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CHEMICAL AND BIOLOGICAL DEFENSE

Program Planning and Evaluation Should Follow Results Act Framework

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GAO/T-NSIAD-00-180

Dear Chairman and Members of the Subcommittee:

We are pleased to be here to discuss our August 1999 report on the Department of Defense's application of the Government Performance and Results Act in its Chemical and Biological Defense Program.[1] In the last decade, concerns about the possible use of chemical and biological weapons in both military and civilian settings led Congress to increase funding for new and expanded initiatives to counter these threats. For example, the Chemical and Biological Defense Program appropriation has more than doubled from $388 million in fiscal year 1996 to $791 million. Today we will address whether a framework exists to monitor and evaluate the impacts of the increased funding on protecting service members from the effects of chemical and biological warfare agents.

Since the Persian Gulf War, members of Congress have raised concerns regarding the adequacy of technology used by the Department of Defense (DOD) to detect, identify, prepare for, and protect troops against chemical and biological weapons.[2] In 1993, the National Defense Authorization Act for Fiscal Year 1994 (P.L. 103-160) directed the Secretary of Defense to take actions to improve the Department's chemical and biological defense capabilities, including coordination and integration of all chemical and biological defense programs into what is now the Chemical and Biological Defense Program. More recently, concerns that terrorists might use chemical or biological devices led Congress to authorize the federal government to improve domestic capabilities to respond to such incidents. With the initiation of these domestic preparedness programs in fiscal year 1997, federal research and development efforts to develop nonmedical chemical and biological defense technology expanded considerably, and they continue to grow.[3]

In 1993 Congress enacted the Government Performance and Results Act (commonly referred to as the Results Act). The legislation was designed to have agencies focus on the performance and

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[1] Chemical and Biological Defense: Program Planning and Evaluation Should Follow Results Act Framework (GAO/NSIAD-99-159, Aug. 16, 1999).

[2] See Chemical and Biological Defense: Emphasis Remains Insufficient to Resolve Continuing Problems (GAO/NSIAD-96-103, Mar. 29 1996) and Chemical Weapons: DOD Does Not Have a Strategy to Address Low-Level Exposures (GAO/NSIAD-98-228, Sept. 23, 1998).

[3] Nonmedical technologies refer to technologies for detecting, identifying, protecting against, or decontaminating personnel and equipment of chemical and biological agents. By contrast, examples of medical research and development include the development of prophylactics such as vaccines, medical diagnostics for determining exposure to chemical or biological agents, and therapeutic drugs or procedures for countering the effects of exposure.

results of their programs, rather than on program activities and resources, as they had traditionally done. Congress sought to shift federal management and oversight from its preoccupation with program staffing, activity levels, and tasks completed to program results—that is, to the real differences that federal programs make in people's lives. The outcome-oriented principles of the Results Act, which Congress anticipated would be institutionalized and practiced at all organizational levels in federal agencies, include (1) establishing general goals and quantifiable, measurable, outcome-oriented performance goals and related measures; (2) developing strategies for achieving the goals, including strategies for overcoming or mitigating major impediments to goal achievement; (3) ensuring that goals at lower organizational levels align with and support the general goals; and (4) identifying the resources that will be required to achieve the goals.

We examined the extent to which DOD has applied the Results Act's outcome-oriented principles to the Chemical and Biological Defense Program, focusing in particular on research and development, testing, and evaluation (henceforth referred to as R&D) activities that lead to new defense technologies and capabilities. Specifically, we assessed whether (1) Results Act principles can and should be applied to the Chemical and Biological Defense Program's R&D activities, (2) current Chemical and Biological Defense Program planning and evaluation practices follow the Results Act framework, and (3) organizations executing the R&D activities have incorporated Results Act principles in their program planning and evaluation practices. Moreover, we examined whether DOD has implemented our recommendation to development of a performance plan for the Chemical and Biological Defense Program based on the outcome-oriented management principles embodied in the Results Act.

SUMMARY

Congressional reports and administrative guidance indicate that DOD programs such as the Chemical and Biological Defense Program should follow the Results Act's outcome-oriented principles, including the establishment of general goals; quantifiable, measurable, outcome-oriented performance goals; and related measures. Moreover, research organizations such as the Research Roundtable, the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine have concluded that both applied and basic research programs supported by the federal government could be evaluated meaningfully in accordance with the Results Act framework.

DOD's Chemical and Biological Defense Program in general, and its R&D activities in particular, have not incorporated key Results Act principles. Program goals are vague and unmeasurable and the performance measures emphasize activities rather than impacts. In the absence of explicit and measurable goals, it is difficult to assess the impact of the Program on warfighters' ability to survive, fight, and win in a chemical and biological environment.

Chemical and Biological Defense Program research and development organizations have incorporated Results Act principles inconsistently. Only one of three DOD organizations that engage in R&D activities in support of the Chemical and Biological Defense Program has adopted the Results Act planning and evaluation tools. The remaining two cited either the utilization of equivalent planning tools or the unique challenges of evaluating research and development activities as reasons for not adopting the Results Act processes.

Our August 1999 report recommended that the Secretary of Defense direct that actions be taken to develop a performance plan for the Chemical and Biological Defense Program based on the outcome-oriented management principles embodied in the Results Act. DOD concurred with the recommendation and agreed to develop a full detailed and coordinated plan for inclusion in its next DOD Chemical and Biological Defense Program Annual Report to Congress. Nevertheless, the next Report to Congress in March 2000 did not contain a plan containing the elements outlined in our recommendation. In the March 2000 Report to Congress, DOD established a new set of program goals and stated specific technology and systems goals will be included in a performance plan to be completed during calendar year 2000 and included in the next annual report to Congress.

BACKGROUND

The DOD's Chemical and Biological Defense Program addresses three nonmedical defensive capabilities: contamination avoidance, protection, and decontamination.[4] These areas comprise the DOD's framework for developing nonmedical program requirements. When changes in doctrine, training, or organizational structure cannot satisfy warfighters' needs in these areas, DOD seeks new equipment through the research, development, and acquisition cycle. Chemical and biological

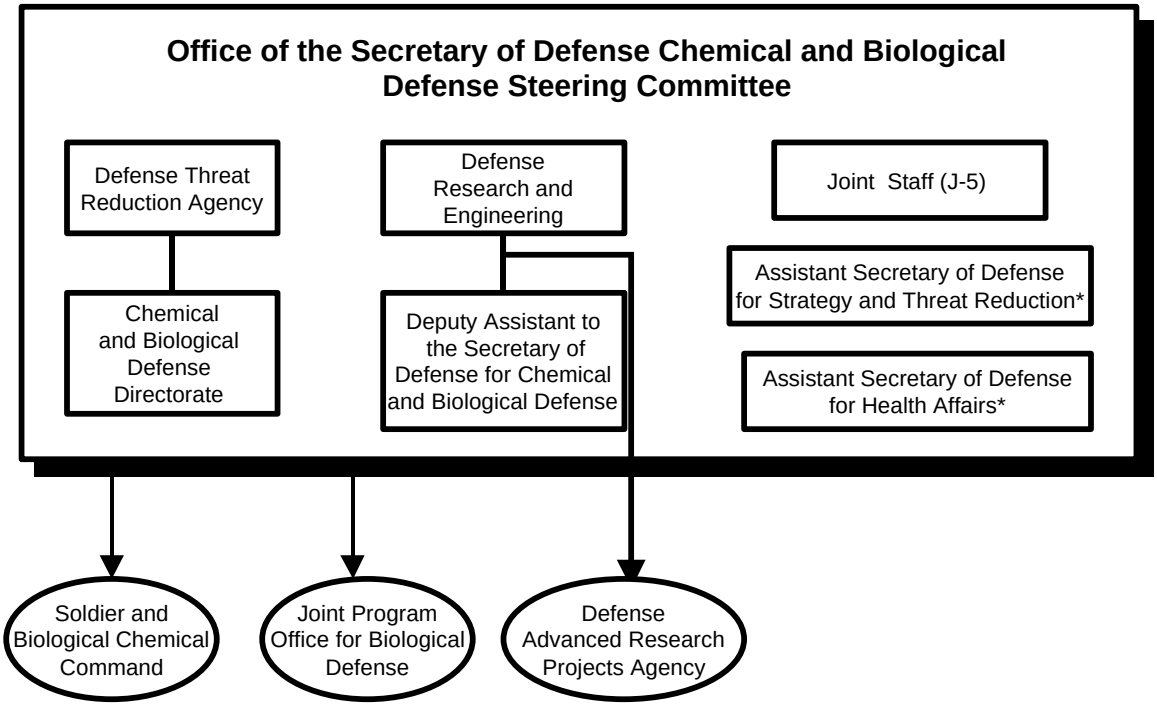
[4] Contamination avoidance includes detecting, avoiding, and bypassing contaminated areas; protection consists of individual and collective protection; decontamination is the restoration of combat power after a chemical and biological attack.

defense funding is divided between the program's two primary activities: R&D and procurement. Of the Chemical and Biological Defense Program appropriation of $791 million in fiscal year 2000, $410 million (52 percent) is for R&D and the remaining $381 million (48 percent) for procurement.

Consistent with the National Defense Authorization Act for Fiscal Year 1994,[5] the Secretary of Defense assigned responsibility for the overall coordination and integration of the Chemical and Biological Defense Program to a single office headed by the Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense. The office is responsible for approving all planning, programming, and budgeting documents; ensuring coordination between the medical and nonmedical chemical and biological defense efforts; and overseeing management oversight in accordance with the law. The Deputy Assistant to the Secretary of Defense manages program research, development, and acquisition efforts for Chemical and Biological Defense. The Deputy Assistant Secretary is also Executive Secretary of a Steering Committee that is responsible for oversight of the program. In August 1999 the Steering Committee was comprised of the Directors of the Defense Threat Reduction Agency and Defense Research and Engineering as well as their top officials responsible for chemical and biological defense. Since our report was issued, the membership of the Committee has been expanded to include representation for the joint Chiefs of Staff, the Assistant Secretary of Defense for Strategy and Threat Reduction, and the Assistant Secretary for Health Affairs, as depicted in figure 1.

[5] P.L. 103-160, sec. 1701.

Figure 1: DOD Chemical and Biological Defense Program Oversight Structure and Selected DOD Organizations Executing Research and Development



*Non-Voting Members

Source DOD

As illustrated in figure 1, the program's DOD research and development organizations in the execution of the program include the Soldier and Biological Chemical Command,[6] the Joint Program Office for Biological Defense,[7] and the Defense Advanced Research Projects Agency.[8]

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[6] The Soldier and Biological Chemical Command is organized around two integrated business areas, one of which is research, development, and acquisition. Nearly half of its research, development, and acquisition funding supports the Chemical and Biological Defense Program. The Command is engaged in the full range of research and development encompassing both biological and chemical systems. Its business areas include chemical detection, biological detection, decontamination, protection, and supporting science and technology.

[7] The Joint Program Office for Biological Defense manages the biological warfare agent detection program. The office monitors emerging technologies for advanced development, demonstration, and upgrades of fielded biological detection systems.

[8] The Defense Advanced Research Projects Agency's Biological Warfare Defense Program is an applied research program established under the authority of the National Defense Authorization Act for Fiscal Year 1997 (P.L. 104-201, as amended) to fund revolutionary new approaches to biological warfare defense. The Biological Warfare Defense Program pursues high-risk, high-potential technologies from the demonstration of technical feasibility through the development of prototype systems.

THE CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM SHOULD FOLLOW THE RESULTS ACT'S OUTCOME-ORIENTED PRINCIPLES

Congressional and administrative guidance indicate that DOD programs such as the Chemical and Biological Defense Program should follow the outcome-oriented principles of the Results Act. The 1997 Quadrennial Defense Review,[9] which serves as DOD's overall strategic planning document, directs DOD organizations at all levels to review their objectives to ensure that they link to the goals and objectives of the Quadrennial Defense Review and to ensure that Results Act performance plans indicate progress toward meeting Quadrennial Defense Review goals. DOD guidance for implementing the Results Act states that the goals, objectives, measures of success, quantifiable performance measures, and program outcome evaluations of subordinate organizations should be linked to the DOD goals articulated in the Quadrennial Defense Review and made operational in DOD's annual performance plan. Chemical and Biological Defense Program R&D activities support DOD's second goal to "prepare now for an uncertain future by pursuing a focused modernization effort that maintains U.S. qualitative superiority in key warfighting capabilities."

Congress has recognized that successful implementation on the Results Act in science agencies would not come quickly or easily. Nonetheless, several professional science organizations have concluded that the Results Act principles can or should be applied to R&D. The Research Roundtable, a group of federal researchers and managers representing a cross section of departments and agencies, concluded in 1995 that the results of a research program's performance could be measured. The Army Research Laboratory was designated as a pilot project for performance measurement under the act and ultimately outlined an evaluation approach that made use of three pillars: metrics, peer review, and customer feedback. In 1999, the Committee on Science, Engineering, and Public Policy of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine concluded that both applied and basic research programs supported by the federal government could be evaluated meaningfully on a regular basis.

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[9] The 1997 Quadrennial Defense Review was a comprehensive examination of the defense strategy, force structure, force modernization plans, infrastructure, budget plan to determine defense strategy and a defense program through the year 2005 as required by the National Defense Authorization Act of Fiscal Year 1997 (P.L. 104-201). Congress has recently established a permanent Quadrennial Defense Review (the National Defense Authorization Act for Fiscal year 2000, P.L. 106-65).

DOD'S CHEMICAL AND BIOLOGICAL DEFENSE PROGRAM IN GENERAL, AND ITS R&D ACTIVITIES IN PARTICULAR, HAVE NOT INCORPORATED KEY RESULTS ACT PRINCIPLES

Results Act outcome-oriented principles have not been widely applied by either Chemical and Biological Defense Program planners or executing organizations. Chemical and biological defense research and development outcomes and impacts are not being systematically measured because the Program lacks both quantifiable performance goals and measurable objectives.

Although DOD has taken the initial and necessary step of articulating Chemical and Biological Defense Program goals, the goals are not articulated in a manner consistent with Results Act principles. The stated goals are vague and unmeasurable, and they fail to articulate specific desired impacts. A Results Act framework requires that managers define a related set of long-term strategic goals, annual agency goals, and measurable performance goals for each program. In 1999, the five Chemical and Biological Defense Program goals were to

-- deter chemical and biological weapon use by denying military advantage to an enemy through a combination of avoidance, protection, decontamination, and medical support capabilities, allowing U.S. forces to operate largely unimpeded by chemical and biological attacks and their subsequent effects;

-- address the most probable chemical and biological weapon threats that could be encountered in regional conflicts and field capabilities to the forces required for two major theater wars;

-- ensure the chemical and biological weapon threat drives chemical and biological defense research, development, and acquisition programs;

-- emphasize a joint service approach to chemical and biological defense R&D, and acquisition; and

-- complete critical R&D and acquisition of improved chemical and biological detection, identification, and warning systems; individual and collective protection systems; and medical support and decontamination systems.

Measuring the first goal is unachievable, determining a deterrence effect is problematic, and attributing the specific rationale for the deterrence is unrealistic. The second, third, and fourth goals address the size, focus, and coordination of the program—not program outcomes. Together, these goals direct that the program be sufficiently large to address the needs resulting from two major theater wars; sufficiently focused to address the likely validated threats; and sufficiently coordinated to capitalize on efficiencies and other benefits of joint requirements determination, research, development, and procurement. The objective of the fifth goal is measurable but addresses program outputs without discussing program outcomes or impacts (such as decreased defensive vulnerabilities or increased operational capabilities). The completion of R&D or procurement cannot be assumed to result in a positive impact on the defensive posture or operational flexibility of U.S. forces. While the completion of these activities may generate benefits for U.S. troops, in the absence of valid, reliable measures, the contributions of R&D or procurement cannot be determined.

Program planners cite the execution of technology development plans, and the completion of defense technology objectives and advanced concept technology demonstrations[10] as measures of progress toward program goals. Program planners cited a number of supporting plans as being "in the spirit of the Results Act," even though not specifically assessing outcomes and impacts. For example, DOD's Chemical and Biological Defense Annual Report to Congress[11] and the Joint Service Nuclear, Biological, and Chemical Defense Research, Development, and Acquisition Plan are updated annually and include detailed metrics and time lines reflecting the program performance in developing new defense technologies. Technology development plans track progress toward defense technology objectives and advanced concept technology demonstrations that, when achieved, DOD claims will create new operational capabilities. In addition, Chemical and Biological Defense Program planners cited ongoing programmatic peer reviews, such as Technology Area Review Assessments, as additional means to measure progress toward meeting program goals.

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[10] Advanced concept technology demonstrations assess the military utility of mature technologies and their capabilities in realistic operational scenarios. Chemical and biological defense capabilities that have been explored through these technology demonstrations include the capability to (1) provide early warning of remote biological warfare agents; (2) detect, warn, identify, protect, and decontaminate air bases and seaports against biological attack; and (3) integrate biological and chemical detection and early warning capability at an air base or seaport.

[11] Submitted to Congress annually pursuant to 50 U.S.C. 1523.

We do not agree that the conduct of an advanced concept technology demonstration measures the impact of the Chemical and Biological Defense Program on the warfighter. Advanced concept technology demonstrations represent a means for rapidly introducing new technologies and reducing the time from the start of a program to the system's initial operational capability. However, the demonstration of a new technology may not by itself result in the effective and safe deployment of a military capability in support of the warfighter. Moreover, as we previously reported, DOD has not always emphasized the need to complete concept and product development or testing before production, thus increasing the risk of approving advanced concept technology demonstrations in support of chemical and biological defense that include immature technologies and then prematurely starting production.[12]

We also do not agree that peer reviews measure the impact of the program on the warfighter. Technology Area Review Assessments are peer reviews conducted by the Director, Defense Research and Engineering on each of DOD's 12 science and technology programs—one being, chemical and biological defense. These peer reviews address progress toward achieving defense technology objectives and form the basis of DOD's performance in science and technology.[13] However, the application of the assessments to generate performance measures of DOD's science and technology programs—such as chemical and biological defense—is limited by several factors. First, the measure is limited because these peer reviews only address defense technology objectives. Funding for these objectives, however, comprises less than 50 percent of total funding for applied and advanced technology development research and development. Thus, the Results Act ratings do not capture the majority of the Chemical and Biological Defense Program's R&D activities. Second, the focus of Technology Area Review Assessments is on budgets, schedules, and technical performance. The reviews do not measure technology transition from the laboratory to the battlefield. Lastly, the peer reviews do not measure improvements in the ability of U.S. troops to survive, fight, and win in a chemical and biological environment.

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[12] Defense Acquisition: Advanced Concept Technology Demonstration Program Can Be Improved (GAO/NSIAD-99-4, Oct. 15, 1998).

[13] In fiscal year 1999, 23 chemical and biological defense defense technology objectives existed, many in the form of advanced concept technology demonstrations.

THE PROGRAM'S RESEARCH AND DEVELOPMENT ORGANIZATIONS HAVE INCORPORATED RESULTS ACT PRINCIPLES INCONSISTENTLY

The three DOD organizations that execute or contribute to the research and development goals of the Chemical and Biological Defense Program vary in their use of the Results Act principles to plan and assess their activities. The Soldier and Biological Chemical Command is the only R&D organization to systematically apply results act principles. The Soldier and Biological Chemical Command has demonstrated that the Results Act principles can be integrated into the planning and evaluation process of an organization conducting research and development for the Chemical and Biological Defense Program. The Command's strategic plan for fiscal years 1998 – 2004 is driven by and linked with the strategic plans of DOD, the Army, and the Army Materiel Command. Its strategic planning model directly links the attainment of its vision with the development of goals and enabling strategies—followed by the execution of the strategies and measurement of performance. Separate measures were developed to assess goal achievement as well as progress toward goal achievement.

The performance plan for fiscal years 1998 – 2004 identifies performance measures for each Command goal and performance goals for each strategy. The performance measures address both accomplishments and progress toward accomplishments. Examples of quantitative measures of research and development accomplishments include (1) the percentage of new chemical and biological systems that meet survivability requirements, (2) the percentage of nonexempt acquisitions receiving waivers from performance specifications, and (3) the percentage of Command science and technology programs transitioning to joint service and Army development programs with user validation through modeling, wargames, or similar methods. Command officials noted that identification of measures in the research and development has been an ongoing challenge and continues to evolve.

In contrast, neither the Defense Advanced Research Projects Agency, nor the Joint Program Office for Biological Defense has developed a performance plan. The reasons cited for not incorporating the Results Act's principles into their program planning or evaluation systems were that current DOD planning processes were equivalent to those of the act, resulting in plans that were "in the spirit" of the Results Act[14] and that the unique nature of R&D activities did not lend itself to the act's

[14] Chemical and Biological Defense Program managers stated that DOD's Planning, Programming, and Budgeting System is equivalent to the system required by the act and that therefore no substantive changes are necessary to comply with the spirit of the legislation. The DOD Comptroller has noted that the Results Act is related to, but distinct from, DOD's Planning, Programming, and Budgeting System and has stated that Results

performance measurement and evaluation. The Joint Program Office cites the conduct of advanced concept technology demonstrations as measures of its performance. Defense Advanced Research Projects Agency officials maintained that the nature of the Agency's mission -- to pursue long-term, far-reaching, and high-risk/high-payoff technology and systems for military systems in the distant future – does not lend itself to the application of performance measurement. In December 1998, the Defense Management Council agreed and notified the Agency that it was exempt from the Results Act requirements.

CONCLUSIONS

Chemical and biological defense research and development outcomes and impacts are not being systematically measured. The Chemical and Biological Defense Program lacks both quantifiable performance measures and measurable objectives. In the absence of measures of program impacts and measurable objectives, progress toward achieving program goals cannot be determined. Program planning consists of a series of technology development plans leading to specific equipment items. Managers cite activity measures and technology demonstrations as measures of the program's contribution. These planning and programming steps are appropriate and necessary, but they are insufficient for quantifying outcomes and impacts. Current measures do not assess the incremental changes attributable, in whole or in part, to the Chemical and Biological Defense Program that improve warfighters' ability to survive, fight, and win in a chemical and biological environment.

Results Act outcome-oriented principles have not been widely applied by either Chemical and Biological Defense Program planners or executing organizations. The use of these principles can enable managers and those overseeing the program to quantify the relative success of the program and of component projects in satisfying requirements across different activities (e.g., point detection, early warning, warning and reporting, modeling). Impact measures can provide a planning tool to allocate finite Chemical and Biological Defense Program resources among competing sets of unmet requirements.

Act planning and program evaluations need to be integrated with DOD's Planning, Programming, and Budgeting System.

RECOMMENDATION

In August 1999, we recommended that the Secretary of Defense direct the development of a performance plan for the Chemical and Biological Defense Program based on the outcome-oriented management principles embodied in the Results Act. We specified that the plan should be agreed to and supported by the relevant R&D organizations and incorporated in DOD's Chemical and Biological Defense Annual Report to Congress. Specifically, the plan should (1) establish explicit and outcome-oriented goals linked to warfighters' ability to survive, fight, and win in a chemical and biological environment; (2) identify quantitative or qualitative performance measures that can be used to assess progress toward goal achievement; (3) describe how performance data would be validated; (4) describe how R&D activities of participating DOD and non-DOD organizations are coordinated to achieve program goals; and (5) identify human capital, financial, and resource challenges or external factors that limit the ability of the program to achieve its goals.

DOD RESPONSE

DOD agreed with our recommendation to develop a performance plan and stated it would develop a strategic plan more closely aligned with the tenets of the Results Act and publish that plan in the next DOD Chemical and Biological Defense Annual Report to Congress. Nevertheless, the March 2000 Report to Congress does not contain a performance plan. DOD has defined seven new program goals and stated that more specific technology and systems goals will be included in a performance plan under development. The steps taken and promised in the March 2000 Report to the Congress still reflect only partial compliance with the first of the four outcome-oriented principles by failing even to identify quantifiable, measurable, outcome-oriented performance goals. DOD states that specific technology and systems goals will be included in a performance plan to be completed during calendar year 2000 and included in the next annual report to Congress.

Thus concludes our formal statement. If you or other members of the committee have any questions, we will be pleased to answer them.

For future contacts regarding this testimony, please contact Kwai-Cheung Chan at (202) 512-3652. Individuals making key contributors to this assignment were Sushil Sharma, Jeffrey Harris and Weihsueh Chiu.

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