Audit Report

OFFICE OF THE INSPECTOR GENERAL

PRODUCTION READINESS REVIEW PROCESS FOR MAJOR DEFENSE ACQUISITION PROGRAMS

Report No. 95-302 August 31, 1995

Department of Defense

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Acronyms

AFMCR	Air Force Materiel Command Regulation
AMRAAM	Advanced Medium Range Air-to-Air Missile
DPRO	Defense Plant Representative Office
EMD	Engineering and Manufacturing Development
IPT	Integrated Product Team
LRIP	Low-Rate Initial Production
NESP	Navy's Extremely High Frequency Satellite Communication Program
PRR	Production Readiness Review

INSPECTOR GENERAL
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Report No. 95-302 **August 31, 1995**

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY
ASSISTANT SECRETARY OF THE NAVY (FINANCIAL MANAGEMENT AND COMPTROLLER)
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT AND COMPTROLLER)
DIRECTOR, DEFENSE LOGISTICS AGENCY
AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Audit of Production Readiness Review Process for Major Defense Acquisition Programs (Project No. 5AE-0030)

Introduction

We are providing this final memorandum report for your information and use. System acquisition program managers use the production readiness review (PRR) process to assess a contractor's readiness to transition a design into production. The PRR is performed during Phase II, Engineering and Manufacturing Development (EMD), and assesses product design, industrial resources, production engineering and planning, materials and purchased parts, quality assurance, logistics, and contract administration. Program managers report the results of the PRR concerning production risk to the milestone decision authority before the Milestone III, Production Approval, decision as part of the Integrated Program Summary.

Audit Results

The Military Departments generally executed, reported, and followed up on the results of PRRs in an effective manner. However, the effectiveness and efficiency of the PRR process could have been improved by expanding the role of the Defense Plant Representative Office (DPRO) staff in planning, executing, reporting, and following up PRRs; increasing the use of incremental PRRs; and tailoring PRRs to fit the needs of individual programs. We are not making recommendations in this report to address these improvements in the PRR process due to uncertainty as to how integrated product teams (IPTs) will handle future PRRs as part of ongoing acquisition reform initiatives.

Audit Objectives

The overall audit objective was to evaluate the effectiveness of the PRR process for major Defense acquisition programs. The audit also followed up on the findings and recommendations in the Inspector General, DoD, Audit Report No. 87-028, "DoD Production Readiness Review Process," October 27, 1986. Management controls related to the objectives were also evaluated.

Scope and Methodology

Scope and Methodology. We judgmentally selected and reviewed four major Defense acquisition programs that were either in low-rate initial production (LRIP) or full-rate production. Programs having very low planned production quantities, such as ships and satellites, were not included as candidates for selection. Programs selected for review included the Army's Javelin, the Navy's Extremely High Frequency Satellite Communication Program (NESP) and T-45 Training System, and the Air Force's Advanced Medium Range Air-to-Air Missile (AMRAAM). We examined the PRR planning, execution, reporting, and followup process for each of the four programs. We interviewed the program office, DPRO, and contractor representatives to discuss their roles in the PRR process and lessons learned through their experience with PRRs. In addition, we interviewed Office of Secretary of Defense and Military Department personnel who had oversight responsibility for PRRs.

Audit Period, Standards, and Locations. We conducted this program audit from January through July 1995 in accordance with auditing standards issued by the Comptroller General of the United States, as implemented by the Inspector General, DoD. The audit reviewed PRRs and related documentation dated from September 1982 through May 1995. Accordingly, we included such tests of management controls considered necessary. We did not use computer-processed data or statistical sampling procedures in conducting this audit. Enclosure 2 lists the organizations visited or contacted during the audit.

Termination of Audit Work. Although we found opportunities for improving the PRR process, we concluded that further audit effort was not warranted because ongoing DoD acquisition reform initiatives are expected to change the PRR process significantly. Planned and actual changes include cancellation and revision of PRR guidance and criteria and the use of IPTs to conduct PRRs. Accordingly, we plan to use the knowledge gained during our audit survey to comment on draft revisions to the DoD 5000 series documents that will address the assessment and reporting of the program's risks in transitioning from development to production. Our comments for modifying the revised guidance will include suggestions that would improve the effectiveness and efficiency of the process for assessing and reporting production risk.

Management Control Program

DoD Directive 5010.38, "Internal Management Control Program," April 14, 1987, requires DoD organizations to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of the controls.

Scope of Review of the Management Control Program. We evaluated management controls and procedures related to the planning, executing, reporting, and following up of PRRs to ensure that accurate and useful information is provided to milestone decision authorities and that results of the

reviews are used to reduce program risk. To avoid duplicating the efforts of an ongoing Inspector General, DoD, audit, we did not evaluate the Military Departments' implementation of the requirements of DoD Directive 5010.38.

Adequacy of Management Controls. For the four major Defense acquisition programs selected for review, PRR management controls were deemed to be effective in that no material deficiencies were disclosed that related to the audit objectives.

Prior Audits and Other Reviews

Since FY 1987, the Office of the Assistant Inspector General for Auditing, DoD, has addressed the PRR process in two reports. Enclosure 1 summarizes the reports.

Audit Background

Production readiness is the state or condition of preparedness of a system to proceed into production. A system is ready for production when the producibility of the production design and the managerial and physical preparations necessary for initiating and sustaining a viable production effort have progressed so that a production commitment can be made without incurring unacceptable risks that program thresholds for schedule, performance, and cost will be breached. The following guidance governs PRRs:

o DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," February 23, 1991, requires that program managers perform a PRR during EMD to assess the completeness and producibility of the product design and the planning and preparation necessary for a viable production effort. The Instruction states that the full-rate production of a system will not be approved until the product design has been stabilized.

o DoD Manual 4245.7-M, "Transition From Development to Production," September 1985, includes performance of PRRs using a set of management templates intended to reduce the risk that is inherent in the transition from development to production. The templates provide guidance for structuring technically sound programs, assessing risk, and identifying areas needing corrective action.

o Air Force Materiel Command Regulation (AFMCR) 84-7, "Production Readiness Review," September 1986, establishes guidance for planning, executing, and reporting PRRs and requires that the reviews be done incrementally. The number of incremental reviews depends on the length of the EMD phase. Military Standard 1521B, "Technical Reviews and Audits for Systems, Equipment, and Computer Software," July 1992, cites AFMCR 84-7 as the specific PRR guidance all Military Departments are to apply. With cancellation of the Military Standard in April 1995, PRR guidance in AFMCR 84-7 is directly applicable only to Air Force major Defense acquisition programs.

In addition to PRRs performed by program managers, the Defense Product Engineering Support Office, a field activity that reports to the Under Secretary of Defense for Acquisition and Technology, performs independent assessments of production readiness for all major Defense acquisition programs for which the Under Secretary is the milestone decision authority. Within the Army, the Army Product Engineering Support Office, under the Army Materiel Command, performs independent assessments of acquisition programs for which the Army Acquisition Executive is the milestone decision authority. The Navy and the Air Force do not have similar organizations that perform independent production readiness assessments.

Discussion

While the Military Departments generally executed, reported, and followed up on the results of PRRs in an effective manner, the effectiveness and efficiency of the PRR process could have been improved by:

o expanding the role of the DPRO staff in planning, executing, reporting, and following up PRRs;

o increasing the use of incremental PRRs; and

o tailoring PRRs to fit the needs of individual programs.

Use of Defense Plant Representative Office. AFMCR 84-7 states that the DPRO should be part of the PRR team and involved in the PRR process, from planning the reviews through closure of deficiencies noted in the PRRs. DPRO personnel are valuable resources for the PRR process because they are located in the contractors' plants and are familiar with both the weapon system and the contractors' operations.

Even though DPROs were involved to some extent in the PRRs for the four major Defense acquisition programs we reviewed, DPRO resources and knowledge could have been more effectively used in the PRR process. Specifically, program offices were not using DPRO personnel to provide:

o input to PRR planning (Javelin, T-45 Training System, and NESP);

o an independent assessment of production risk based on data gathered from PRR (Javelin, T-45 Training System, and NESP); and

o on-site verification of closure of PRR action items (Javelin and NESP).

DPROs were used differently in the PRR process based on the program offices' lack of specificity in Memoranda of Agreement with the DPROs concerning their role in the PRR process. The Memoranda of Agreement stated that DPROs were expected to support the PRR process; however, no mention was

made of what that support would include. DPRO personnel agreed that, in most cases, they should have been more involved in planning, execution, reporting, and following up PRRs.

The increased use of DPRO resources in the PRR process would have improved the focus, quality, and efficiency of PRRs conducted for the major Defense acquisition programs.

Timing and Tailoring of PRRs. AFMCR 84-7 provides guidance on timing of PRRs. The Regulation requires program managers to conduct PRRs incrementally during EMD. It also states that program managers should complete the first PRR within 90 days of the critical design review and at least yearly thereafter. Additionally, Military Standard 1521B provided guidance on tailoring PRRs. The Standard required managers to focus the initial PRR on gross level concerns and refine follow-on incremental reviews to focus on specific risk management concerns.

Program managers for three of the four programs reviewed (Javelin, T-45 Training System, and AMRAAM) conducted incremental PRRs before the production decision. All four program managers also tailored PRRs to varying degrees.

Navy Terminals. The NESP Program Office conducted a single PRR (from November 28 through December 1, 1988) before the June 1989 production decision. Because the Program Office completed the PRR late in EMD, the Program Office did not have enough time to resolve all medium- and high-risk findings before the production decision. One medium-to-high-risk finding showed that NESP software faults were not considered in calculating the system's mean-time-between-failures rate. Although the full-scale development specification required only hardware faults to be considered in determining the system's mean-time-between-failures performance, the production specification required hardware and software faults to be considered in determining the system's mean-time-between-failures rate. The Program Office did not anticipate this PRR finding and took nearly 2 years to validate that the NESP met the mean-time-between-failures requirement in the production specification. In our discussions, Program Office personnel agreed that a PRR should have been done earlier in EMD.

Air Force Missile Program. The AMRAAM Program Office and contractors conducted more than 100 PRRs for the AMRAAM system and subsystems, the AMRAAM Product Enhancement Program, and the pre-planned product improvement efforts. For each PRR, the team director was responsible for developing a PRR plan that included each team member's responsibilities and the review's approach. The PRR plan for the pre-planned product improvement efforts required that each team member review PRR guidelines and tailor the PRRs by adding or deleting questions to ensure they adequately assessed production-related risks. In performing the PRRs, PRR teams did not consistently tailor the reviews. In our discussions, both missile contractors said that the Program Office asked too many basic business-practice questions that were redundant from earlier technical reviews. The PRR team asked contractor policy questions such as:

o Is there a hands-on training program for factory personnel?

o Are subcontractor capabilities, past performance, and delivery assessed before contract award?

o Does the contractor use a work measurement system?

Although the PRR team assessed risk areas, the PRRs were time-consuming efforts that could have been done more efficiently. Considering the Program Office's extensive PRR experience, the PRRs for the pre-planned product improvement efforts could have been tailored to eliminate questions for which the Government had answers from earlier technical reviews.

Conclusion. PRRs, when performed incrementally during EMD, enabled timely surfacing of production-related problems. Tailoring PRRs also improved the effectiveness and efficiency of production readiness assessments.

Acquisition Reform Initiatives. The ongoing acquisition reform initiatives within DoD will have a direct effect on the PRR process. Guidance and criteria are being canceled or revised and IPTs will be used to assess and report on production readiness.

Cancellation and Revision of Guidance. Since the start of our audit in January 1995, the Defense Standards Improvement Council canceled Military Standard 1521B, "Technical Reviews and Audits for Systems, Equipment, and Computer Software," and Military Standard 1528A, "Manufacturing Management Program." Military Standard 1521B provided policy on timing and tailoring PRRs and required all Military Departments to comply with AFMCR 84-7, "Production Readiness Review." Military Standard 1528A established requirements for conducting PRRs of subcontractors.

Further, the Office of the Under Secretary of Defense for Acquisition and Technology is rewriting acquisition guidance in the DoD 5000 series to implement the acquisition reform initiatives. Guidance will be separated into two document sets:

o guiding principles that are mandatory policies and

o institutionalized knowledge that consists of discretionary alternative procedures.

In reference to PRRs, Under Secretary of Defense for Acquisition and Technology officials stated that the rewritten acquisition documents will require that programs have, before production, a stable system design, production planning in place, and a completed risk assessment. The formal PRR is expected to be a discretionary alternative procedure for meeting the mandatory risk assessment criteria. Program managers will have the discretion to use alternative production readiness procedures as long as they provide adequate support for determining and reporting program production risk.

Integrated Product Teams. In a memorandum on the "Use of Integrated Product and Process Development and Integrated Product Teams in DoD Acquisition," May 10, 1995, the Secretary of Defense directed the

acquisition community to implement Integrated Process and Product Development concepts to the maximum extent practicable. Implementing these concepts is intended to provide milestone decision authorities with integrated rather than functional checking, reviewing, and reporting before acquisition milestone decisions. Currently, the Defense and Army Product Engineering Support Offices have functional responsibility for conducting independent production readiness assessments. Their roles are likely to be significantly impacted by the IPT concept. The DPROs and the system contractors will likely be included on the IPTs assigned to assess and report on production readiness.

Conclusion. After implementation of the acquisition reform initiatives, some process for assessing production readiness will still be required before the decision is made to produce a system.

Follow-up on Prior Audit Effort. To follow up on implementation of recommendations made in Report No. 87-028, "Audit of the DoD Production Readiness Review Process," October 27, 1986, we determined whether program office personnel and other Service personnel assigned to perform the PRR:

- o effectively reported PRR results to their program managers and
- o properly resolved PRR issue actions items before their closure.

Reporting PRR Results. Except for one instance on the T-45 Training System Program, PRR results were effectively reported to the program managers for the four major Defense acquisition programs reviewed. The June 1988 PRR for the T-45 Training System Program rated the functional area Engineering/Production Design as "high risk" because the contractor's flight test program was falling behind schedule and could jeopardize the LRIP decision with a corresponding delay in exercising the FY 1989 limited production option. The September 1988 Follow-up PRR rated engineering/production design as "moderate risk" because the contractor was attempting to address the testing problem identified in June 1988. The contractor, however, was still behind in its flight test program that impacted the resolution of several aircraft problems. Accordingly, the impact to the design of the production aircraft could not be determined. Because of the significant uncertainty related to the aircraft design, this functional area should have been rated as a "high risk"; therefore, the overall production risk assessment should have been "high" rather than "medium" risk.

PRR Action Item Closure. We found that PRR issue action items were properly resolved before closure.

Management Comments

We provided a draft of this report to the addressees on July 31, 1995. Because this report contains no recommendations, no management comments were required, and none were received. Therefore, we are publishing this report in final form.

We appreciate the courtesies extended to our audit staff. If you have questions on this audit, please contact Mr. John E. Meling, Audit Program Director, at (703) 604-9091 (DSN 664-9091) or Mr. Harold James, Audit Project Manager, at (703) 604-9093 (DSN 664-9093). See Enclosure 3 for the report distribution. The audit team members are listed inside the back cover.

Robert J. Lieberman
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Enclosures

Prior Audits and Other Reviews

Two Inspector General, DoD, reports addressed the PRR process.

Report No. 94-014, "Low-Rate Initial Production in Major Defense Acquisition Programs," November 9, 1993, found that all seven major Defense acquisition programs reviewed entered LRIP without completing at least some prerequisites in design, testing, and preparation for production. As a result, the Government incurred significant program risk from systems entering LRIP when their production processes were not verified. The report recommended that the Under Secretary of Defense for Acquisition and Technology revise DoD Instruction 5000.2 to include review of LRIP quantities in the guidelines for PRRs. The Under Secretary agreed to include guidance on review of LRIP quantities as part of the PRR guidelines.

Report No. 87-028, "Audit of the DoD Production Readiness Review Process," October 27, 1986, found that the Air Force was operating an effective PRR program while the Army and Navy programs required strengthening in specific areas to be fully effective management tools. The Army did not effectively communicate PRR findings and recommendations to the program managers and follow up on reported issues. The Navy had closed out PRR findings when the findings had not actually been resolved. The report recommended that the Army revise its guidance for the PRR process to ensure that findings and recommendations were reported in sufficient detail to allow followup, initial and final reports were furnished to contractors for comment and action, risk categories were assigned to findings, and PRR focal points were established at commands with program office oversight. The report recommended that Navy revise its PRR guidance to require adequate documentation to support closing a finding. The Army and Navy officials concurred with all recommendations. As stated in this report, the Army and the Navy have also effectively implemented these recommendations.

Organizations Visited or Contacted

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition and Technology, Washington, DC
Assistant Secretary of Defense (Command, Control, Communications and Intelligence), Washington, DC

Department of the Army

Assistant Secretary of the Army (Research, Development and Acquisition), Washington, DC
U.S. Army Missile Command, Redstone Arsenal, AL
U.S. Army Program Executive Office, Tactical Missiles, Redstone Arsenal, AL
U.S. Army Program Office, Javelin Program, Redstone Arsenal, AL

Department of the Navy

Assistant Secretary of the Navy (Research, Development and Acquisition), Washington, DC
T-45 Training System Program Office, Naval Air Systems Command, Arlington, VA
Navy Extremely High Frequency Satellite Communication Program Office, Space and Naval Warfare Systems Command, Arlington, VA

Department of the Air Force

Assistant Secretary of the Air Force (Acquisition), Washington, DC
Deputy Assistant Secretary of the Air Force (Management Policy and Program Integration), Washington, DC
Advanced Medium Range Air-to-Air Missile Program Office, Eglin Air Force Base, FL

Other Defense Organizations

Defense Logistics Agency, Headquarters, Alexandria, VA
Defense Plant Representative Office, Hughes Missile Systems Company, Tucson, AZ
Defense Plant Representative Office, Lockheed Martin Corporation, Orlando, FL
Defense Plant Representative Office, McDonnell Douglas Corporation, St. Louis, MO

Other Defense Organizations (cont'd)

Defense Plant Representative Office, Raytheon Company, Burlington, MA
Defense Plant Representative Office, Texas Instruments, Lewisville, TX

Non-Government Organizations

Advanced Communications Systems Inc., Arlington, VA
Hughes Missile Systems Company, Tucson, AZ
Lockheed Martin Corporation, Orlando, FL
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Raytheon Company, Electronic Systems Division, Burlington, MA
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  Senate Subcommittee on Defense, Committee on Appropriations
  Senate Committee on Armed Services
  Senate Committee on Governmental Affairs
  House Committee on Appropriations
  House Subcommittee on National Security, Committee on Appropriations
  House Committee on Government Reform and Oversight
  House Subcommittee on National Security, International Affairs, and Criminal Justice, Committee on Government Reform and Oversight
  House Committee on National Security

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