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Testimony

Before the Subcommittee on Federal Services, Post Office, and  
Civil Service, Committee on Governmental Affairs, U.S. Senate

For Release on Delivery  
Expected at  
10:00 a.m., EST  
Tuesday  
March 22, 1994

ACQUISITION REFORM

Role of Test and Evaluation in  
System Acquisition Should  
Not Be Weakened

Statement of Louis J. Rodrigues, Director for Systems  
Development and Production Issues, National Security and  
International Affairs Division



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Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the current legislation affecting the test and evaluation (T&E) of defense systems and the various proposals to reform that legislation. As you know, our Office has a long history of supporting independent operational T&E--conducted as early as possible in the acquisition process--as a critical management control over the process to acquire defense systems. We are currently studying the Department of Defense's (DOD) use of the low-rate initial production (LRIP) concept and, in particular, the advantages and disadvantages of performing at least some operational T&E prior to starting LRIP.

#### RESULTS IN BRIEF

Let me be clear right up front that GAO generally supports most of the acquisition reform proposals being debated in the Congress. However, most of the proposed revisions to the current T&E legislation should not, in our view, be enacted because they are directed at perceived rather than documented problems and because they would undermine a key management control over the system acquisition process. In light of the problems that we continue to find in the acquisition of defense systems, the priority given to T&E should increase, not decrease, as would occur if the legislative proposals were enacted. Our reviews of test and evaluation issues, the defense system acquisition process, and numerous individual weapon programs have consistently shown that independent operational T&E is the most realistic way, short of war, to determine whether DOD is getting what it paid for in each system acquisition program. We also believe that, if a program is "sold" on meeting certain requirements, DOD's commitment to that program should be strictly limited until those requirements have been adequately demonstrated. Accordingly, we believe that any change to the current T&E legislation should at least preserve, if not strengthen this "fly-before-buy" principle.

#### BACKGROUND

Over a period of many years, Congress has been greatly concerned about the performance of weapon systems being acquired by the DOD. As early as 1972, Congress required DOD to provide it with information on the operational T&E results of major weapons systems before committing to production. However, Congress continued to receive reports from our Office, the DOD Inspector General, and others that (1) weapon systems were not being adequately tested before beginning production, (2) fielded systems were failing to meet their performance requirements, and (3) the operational T&E being conducted on weapon systems was of poor quality.

In an effort to ensure not only that U.S. military personnel receive the best weapon systems possible but to ensure that the

U.S. government receives best value for the defense procurement dollar, the Congress enacted legislation which

- defined operational T&E<sup>1</sup> (10 U.S.C. 139(a)(2)(A)); and
- established the office of the Director, Operational Test and Evaluation (DOT&E), and assigned specific oversight duties and responsibilities (10 U.S.C. 139(a)(1)).

The Congressional Military Reform Caucus convened a panel in 1989 to review the conduct of operational and live fire testing, and how DOD was implementing the testing laws. The panel found that top DOD decisionmakers needed to pay greater attention and commitment to operational T&E. In the House Armed Services Committee report accompanying the National Defense Authorization Act for Fiscal Years 1990-1991, the Committee noted its concern that DOD was procuring large quantities of weapons systems without completing operational testing. The Phoenix missile was cited as an example where over 52 percent of the program quantity had been procured before operational testing was completed.

As a result of these and other cases, Congress passed additional T&E legislation which, among other things,

- required that a major system<sup>2</sup> may not proceed beyond LRIP until its initial operational T&E is completed (10 U.S.C. 2399(a));
- specified that operational T&E of a major defense acquisition program<sup>3</sup> may not be conducted until the DOT&E approves the adequacy of the plans for operational T&E (10 U.S.C. 2399(b)(1));

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<sup>1</sup>The term "operational test and evaluation" means (1) the field test, under realistic conditions, of any item of (or key component of) weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability of the weapons, equipment, or munitions for use in combat by typical military users; and (2) the evaluation of the results of such test.

<sup>2</sup>According to DOD regulation, a major system is defined as a system whose research, development, test, and evaluation cost is estimated to exceed \$115 million in fiscal year 1990 dollars or procurement cost is estimated to exceed \$540 million in fiscal year 1990 dollars.

<sup>3</sup>A major defense acquisition program is defined as a system whose research and development cost is expected to exceed \$300 million in fiscal year 1990 dollars or procurement cost is expected to exceed \$1.8 billion in fiscal year 1990 dollars.

- specified the purposes of LRIP, the timing of the determination of quantities to be procured in LRIP, and provided for certain exemptions to the LRIP requirements (10 U.S.C. 2400);
- required that DOT&E analyze the results of the operational T&E conducted for each major defense acquisition program and, prior to a final decision to proceed beyond LRIP, report on the adequacy of the testing and whether the results of such T&E confirm that the items tested are effective<sup>4</sup> and suitable<sup>5</sup> for combat (10 U.S.C. 2399(b)(2) and (b)(4));
- specified that, for purposes of proceeding beyond LRIP, required operational T&E not include an operational assessment based exclusively on computer modeling, simulation, or certain analyses (10 U.S.C. 2399(h)(1)); and
- specified that, for certain covered systems and major munition or missile programs<sup>6</sup>, realistic survivability and lethality T&E, respectively, be conducted; any design deficiency identified by the testing be corrected; and specific reports be submitted before proceeding beyond LRIP (10 U.S.C. 2366).

Section 800 of the National Defense Authorization Act for Fiscal Year 1991 directed the Under Secretary of Defense for Acquisition

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<sup>4</sup>DOD defines operational effectiveness as "the overall degree of mission accomplishment of a system when used by representative personnel in the environment planned or expected (e.g., natural, electronic, threat, etc.) for operational employment of the system considering organization, doctrine, tactics, survivability, vulnerability, and threat (including countermeasures, initial nuclear weapons effects, nuclear, biological, and chemical contamination (NBCC) threats)."

<sup>5</sup>DOD defines operational suitability as "the degree to which a system can be placed satisfactorily in field use with consideration given to availability, compatibility, transportability, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistics supportability, natural environmental effects and impacts, documentation, and training requirements."

<sup>6</sup>10 U.S.C. 2366 contains definitions of the terms "covered system" and "major munitions program." For example, it defines covered system as a vehicle, weapon platform, or conventional weapon system that (a) includes features designed to provide some degree of protection to users in combat and (b) is a major system.

(USD-A)<sup>7</sup> to appoint an advisory panel of government and private-sector experts to start the process of rationalizing, codifying, and streamlining the laws underpinning the defense acquisition system. The Panel was to review all laws affecting DOD procurement and to issue a report for transmission by the Secretary of Defense to Congress. The report was to contain recommendations to eliminate any laws "unnecessary for the establishment and administration of the buyer and seller relationship in procurement"; ensure the "continuing financial and ethical integrity of defense procurement programs"; and "protect the best interests of the Department of Defense."

Issued in January 1993, the Panel's report<sup>8</sup> and recommendations address those statutes governing (1) DOD's procurement of commercial items; (2) simplified acquisition thresholds and socioeconomic policies; (3) contract formation and management (such as truth in negotiations, protests, and cost accounting standards); (4) defense technology and industrial base matters; (5) intellectual property rights and standards of conduct; and (6) major systems, testing, and other matters.

We recently reported<sup>9</sup> on, among other things, the Section 800 Panel's compliance with certain legislative requirements. Also, our Office has recently addressed<sup>10</sup> other aspects of acquisition reform at a joint hearing of the Senate Committee on Armed Services and the Senate Committee on Governmental Affairs. Our discussion here today will be limited to the proposals to revise the T&E legislation.

#### CURRENT PROPOSALS TO REVISE T&E LEGISLATION

The Section 800 Panel made several legislative proposals in the T&E area that have also been included to various extents in the pending Senate and House bills (S. 1587 and H.R. 3586) and the Conyers/Clinger proposals to reform the defense acquisition system. The major T&E proposals currently under consideration seek to:

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<sup>7</sup>Now the Under Secretary of Defense for Acquisition and Technology (USD-A&T).

<sup>8</sup>Streamlining Defense Acquisition Laws; Report of the Acquisition Law Advisory Panel.

<sup>9</sup>Acquisition Reform: DOD Acquisition Law Advisory Panel's Operations and Report (GAO/NSIAD-94-5, Dec. 1, 1993).

<sup>10</sup>Procurement Reform: Comments on Proposed Federal Acquisition Streamlining Act (GAO/OGC-94-1, March 10, 1994).

- (1) authorize the use of component, subsystem, and subassembly testing instead of full-up system<sup>11</sup> testing in determining the survivability of "high value" systems;
- (2) provide authority to waive survivability testing after full-scale development begins;
- (3) provide for the use of "different" operational T&E procedures in certain circumstances; and
- (4) provide an exception to the LRIP requirements for "strategic defense missile systems."

#### GAO ASSESSMENT OF LEGISLATIVE PROPOSALS

We reviewed the T&E proposals, the Section 800 report, and all available supporting materials with the following questions in mind:

- (1) Is the current T&E legislation a sensible approach to address deficiencies in the system acquisition process?
- (2) To what extent is the current T&E legislation, as implemented, effective in meeting its objectives?
- (3) Does the current T&E legislation impose extraordinary penalties or burdens on DOD?

As I will discuss in some detail below, we have concluded that the justifications for the T&E proposals do not answer these questions and that the proposals appear to be directed at perceived rather than documented problems. We believe the proposals to modify the T&E legislation would dilute the effectiveness of T&E as a key management control and thus, would weaken rather than strengthen the system acquisition process. Therefore, we would not support the major T&E proposals and strongly suggest that they be deleted from the acquisition reform bills pending before the House and Senate.

Although independent T&E is clearly the most realistic way, short of war, to determine if DOD is getting what it paid for, T&E is generally viewed by the acquisition community as a requirement imposed by outsiders rather than a management tool to identify, evaluate, and reduce technical risks and, therefore, a means to more successful programs. In that light, the Panel's report

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<sup>11</sup>The term "full-up system" is synonymous with the term "configured for combat," which is defined in 10 U.S.C. 2366(e)(5) as a weapon system, platform, or vehicle loaded or equipped with all dangerous materials (including flammables and explosives) that would normally be on board in combat.

stated that, in some cases, the developers express frustration over the delays and expense imposed on their programs by overzealous testers. We would point out, however, that the testers can test only what is called for in the test and evaluation master plan, which is put together by the developers, users, and testers. If the developers promise to develop a system with specific capabilities, it is incumbent on them to clearly demonstrate those capabilities during the testing program. To the extent that they cannot do that, we believe it is unfair and inappropriate for the developers to consider the testers "overzealous" simply because they may be the bearer of the bad news.

The legislative proposals also seem to support the philosophy that we encounter too frequently at the program office level-- that it is most important to get the program into production despite the uncertainty that the system will work as promised or intended. Also, an underlying assumption seems to be that a key acquisition issue is to reduce the length of the system acquisition process and an obvious way to shorten the process is to reduce troublesome parts of the process, such as testing. Moreover, we have seen numerous instances where DOD has chosen not to promptly correct problems identified during testing and decided to proceed into production and deployment despite the identified problems. With that in mind, we do not believe it would be in the best interests of the U.S. government to weaken the testing requirements and discipline embodied in the current legislation.

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I will now address the individual proposals in the order mentioned earlier.

(1) Authorize the use of component, subsystem, and subassembly testing instead of full-up system testing in determining the survivability of "high value" systems.

The Section 800 Panel concluded that full-up system testing can add unnecessary time and expense over component testing and that the provision in the current legislation permitting waivers from full-up system testing was not adequate. However, in creating an exemption for all "high value" systems, the proposal would eliminate reporting to the Congress on plans for alternatives to full-up survivability testing, as is required under the current waiver process. Moreover, the fact that "high value" is not defined is an added concern since more systems may be affected than Congress may anticipate.

In addition, the Panel's conclusion admittedly did not consider the results of a January 1993 National Research Council study.<sup>12</sup> Among other things, the Council concluded that the existing live fire test law was a valuable contribution to vulnerability assessment and to the design of survivable aircraft. The Council also concluded that the law was satisfactory in its present form, including its mandate for full-up system testing, because the waiver process permitted exceptions where appropriate. The Council, however, recommended that DOD formalize the waiver process by developing a risk-benefit assessment methodology that could be used uniformly to determine whether a full-scale, full-up system test program for any particular aircraft is "unreasonably expensive and impractical."

In light of the Council's study results and our earlier work in this area,<sup>13</sup> we recommend that Congress not change the legislation to authorize less than full-up system survivability testing for "high value" systems. A case-by-case assessment of the costs and benefits of full-up system testing--which is the current practice--is preferable to an across-the-board exemption for "high value" systems.

(2) Provide authority to waive survivability testing after full-scale development begins.

The Section 800 Panel stated that this provision was needed because the cost and complexity of survivability testing may not be known until after some systems enter full-scale development. We do not see the need for this provision because the survivability test plan should be completed and any basis for a waiver from full-up system testing should be evident prior to the start of full-scale development. As a reminder, the survivability/lethality test law requires consideration of survivability/lethality during the system development phase. The proposal to allow waivers later in the system acquisition process may give program officials an incentive to delay planning and implementing the tests as long as possible and then apply for a waiver.

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<sup>12</sup>This study, entitled Vulnerability Assessment of Aircraft: A Review of the Department of Defense Live Fire Test and Evaluation Program, was requested by DOD in an attempt to resolve the controversy regarding the law's requirements and to obtain an independent opinion regarding the total vulnerability assessment process and the law's contribution to that process.

<sup>13</sup>See Live Fire Testing: Evaluating DOD's Programs (GAO/PEMD-87-17, Aug. 17, 1987).

We believe much more attention needs to be focused on identifying and addressing problem areas earlier in the system acquisition process--through survivability, lethality, and operational testing--because early fixes are less expensive, easier to implement, and less disruptive to the program. In the survivability test area, more attention needs to be placed on how to do the testing in a timely, efficient and effective manner and less attention on how to obtain a waiver from the testing.

(3) Provide for the use of "different" operational T&E procedures in certain circumstances.

This proposal is the most troublesome to us because it is ambiguous and potentially far-reaching. The alternative testing procedures would be permitted if the normal operational T&E procedures were found to (a) be unreasonably expensive and impractical, (b) cause unwarranted delay, or (c) be unnecessary because of the acquisition strategy for that system. We are very concerned about the potential impact of this proposal and strongly recommend that it not be enacted.

First, until shown otherwise, we believe that "regular" operational T&E (i.e. field testing under realistic conditions) is the best way, by far, to ensure that an item will be effective and suitable. Second, the proposal does not specify what is meant by "different" operational T&E procedures. For example, would computer modeling and simulation, paper studies, etc., be substituted for field tests? We want to emphasize here that the ultimate objective of operational T&E is to clearly demonstrate the system's operational effectiveness and suitability in a realistic environment. There is no prohibition on the use of computer modeling and simulation as a supplement to operational T&E. Computer modeling and simulation, as well as other developmental tools, should be used to evaluate the operational utility of the system and to identify key aspects of the system design to be addressed in operational T&E. Lastly, this proposal would eliminate the role of DOT&E in approving the test plans before operational testing begins.

In addition, we question the prescribed bases for the use of "different" operational T&E, as follows:

- Where "regular" operational T&E is unreasonably expensive and impractical. Fundamentally, we are hard-pressed to envision situations where "regular" operational tests have been or could be "unreasonably expensive and impractical" when judged against the potential expenditures of many millions, if not billions, of dollars for a weapon system. Moreover, we point to the fact that, under the current procedures, the operational testing to be conducted and the testers' role in each program is specified in the test and evaluation master plan, a document put together by the developers, users, and

testers. We believe the current processes to develop and approve the test plans provide adequate opportunity to structure affordable and practical programs of "regular" operational T&E. Unfortunately, this provision would provide the opportunity for the system developers to circumvent these processes.

- Where "regular" operational T&E would cause unwarranted delay. Although operational T&E takes time, one should look at the causes for delays attributed to testing--for example, are they due to excessive or unnecessary testing or to an inadequate system struggling to meet its goals? While there are many potential causes of program delays, our experience is that programs are often delayed or disrupted because they did not do well in development and testing. In addition, we often find that system acquisition strategies frequently do not allow enough time for resolution of problems expected to be found during testing. Therefore, we believe that this provision will not improve the system acquisition process because it would provide the opportunity to single out T&E as the cause of program delays.
- Where "regular" operational T&E would be unnecessary because of the acquisition strategy for that system. This proposal is very broad but, according to the Section 800 Panel report, is directed, at least in part, at situations involving the acquisition of non-developmental items. Regardless of whether items are developmental or non-developmental, the items should demonstrate that they meet military requirements before being procured. We have seen several cases--such as the Heavy Equipment Transporter System, the Family of Medium Tactical Vehicles, and the Palletized Loading System--where operational T&E has shown that a "non-developmental item" was not fully effective and/or suitable for military operations.

(4) Provide an exception under the LRIP requirements for "strategic defense missile systems."

The Section 800 Panel's rationale for this proposal is that these systems have low production quantities. That rationale is not necessarily correct in that at least some of these programs may involve production of dozens, if not hundreds, of units. Therefore, these types of systems should be expected to have a phase of low-rate production followed by full-rate production. Naval ships and satellites have been given special legislative treatment because they do not typically ramp-up to full-rate production. Therefore, we do not see any justification for exempting "strategic defense missile systems" from the LRIP legislation.

We believe that simpler, more flexible, and more responsive procedures in the testing area should not compromise the necessary discipline embodied in the current legislation. We have not found, and the Section 800 Panel has not provided the analysis to show that T&E is one of the problems with the system acquisition process. On the contrary, our large body of work indicates that the testing requirements may need to be strengthened and expanded.

ONGOING GAO WORK ON  
LOW-RATE INITIAL PRODUCTION

For many major and non-major system acquisition programs, LRIP has been permitted to begin and continue based not on the systems' technical maturity but on schedule considerations. For example, the Advanced Medium Range Air-to-Air Missile, the B-1B, the C-17, the Short-Range Unmanned Aerial Vehicle, the B-2, and numerous electronic warfare programs clearly started production prematurely and with little, if any, indication of the system's operational effectiveness and suitability. The current LRIP legislation permits--and tends, in our view, to encourage--DOD to start LRIP before any operational testing is conducted.

Many of the systems that enter LRIP prematurely later experience significant effectiveness and/or suitability problems during operational testing that require major design changes to correct and additional testing to verify. In those cases where production is well underway, costly retrofits are required for delivered units. For example, the C-17 and T-45A aircraft, the B-1B defensive avionics, the Advanced Medium Range Air-to-Air Missile, and numerous electronic warfare systems needed many design changes and costly retrofits because of poor test results. In some cases, such as the B-1B defensive avionics, the problems identified could not be corrected, resulting in deficient systems being fielded.

Moreover, even though LRIP may have been started primarily to provide articles for testing, DOD very often continues production beyond that purpose, despite technical problems identified during operational testing. For example, despite a number of serious technical problems, as many as 72 T-45A aircraft of the total program quantity of 268 will be authorized under LRIP. In addition, significant quantities of several electronic warfare systems were procured despite significant technical problems and shortcomings.

To reduce the risk of finding major operational effectiveness and suitability problems after production starts, we have regularly recommended (1) less concurrent development and production, and (2) as much operational testing as possible before production starts. Nevertheless, we continue to find that highly concurrent acquisition strategies are featured in many current major and

non-major programs, with little, if any, operational testing expected until well after the start of LRIP. For example, the F/A-18E/F aircraft and F-22 aircraft programs plan to make substantial commitments to production before completing initial operational T&E. Contrary to general commercial practices and despite the risk of being committed to producing deficient systems, defense system acquisition programs continue to enter and proceed well into production before being put under serious scrutiny. In today's national security environment, we believe there should be very few cases where there is a need to assume the additional risks inherent in a highly concurrent acquisition strategy.

Based on its review of major defense acquisition programs,<sup>14</sup> the DOD Inspector General also found that programs were entering LRIP without meeting the development, testing, and production readiness prerequisites and recommended that program-specific exit criteria be set up to ensure that those prerequisites be met before entering LRIP. Because of the costs involved and the inability or unwillingness to curtail production after it starts, we agree that controls are urgently needed over the start and continuation of LRIP. Most importantly, we believe that a requirement to conduct at least a phase of operational testing before LRIP starts would be feasible in most cases and would be an effective management control over the premature start of production.

The requirement in the National Defense Authorization Act for Fiscal Year 1994 that the Secretary of Defense ensure appropriate, rigorous, and structured testing be completed prior to LRIP of any electronic combat or command, control, and communication countermeasure system is definitely a move in the right direction. However, its provisions--as are most legislative provisions on T&E matters--are applicable only to major defense acquisition programs.<sup>15</sup> We presently expect no more than three or four systems will be covered by this provision. Our findings--particularly evident in the electronic warfare and command, control and communications area but common on other system developments--are not limited to major systems or major defense acquisition programs. In fact, some of these problems appear to be more acute with the non-major programs. We feel strongly that the principles, if not the reporting requirements, of the current--and we hope strengthened--T&E

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<sup>14</sup>Low-Rate Initial Production in Major Defense Acquisition Programs (Report No. 94-014; Nov. 9, 1993).

<sup>15</sup>The legislation in question here refers to acquisition category I (ACAT I) programs, which are also major defense acquisition programs.

legislation should be applicable to non-major as well as major systems.

#### POTENTIAL IMPACT OF ACQUISITION "CULTURE"

In late 1992, we reported<sup>16</sup> on the problems in acquiring defense systems and described the entrenched "culture" that has so effectively resisted many attempts at reforming the system acquisition process. We continue to see that culture hard at work today in this attempt to significantly weaken the current legislation controlling T&E. We do not support the proposed changes because they would tend to weaken the primary mechanism that, in our view, can be used effectively to discipline the system acquisition process.

Plain and simple, we support increased accountability in the system acquisition process. We continue to believe that, if a program is "sold" on meeting certain requirements, DOD's commitment to that program should be strictly limited until those requirements have been adequately demonstrated. Based on the interim results of our ongoing work, we believe that DOD's initial commitment to LRIP of a weapon system should not be made until developmental and operational test results show that the system (a) is potentially operationally effective, (b) will not need costly or extensive changes, and (c) has a reasonable chance to successfully complete its remaining operational T&E in a timely fashion. We expect to complete our ongoing work by the late summer.

Most participants in the defense system acquisition process ascribe at least in principle to a "fly-before-buy" acquisition philosophy. However, many of the current T&E proposals would in practice move DOD away from that principle.

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In response to Senator Roth's specific question regarding the current organizational placement of the Office of the Director, Operational Test and Evaluation (DOT&E), we have found that the organization chart contained in the Secretary of Defense's January 1994 report to the Congress to be in error. That report erroneously shows DOT&E reporting directly to the Under Secretary of Defense for Acquisition and Technology rather than directly to the Secretary of Defense. At this time, DOT&E continues to report directly to the Secretary of Defense. However, the National Defense Authorization Act for Fiscal Year 1994 deleted the legislative requirement that DOT&E report directly, without intervening review or approval, to the Secretary of Defense. The

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<sup>16</sup>Weapons Acquisition: A Rare Opportunity for Lasting Change (GAO/NSIAD-93-15, Dec. 1992).

conferees suggested that DOT&E be placed under the Comptroller's Office.

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Mr. Chairman, that concludes my statement. I will be happy to answer any questions you or members of the Subcommittee may have.

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