From the Department of Commerce

THE SECRETARY OF COMMERCE
Washington, D.C. 20230
MAY 13 1997

Mr. Thomas J. Schulz
Associate Director
Defense Acquisitions Issues
General Accounting Office
National Security and International Affairs Division
Washington, DC 20548

Dear Mr. Schulz:

Thank you for the opportunity to comment on the draft GAO report on the transfer of Federal radio frequency spectrum for assignment to the private sector. As noted in your report, the spectrum transferred was identified in the Spectrum Reallocation Final Report published by the National Telecommunications and Information Administration (NTIA) in 1995 as required by the Omnibus Budget Reconciliation Act of 1993 (OBRA 93). The draft GAO report specifically focuses on the possible adverse impact that the transfer of spectrum could have on the Navy's $3 billion Cooperative Engagement Capability (CEC) program.

Wireless communications have become increasingly important in achieving Federal agencies' missions, improving industrial productivity, and improving the overall quality of life of the general public. We agree with the views expressed in the report on the importance of effective management of the radio spectrum, a joint responsibility of NTIA on behalf of Federal agencies and the FCC for the private sector and other non-federal government licensees. NTIA, in performing its Federal spectrum management role, relies extensively on advice from Federal agencies, including the Department of Defense (DOD), represented on the Interdepartment Radio Advisory Committee.

We find that the draft GAO report provides a thorough review of the issues involved. It makes specific recommendations regarding the spectrum management and spectrum planning processes within the DOD and recommends actions that may be taken to address issues raised by reallocation of spectrum under OBRA 93.

While we have no specific objections to the five recommendations included in the draft report, we believe some clarifications in the text would help balance the discussion. Enclosure 1 provides specific comments aimed at clarifying the draft text. Enclosure 2 provides detailed answers to questions that were informally passed to NTIA staff on this issue. Other comments that are strictly of an editorial nature have been passed directly to your staff in the form of a marked-up draft.

I commend the GAO on the completion of this study of a most difficult issue and trust that the enclosed material will be useful in completing the report.

Sincerely,

William M. Daley

Enclosures

Comments From the Federal Communications Commission

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

Federal Communications Commission
Washington, D.C. 20554

May 9, 1997

Thomas J. Schulz, Associate Director
Defense Acquisitions Issues
National Security and International Affairs Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Schulz:

At the request of Chairman Hundt, staff at the Federal Communications Commission (FCC) have reviewed the Draft Report prepared by the U.S. General Accounting Office (GAO) entitled, "Defense Communications: Planned Federal Frequency Spectrum Sale Could Undermine Military Operations." The following comments, together with specific edits that we recommend be made to the Report, also enclosed, represent the FCC's official response to the draft.

The draft describes DOD's Cooperative Engagement Capability (CEC) program and its potential interference to non-Federal Government systems operating in an adjacent frequency band (the General Wireless Communications Service or "GWCS" band). The GWCS band is part of the spectrum reallocated by the Federal Government under the Omnibus Budget Reconciliation Act of 1993 ("OBRA"). The FCC is required by statute to issue licenses for the use of at least 10 MHz of the spectrum reallocated by the President pursuant to OBRA by August 4, 1998.

See Comment 1.

FCC staff are concerned that the draft Report glosses over key elements of the relevant law, and fails to identify meaningful solutions to the fundamental problem of Federal Government spectrum management. The overall thrust of the draft incorrectly implies that the primary problem identified in the Report is a result of FCC action or plans and can be solved by the FCC alone.

The GAO Report concludes that the potential CEC interference problem has arisen "because DOD spectrum management is fragmented and weak." The Report notes several ways in which spectrum management within the Federal Government is weakened by inadequate sharing of information by DOD with NTIA, by the exclusion of the FCC from the planning process, and by a lack of coordination and adequate planning within DOD.

See Comment 2.

Although it acknowledges these information flow problems within DOD, and between DOD and the rest of the Federal Government, the draft Report fails to fully explore appropriate solutions to these problems. Instead, the Report concludes that the FCC should

Thomas J. Schulz
May 9, 1997
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See comment 3.

suspend plans to assign the spectrum already lawfully transferred to it by the President. Even the title of the Report focuses on the FCC's licensing process rather than DOD's spectrum management problems.

See comment 4.

Not only does GAO's suggested solution miss its mark, but it also may be inconsistent with Congressional intent. Moreover, it is only one possible option that should be considered. Another option, that the President recover this spectrum according to the criteria and rules laid out in OBRA, is only briefly mentioned. This option should be more fully analyzed in conjunction with a DOD study of its spectrum requirements and the full impact of the transfer of federal spectrum to private uses -- a study that is recommended by the Report. DOD, in consultation with NTIA, could then make a more fully informed recommendation to the President and Congress about how to implement the requirements of the statute. The President, with the recommendation of the Secretary of Commerce, could decide whether the GWCS spectrum should remain under FCC control, with adequate protection by DOD against interference to operations in the GWCS band, or whether that spectrum should be reclaimed by the President from the FCC and substitute spectrum identified and transferred from Federal Government to non-Federal Government use.

See comment 5.

The draft sets no time frame within which DOD's study should be conducted and a final decision made with respect to the GWCS spectrum. This could mean that many years would pass until such an evaluation were completed and decisions made. This presents several problems. First, the public would be denied the benefits of this spectrum in contradiction with the explicit language of OBRA. Second, as noted above, the FCC is under a Congressional deadline to assign licenses in at least 10 MHz of spectrum transferred under OBRA before August 4, 1998. At present, the FCC is planning to assign licenses in at least 5 MHz of the GWCS spectrum to meet that mandate, as no other transferred spectrum is suitable for this purpose. For these reasons, we propose that a deadline of September 1, 1997, be set for DOD to finally determine how to proceed with this spectrum. If action is not completed by that time, the FCC will proceed to take actions that ultimately will result in the assignment of the GWCS spectrum to commercial licensees, according to Congressional intent.

See pp. 19-20.

The draft GAO Report contends that a possible solution to potential interference between government and non-government licensees would be for the FCC to impose receiver standards. Even if the FCC has the authority to impose such standards, such a course is simply bad public policy. The benefits of mandatory, government-imposed standards are outweighed by their disadvantages, including a loss of flexibility and innovation in design, added expense to manufacturers and consumers, and potential reduction in the number of technically and economically feasible applications. Moreover, the GAO Report identifies in no uncertain terms the ineffective spectrum management policies of DOD as the source of the problems at issue. Even if the FCC were to determine that mandatory receiver standards were in the public interest, imposing them would do nothing to improve the

Thomas J. Schulz
May 9, 1997
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management of Federal Government spectrum.

See comment 6.

Finally, FCC staff believe that the GAO draft report does a good job of describing the problems of information sharing between the Commission and the Federal Government. In many cases, information that would be useful or necessary to ensure good coordination is not made available to the FCC or its licensees because it is classified. However, it is incorrect to assume that because complete information is not always shared that all joint spectrum management is flawed. In fact, the FCC closely coordinates with the Federal Government through its participation in the Interdepartment Radio Advisory Committee and in preparing for international conferences. The FCC and NTIA have routinely coordinated on specific matters to successfully resolve potential interference concerns. Further, the FCC and NTIA coordinate thousands of applications per year for Federal Government and non-Federal Government operations in bands that are shared by both types of users. The problems of spectrum management the draft Report identifies related to CEC are not the result of coordination problems between the FCC and NTIA, but rather the breakdown in coordination within the Federal Government that resulted in the identification of spectrum for transfer to non-Federal Government use that now appears to be problematic.

We appreciate this opportunity to comment in the draft GAO Report and we respectfully request that these comments be included in their entirety in the final Report, and that the enclosed edits be incorporated into the final text of the Report.

Sincerely,

Daniel B. Phythyon, Chief
Wireless Telecommunications Bureau

Richard M. Smith, Chief
Office of Engineering & Technology

Enclosure

The following are GAO's comments on the Federal Communications Commisson's (FCC) letter dated May 9, 1997.

GAO Comments

1. Our report is not intended to single out FCC as the cause for the problems identified in this report. As we point out on page 1 of the report, our objective was to determine whether each of the involved agencies was taking the appropriate steps to prevent or minimize adverse effects of the transfer of frequency bands to the private sector. We are making recommendations to others besides FCC and, subsequent to our analysis of comments from involved agencies, have added a matter for congressional consideration.

2. The information exchange problem, like others discussed in the report, revolves around the lack of agreement among the agencies involved. Currently, there is a lack of agreement on what data should be gathered and who should be responsible for gathering that data. We are recommending that FCC and Commerce report on their progress in implementing the joint planned requirements of the 1993 act and on any unresolved issues and impediments.

3. The title of the report, in our view, accurately portrays the issue. The report does not discuss FCC's licensing process, as FCC asserts.

4. Our review of the legislative history of the 1993 act indicates that the act was intended to benefit the public by making spectrum available but not at the expense of national security or excessive costs to the government. Our recommendations are intended to prevent the reallocation of frequencies from the federal government to the private sector until all national security requirements for these frequencies are reviewed, thus avoiding excessive costs the government may incur in its recovery of any necessary frequencies.

5. The legal time limit set by the 1993 Omnibus act is August 1998 and the deadline imposed by FCC for the Department of Defense (DOD) to respond is September 1997. We believe FCC could allow DOD time to implement our recommendation for completion of its study after September 1997 and still comply with its statutory deadline. FCC could negotiate that date with DOD. Additionally, we are offering a matter for the Congress to consider with regard to relaxing the existing deadline.

6. We are concerned that the lack of coordination between FCC and the National Telecommunications and Information Administration (NTIA) on frequency sharing may exacerbate the problem of potential interference between federal and nonfederal users of the frequency spectrum or, at a minimum, not serve to help overcome that problem.

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

ASSISTANT SECRETARY OF DEFENSE
6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

May 19, 1997

COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE

Mr. Thomas J. Schulz
Associate Director, Defense
Acquisition Issues
National Security and International
Affairs Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Schulz:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "DEFENSE COMMUNICATIONS: Planned Federal Frequency Spectrum Sale Could Undermine Military Operations," dated April 10, 1997 (GAO Code 707182/OSD Case 1338). The Department concurs with the title of the report but is extremely concerned with the recommendations.

See comment 1.

I would like to highlight a few specific areas of concern beginning with the first recommendation. The Secretary of Defense has already assigned responsibility to a specific organization for overall DoD Spectrum Management. Per DoD Directive 4650.1, "Management and Use of the Radio Frequency Spectrum", June 24, 1987, ASD(C3I) provides overall policy for managing and using the radio frequency spectrum. The Directive also assigns responsibilities to the Organization of the Joint Chiefs of Staff (OJCS), the Military Departments, and other applicable organizations. The organizations under this structure, a microcosm of the Department itself, have successfully ensured spectrum access for national security and military operations. While we continue to seek improvements in the process, such as increased spectrum cooperation between the spectrum management and acquisition communities, increased awareness of the importance of spectrum to DoD in Congress and the Administration, and participation in the national and international regulatory processes, we believe any problems encountered are due to the lack of resources, not the mechanism in place. We also have been working to increase the awareness within the Intelligence Community and in Special Programs to ensure that they adhere to national and international spectrum regulations.

In reference to the second recommendation, we already have an initiative underway to assess our spectrum requirements and

See p. 24 and comment 2.

provide us the necessary information to provide timely responses on operational and cost impacts and make informed decisions. The Joint Spectrum Center is currently cataloging our spectrum use so that we can make accurate assessments when bands are targeted for reallocation. We are focusing on bands that may be targeted for future reallocation. We believe that further study of the bands reallocated under the Omnibus Budget Reconciliation Act of 1993, other than what was published in the National Telecommunications and Information Administration (NTIA), "Final Spectrum Reallocation Plan", February, 1995, would be nonproductive. Our focus must be on the future.

See p. 24.

The Department considered recommending outright delay or deferral of the auction of the 50 MHz in the Cooperative Engagement Capability (CEC) band. However, delaying or deferring the sale of this band would require the identification of another band that met the criteria in the Omnibus Budget Reconciliation Act of 1993. This would result in impact to other critical DoD systems. Recapturing most of the CEC frequency spectrum as well as improved utilization across all frequency bands could be realized by instituting improved, stringent performance requirements for commercial receivers and transmitters. We are working with the Federal Communications Commission on this approach which will not only help resolve the CEC problem but will allow further spectrum sharing between government and non-government systems.

Detailed comments on the report recommendations are provided in the enclosure. Additionally, line in/line out comments are provided for the entire report.

The Department continues to review its requirements to assess what spectrum can be shared with emerging technologies, and to identify ways to more effectively and efficiently manage this limited resource and appreciates the opportunity to comment on these efforts and our draft report. My point of contact for this matter is Ms. Cindy Raiford, Deputy Director for Communications, (703) 697-1029.

Sincerely,

Emmett Paige, Jr.

Enclosures

GENERAL ACCOUNTING OFFICE DRAFT REPORT - DATED APRIL 10, 1997

(GAO CODE 707182) OSD CASE 1338

"DEFENSE COMMUNICATIONS: PLANNED FEDERAL FREQUENCY SPECTRUM SALE COULD UNDERMINE MILITARY OPERATIONS"

* * * * *

DoD COMMENTS IN RESPONSE TO THE REPORT FINDINGS AND RECOMMENDATIONS

FINDINGS

Now on pp. 5 and 10.

FINDING 1: It appears that the national security and cost implications of the federal frequency losses on CEC and other military systems were not fully considered in 1995 and have still not been adequately addressed. (p. 6/GAO Draft Report)

See comment 2.

DoD RESPONSE: Substantial effort was put into determining what spectrum should be transferred to the private sector. Within the Air Force alone, all positions and inputs were coordinated with the Air Staff, Major Commands, and affected users. The Joint Staff ran a joint action to ensure that the Commanders-in-Chief (CINCs) had an opportunity to comment. Substantive comments were provided to NTIA that were used in their preparation of the preliminary and final reallocation reports. In many cases, a range of costs were identified because final costs will be determined, in part, by the types of civil systems that will use transferred spectrum as well as decisions by program managers. This determination involves the consideration of numerous non-frequency related issues.

The DoD has many extensive data bases on the technical parameters of its spectrum dependent systems. These data bases and a core of highly trained and experienced spectrum managers helped NTIA identify the spectrum that met the conditions specified in the OBRA-93, while minimizing the overall impact of the transfer on the DoD.

Now on pp. 5 and 14.

FINDING 2: DoD Spectrum management responsibility fragmented and weak. (p. 18/GAO Draft Report)

See comment 1.

DoD RESPONSE: The structure of DoD spectrum management is a microcosm of the Department itself. Per DoD Directive, ASD(C3I) has overall spectrum management policy responsibility. The Joint Staff represents the requirements of the Commanders-in-Chief (CINCs) as well as chairs a panel to coordinate intra-departmental

spectrum items. This panel is a subcommittee of the Military Communications Electronics Board (MCEB). The Military Departments have consolidated spectrum management functions under one organization within each Military Department. This organization conducts spectrum management for all electromagnetic dependent systems, e.g., space systems, radars, weapons systems, communications systems, etc. The DoD Joint Spectrum Center, which receives policy guidance from OASD(C3I) and operational guidance from the Joint Staff/J6, provides analytical support.

While improvements have been identified in strategic planning and the acquisition process, the spectrum management components coordinate well on day-to-day and operational items.

RECOMMENDATIONS

Now on p. 21.

RECOMMENDATION 1: The GAO recommended that the Secretary of Defense assign responsibility to a specific organization for overall DoD spectrum management. (p. 29/GAO Draft Report)

See comment 1.

DoD RESPONSE: The Secretary of Defense has already assigned responsibility to a specific organization for overall DoD Spectrum Management. Per DoD Directive 4650.1, "Management and Use of the Radio Frequency Spectrum," June 24, 1987, the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASD(C3I)) provides overall policy for managing and using the radio frequency spectrum. The Directive also assigns responsibilities to the organization of the Joint Chiefs of Staff, the Military Departments, and other applicable organizations. The organizations under this structure, a microcosm of the Department itself, have successfully ensured spectrum access for national security and military operations. While we continue to seek improvements in the process, such as increased spectrum cooperation between the spectrum management and acquisition communities, increased awareness of the importance of spectrum to DoD in Congress and the Administration, and participation in the national and international regulatory processes, we believe any problems encountered are due to the lack of resources, not the mechanism in place.

We also have been working to increase the awareness within the Intelligence Community to ensure that they adhere to national and international spectrum regulations, and that the Military Departments ensure that: (1) highly classified or specialized access programs adhere - to the maximum practical extent - established spectrum policies, (2) sufficiently trained and properly resourced spectrum management entities are maintained.

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and (3) acquisition program managers are aware of spectrum access as a significant programmatic element.

This structure provides for high level oversight while retaining the Title 10 individual Military Department responsibilities.

Now on p. 22.

RECOMMENDATION 2: The GAO recommended that the Secretary of Defense complete and expand the ongoing DoD study and prepare a report to Congress which details how (1) the transfer of the 50 MHz in the CEC band and other transfers of federal frequency spectrum to the commercial sector could affect CEC and the other critical military systems in its study, and (2) DoD plans to modify CEC and other critical systems, including estimated costs and schedule, to compensate for operational degradation caused by spectrum losses. (p. 29/GAO Draft Report)

See pp. 11 and 12 and comment 2.

DoD RESPONSE: (1) We have an initiative underway being conducted by the Joint Spectrum Center (JSC) to assess our spectrum requirements and provide us the necessary information to provide timely responses on operational and cost impacts and make informed decisions. The result of this ongoing effort will be a data base of information .... The JSC is focusing on bands that may be targeted for future reallocation. We believe that further study of the bands reallocated under the Omnibus Budget Reconciliation Act of 1993, other than what was published in the National Telecommunications and Information Administration (NTIA), "Final Spectrum Reallocation Plan," February 1995, would be nonproductive. Our focus must be on the future.

(2) Plans to modify CEC to compensate for spectrum loss have already been described in the recent report to Congress entitled "Report on Cooperative Engagement Capability Frequency Issues," prepared by the Office of the Assistant Secretary of the Navy for Research, Development, and Acquisition, April 1997.

Now on p. 22.

RECOMMENDATION 3: The GAO recommended that the Chairman, FCC suspend plans for auctioning the 50 MHz from the CEC operating band and other transfers of spectrum until Congress has received the DoD report transmitting the results from the on going review of its frequency requirements. (p. 29/GAO Draft Report)

See pp. 11 and 24 and comment 2.

The current analysis being conducted by the JSC is not intended to address impacts of the reallocation under the Omnibus Budget Reconciliation Act of 1993 for the reasons stated under Recommendation 2.

The Department considered recommending outright delay or deferral of the auction of the 50 MHz in the Cooperative Engagement Capability (CEC) band. However, delaying or deferring the sale of

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this band would require the identification of another band that met the criteria in the Omnibus Budget Reconciliation Act of 1993. This would result in impact to other critical DoD systems. The Department instead informed NTIA and the Federal Communications Commission (FCC) that recapturing most of the CEC frequency spectrum as well as improved utilization across all frequency bands could be realized by instituting improved, stringent performance requirements for commercial receivers and transmitters. We are working with the NTIA and the FCC on this approach which will not only help resolve the CEC problem but will allow further spectrum sharing between government and non-government systems.

Now on p. 22.

RECOMMENDATION 4: The GAO recommended that the Chairman, FCC and Secretary of Commerce submit a joint report to the Congress on their progress implementing the 1993 act requirements on joint spectrum planning, unresolved issues, and impediments to the resolution of these issues; as part of the report, the FCC should consider requesting specific authority to require performance standards on commercial receivers or ensure that adequate industry standards for commercial receivers are established prior to a sale. (p.29-30/GAO Draft Report)

DoD RESPONSE: As stated in the response to Recommendation 4, we concur with the proposal to provide the authority to the FCC to require performance standards on commercial receivers.

Now on p. 22.

RECOMMENDATION 5: The GAO recommended that the National Security Council, in its role of integrating all aspects of national security policy, review actions taken as a result of the above recommendations for national security implications, and on the basis of its findings, advise the President whether he should exercise his authority to recover the 50 MHz for Federal government use in the CEC program and how he should proceed with future transfers. (p. 30/GAO Draft Report)

DoD RESPONSE: The DoD will provide any information necessary should the National Security Council wish to review any and all actions regarding spectrum management.

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The following are GAO's comments on DOD's letter dated May 19, 1997.

GAO Comments

1. The 1996 DOD-commissioned study by the Institute for Defense Analysis corroborates our finding that DOD spectrum management was fragmented and inadequate. The study concluded that no single high-level DOD point of contact for spectrum management existed and that most influence resided within the services. According to the study, neither the Office of the Secretary of Defense nor the Joint Chiefs of Staff has official representatives to the Interdepartment Radio Advisory Committee, the advisory body for spectrum planning and policy. Instead, each service has its own representative to that committee. The study also stated that the services primarily represent DOD in international frequency management matters.

Further, the DOD-commissioned study stated weaknesses existed in carrying out some spectrum management functions, specifically, long-range planning. Our review also found these weaknesses. In addition, the study concluded that DOD needed to pay more attention to long-range planning and to provide more intercommunication, coordination, and cooperation among spectrum management organizations within DOD and between DOD and non-DOD organizations. Our work also convinced us that these long-range planning observations were valid.

2. We believe the study should include information on the impact of the 1993 act on the systems affected. Comments from the National Security Council and FCC fully suggest its inclusion. Moreover, Commerce had no objection to it.

As we noted in our report, the 1993 act requires that the spectrum to be reallocated must not be "required for the present or identifiable future needs of the Federal Government and should not result in costs to the federal government that exceed the benefits gained." The current DOD study is being done now because it was not done for the 1993 act.

Information provided by the Joint Chiefs of Staff and officials from the Office of the Assistant Secretary of Defense for Command, Control, Communications, Computers, and Intelligence indicates that the Military Communications Electronics Board directed the Joint Spectrum Center in its current study to identify frequencies that DOD (1) must absolutely defend against reallocation, (2) can share with the private sector, and (3) can forfeit.

Additionally, Center officials told us that their initial assessment identified 15 frequency bands where DOD has exclusive use or is allocated priority use of the frequencies and that there are over 2,000 DOD systems operating in these bands now or planned by the year 2005. The officials said 154 of these systems, including CEC, were designated as key or representative systems and a more detailed technical analysis was required of each key system in the 15 bands to identify potential areas where government and private industry sharing can occur.