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DEFENSE
SPECTRUM
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New Procedures
Could Help Reduce
Interference Problems



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Congressional Committees

The Department of Defense (DOD) has become increasingly aware that the use of more commercial and military electronic systems aboard ships, aircraft, and vehicles can cause unintended electromagnetic interactions among systems, resulting in adverse operational impacts. Such unintended interactions are called electromagnetic environmental effects and many interference incidents have already occurred that have limited mission effectiveness. For example, during recent operations in the Balkans, a jammer aircraft's engine shut down when it began transmitting jamming signals, and in Macedonia, electronic equipment experienced problems when hooked up to the local power grid.

To help prevent frequency interference problems, DOD has written new procedures for spectrum management, including electromagnetic environmental effects, which are intended to improve its current guidance when acquiring new weapon systems and is in the process of implementing them. The new procedures are contained in DOD's 5000 series directives, instructions, and regulations and provide mandatory policy and procedures for all DOD acquisition programs. Oversight of implementing the policy and procedures contained in the 5000 series guidance is the responsibility of the Under Secretary of Defense for Acquisition and Technology, while the responsibility for national and international policy and planning for radio spectrum issues lies with the Directorate of Spectrum Management within the Assistant Secretary of Defense for Command, Control, Communications and Intelligence. The responsibility for the management of DOD's current and future spectrum needs, however, has been delegated to the Defense Information Systems Agency's Office of Spectrum Analysis and Management and the Joint Spectrum Center. These organizations, along with the Director, Operational Test and Evaluation, are responsible for addressing the electromagnetic environmental effects and spectrum management issues. The specific role of the Director, Operational Test and Evaluation involving frequency issues is to identify, through testing and risk assessments, any potentially adverse interference problems.

House Report 106-945¹ directed GAO to review DOD's new acquisition procedures designed to help avoid radio frequency mutual interference problems. Of particular interest was the adverse impact of electromagnetic environmental effects between military and commercial users. Specifically, we were asked to provide a report outlining the extent to which these new procedures will result in the development of systems that have identified and addressed radio frequency issues. This report provides the results of our review to date.

Results in Brief

DOD has taken steps to help ensure that program managers identify and address potential interference problems early in system development. For example, the new acquisition guidance establishes procedures that require all new weapon systems acquisition programs to be reviewed for potential electromagnetic and spectrum management problems as they go through the acquisition process. In addition, the Joint Chiefs of Staff have revised their policies and procedures to require program managers to submit relevant documents, such as operational requirements, for review to ensure that radio frequency issues are identified and addressed. We believe that the new procedures are reasonable and, if successfully implemented, could help prevent problems related to frequency interference. However, this new guidance has only been in effect for less than 6 months and no weapons systems have been developed using these new procedures. Consequently, DOD has not had the opportunity to demonstrate that its new policies and procedures have been or will be successful in helping prevent interference problems. Until DOD can, it is premature for us to evaluate the effectiveness of the new procedures. We intend to follow-up on DOD's efforts once it has had sufficient time to impact the acquisition process. According to DOD officials, the first of three pilot programs using the new acquisition procedures should be completed by January 2002.

¹ House Report 106-945 "Enactment of Provisions of H.R. 5408, The Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001." Conference Report to Accompany H.R. 4205; October 6, 2000; p. 775.

Progress Is Being Made, but Evaluation of Changes Is Premature

DOD's revised acquisition guidance establishes procedures that require program managers to identify and address potential interference problems. The Joint Chiefs of Staff have also changed their procedures to reflect the new guidance. However, the recency of changes precludes an assessment of their effectiveness at this time.

DOD's Revised Guidance Now Address Radio Frequency Interference Problems

DOD's acquisition system is composed of three principal decision systems—Requirements Generation; Defense Acquisition; and Planning, Programming, and Budgeting. The first, the Requirements Generation System, produces the initial information for decision-makers of projected needs of the user and drives the entire acquisition process. The user defines mission needs in broad terms and then develops specific requirements. These needs are documented in a Mission Needs Statement, which describes the projected mission of the user in the context of the threat to be countered. A Capstone Requirements Document may be developed to establish the overall requirements for a family of systems. Specific system requirements are documented in an Operational Requirements Document, whose development is guided by the Capstone Requirements. The second principal decision system, the Defense Acquisition System, establishes a management process to translate the needs developed in the Requirements Generation System into weapon system programs that satisfy user requirements. Basically, this process is one in which systems are developed, demonstrated, produced or procured, and deployed. During this process, the Office of Operational Test and Evaluation validates that the system being developed will function as expected. Finally, the Planning, Programming, and Budgeting System provides funding support to develop and operate the weapon system.

Prior to its latest revision, DOD acquisition guidance required a much less demanding review of radio frequency issues and made no mention of electromagnetic environmental effects. However, DOD's revised acquisition guidance sets forth Department policy for managing the acquisition of weapon systems and applies to all DOD programs.² The new procedures established by this guidance now require all weapon systems to be reviewed for electromagnetic and spectrum management issues as

² This guidance includes DOD Directive 5000.1 "The Defense Acquisition System," DOD Instruction 5000.2 "Operation of the Defense Acquisition System" and Interim Regulation 5000.2-R "Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs."

the systems go through the acquisition process. For example, a revised directive, dated October 23, 2000, requires that program managers give full consideration to all aspects of system support including spectrum management and the operational electromagnetic environment. Additionally, the guidance requires that program managers design all programs to be mutually compatible with other electronic equipment and the operational electromagnetic environment and receive spectrum certification.³ Further, frequency issues must be identified and addressed at each acquisition decision milestone to help prevent interference problems.⁴

The Joint Chiefs of Staff Are Also Focusing on Spectrum Issues

The Joint Chiefs of Staff have revised their policies and procedures⁵ to reflect the recent changes in the new DOD acquisition guidance. For example, program managers are now required by this guidance to submit relevant documents to the Joint Spectrum Center for review. As a result, the Joint Spectrum Center has been reviewing Mission Needs Statements, Capstone Requirements Documents, and Operational Requirements Documents. These are key documents initiated by the user at the beginning of the acquisition process for a new weapons system; they drive the entire acquisition process. It is, therefore, important to identify and address potential interference problems from the beginning of the acquisition process. In addition, these documents provide information to acquisition decision-makers to help them determine whether the system can proceed from the initial concept and development phase to the system development and demonstration phase.

³ Spectrum certification is the process by which development and procurement of communications-electronics systems are reviewed and certified for system compliance with spectrum management policy, allocations, regulations, and technical standards to ensure that radio frequency spectrum is available. Additionally, the predicted degree of electromagnetic compatibility between the proposed system and other spectrum-dependent systems, and the possible need for and evaluation of the results of prototype electromagnetic compatibility testing will be determined.

⁴ The sequence of decision points in the acquisition of a new system are Milestone A—Concept Development, Milestone B—System Development and Demonstration, Milestone C—Low Rate Initial Production, and, finally, Full Rate Production Decision Review.

⁵ The Chairman of the Joint Chiefs of Staff Instruction 3170.01A establishes policies and procedures for the Requirements Generation System, such as Operational Requirements Documents and Capstone Requirements Documents; Instruction 6212.01B establishes policies for Interoperability and Supportability of National Security Systems and Information Technology Systems.

Also, the Joint Spectrum Center in coordination with the Director, Operational Test & Evaluation, has issued a guide for early identification of interference problems during the acquisition process. The guide suggests documenting electromagnetic environmental effects and spectrum management limitations and vulnerabilities before a system is fielded. It is intended to let the warfighter know that a system will work as intended and, therefore, make acquisition information more meaningful.

The Joint Spectrum Center has also reinforced its training efforts to help reduce incidents of interference and to help ensure that operators are aware of when and where they can and cannot use specific equipment.

Conclusions

We believe that the new procedures established by DOD are reasonable and, if successfully implemented, could help prevent problems related to radio frequency interference. However, evaluation of the impact of these new procedures cannot be accomplished until DOD has had a chance to apply its revised guidance to systems as they go through each acquisition decision milestone. DOD would then be able to demonstrate that the new procedures have (1) resulted in the review of relevant documents at each decision milestone to identify potential frequency problems, (2) been or will be successful in helping to prevent interference problems, and/or (3) resulted in improvement of the acquisition process. No DOD system had undergone the new procedures for all decision milestones at the time of our review. According to DOD officials, the first of three pilot programs using the new acquisition guidance should be completed by January 2002. Consequently, the recency of changes in DOD's new procedures precludes our assessment of their effectiveness at this time.

Agency Comments and Our Evaluation

We provided DOD with a draft of this report for review and comment. In his oral comments, the Spectrum Management Acting Director said that the Department agreed with the report. He provided clarification on the sharing of responsibilities within the Department for implementing the new policy and procedures contained in the 5000 series guidance. He also provided a technical comment. We have incorporated both comments in this report.

Scope and Methodology

We reviewed and discussed with cognizant officials the revised Defense Department policies and management processes that have been developed to help prevent radio frequency mutual interference problems between military and commercial systems. Specifically, we discussed the new

procedures with officials at the Defense Information Systems Agency's Office of Spectrum Analysis and Management; the Joint Spectrum Center; Assistant Secretary of Defense, Command, Control, Communications, and Intelligence's Directorate of Spectrum Management; and the Office of Director, Operational Test and Evaluation. We were unable to evaluate the extent that DOD's new procedures will reduce radio frequency interference problems as no new weapon systems covered by this guidance have gone completely through the acquisition process.

We conducted our work from December 2000 through April 2001 in accordance with generally accepted government auditing standards.

We are sending copies of this report to the Honorable Donald H. Rumsfeld, Secretary of Defense; Mr. David R. Oliver, Acting Director, Under Secretary of Defense for Acquisition, Technology, and Logistics; Lieutenant General Harry D. Raduege Jr., Director, Defense Information Systems Agency; and Mr. Lee H. Frame, Acting Director, Operational Test and Evaluation. We will also make copies available to others on request. The report will also be available on our home page at <http://www.gao.gov>.

If you or your staff have questions concerning this report, please contact me at (202) 512-4841. Major contributors to this report were Tom Hopp, Charles F. Rey, and Bruce Thomas.



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