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INFORMATION TECHNOLOGY

Inconsistent Software Acquisition Processes at the Defense Logistics Agency Increase Project Risks

**G A O**Accountability * Integrity * Reliability

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Abbreviations

BSM	Business Systems Modernization
CIO	Chief Information Officer
CMM [®]	Capability Maturity Model SM
CMU	Carnegie Mellon University
DLA	Defense Logistics Agency
DOD	Department of Defense
FAS	Fuels Automated System
IT	Information Technology
SA-CMM [®]	Software Acquisition Capability Maturity Model SM
SEI	Software Engineering Institute



United States General Accounting Office
Washington, DC 20548

January 10, 2002

The Honorable Carl Levin
Chairman
The Honorable John Warner
Ranking Minority Member
Committee on Armed Services
United States Senate

The Honorable Bob Stump
Chairman
The Honorable Ike Skelton
Ranking Minority Member
Committee on Armed Services
House of Representatives

The Defense Logistics Agency (DLA) plays a critical role in supporting America's military forces worldwide. To fulfill this role, DLA employs about 28,000 civilian and military workers, located at about 500 sites in all 50 states and in 28 countries. It also manages about 4 million supply items and processes about 30 million annual supply distribution actions. In fiscal year 2000, DLA reported that these operations resulted in sales to the military services of about \$13 billion. DLA relies on software-intensive systems to support this work. An important determinant of the quality of software-intensive systems, and thus DLA's mission performance, is the quality of the processes used to acquire these systems.

This report is one in a series of products to satisfy our mandate under the fiscal year 2001 Defense Authorization Act.¹ The act directed that we review DLA's efficiency and effectiveness in meeting requirements, its application of best business practices, and opportunities for improving its operations. As agreed with your offices, the objectives of this review of DLA's information technology (IT) management were to determine (1) whether DLA has the effective software acquisition processes that are necessary to modernize and maintain systems and (2) what actions DLA has planned or in place to improve these processes.

¹Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001, P.L. 106-398 app., section 917.

Carnegie Mellon University's Software Engineering Institute (SEI), recognized for its expertise in software processes, has developed models and methods that define and determine organizations' software process maturity. Together, these models and methods provide (1) a logical framework for baselining an organization's current process capabilities (i.e., determining what practices are effectively implemented [strengths], not effectively implemented [weaknesses], or contain mixed or inconclusive evidence [observations]) and (2) a structured plan for incremental process improvement. These models and methods are generally recognized as best business practices.

Using SEI's Software Acquisition Capability Maturity ModelSM (SA-CMM[®])² and SEI's software capability evaluation method, our staff (trained at SEI) evaluated DLA's software acquisition maturity in six of seven key process areas that are necessary to attain a "repeatable" level of process maturity.³ The repeatable level of process maturity is level 2 on SEI's five-level scale. An organization at the repeatable level of process maturity has the necessary process discipline in place to repeat earlier successes on similar projects. Organizations that do not satisfy the requirements for the repeatable level are by default judged to be at level 1, the "initial" level of maturity. This means that their processes are immature, ad hoc, and sometimes even chaotic, with few of the processes defined and success dependent mainly on the heroic efforts of individuals. We also evaluated DLA on one level-3, or "defined" level, process—acquisition risk management. We included acquisition risk management because many software experts consider it to be one of the most important process areas.

Our evaluation included DLA's only ongoing software/system acquisitions: the Business Systems Modernization (BSM) and the Fuels Automated System (FAS). Details on our objectives, scope, and methodology are

²Capability Maturity ModelSM is the service mark of Carnegie Mellon University, and CMM is registered with the U.S. Patent and Trademark Office. GAO used the Software Acquisition Capability Maturity ModelSM Version 1.2 (CMU/SEI-99-TR-002, April 1999), the latest version of the model.

³The six key process areas that we evaluated are software acquisition planning, solicitation, requirements development and management, project management, contract tracking and oversight, and evaluation. We did not evaluate DLA against the seventh key process area, transition to support, because the contractors who are implementing the systems we evaluated will also support the systems when they are operational, rendering transition to support irrelevant for these acquisitions.

contained in appendix I. The Department of Defense (DOD) provided us with comments on a draft of this report, which are discussed in the “Agency Comments” section.

Results in Brief

DLA does not have mature software acquisition processes across the agency, as evidenced by the wide disparity in the rigor and discipline of processes between the two systems we evaluated. Whereas BSM fully satisfied requirements for most of the key process areas evaluated, FAS did not fully satisfy all the criteria for any key process area. More specifically, BSM satisfied all requirements for three level-2 key process areas—software acquisition management, project management, and contract tracking and oversight—and for the one level-3 key process area that we evaluated—acquisition risk management. Further, BSM satisfied all but a few practices in the other level-2 key process areas—solicitation, requirements development and management, and evaluation. On the other hand, FAS did not fully satisfy all requirements for any of the level-2 key process areas, and also did not satisfy the one level-3 key process area we evaluated. According to DLA officials, the variance between BSM and FAS software acquisition maturity can be attributed in part to differences in the level of resources that each project committed to acquisition process controls. This means that DLA does not have effective corporate processes for consistently acquiring software (the most costly and complex component of systems), which can lead to the acquisition of systems that do not meet the information needs of management and staff, do not provide support for necessary programs and operations, and cost more and take longer than expected to complete.

Moreover, DLA does not have a software process improvement program in place to effectively strengthen its corporate software acquisition processes. Earlier this year, we reported that DLA does not have a software process improvement program, having eliminated the program in 1998.⁴ We also reported that DLA’s Chief Information Officer (CIO) stated that the program would be reestablished. However, DLA still does not have written plans and milestones for doing so because the improvement program has not been an agency priority. Without a software process improvement program, it is unlikely that DLA can effectively improve its institutional software acquisition capabilities, which in turn means that

⁴*DOD Information Technology: Software and Systems Process Improvement Programs Vary in Use of Best Practices* (GAO-01-116, March 30, 2001).

DLA's software projects will be at risk of not delivering promised capabilities on time and within budget.

To reduce DLA's software acquisition project risks, we are recommending actions aimed at (1) correcting BSM and FAS process weaknesses and (2) establishing a framework for long-term institution software process improvement.

DOD provided what it termed "official oral comments" on a draft of this report. In its comments, DOD stated that it generally concurred with the report and that it concurred with the recommendations.

Background

DLA is the Department of Defense's (DOD) logistics manager for all DOD consumable items⁵ and some department repair items.⁶ Its primary business function is to provide supply support in order to sustain military operations and readiness. In addition to this primary function, which DLA refers to as either "materiel management" or "supply-chain management," DLA performs five other major business functions: distributing materiel ordered from its inventory; purchasing fuels for DOD and the U.S. government; storing strategic materiel;⁷ marketing surplus DOD materiel for reuse and disposal; and providing numerous information services, such as item cataloging,⁸ for DOD, the United States, and selected foreign governments. DLA consists of a central command authority supported by a number of field commands that manage the agency's six business functions.

Until about 1997, DLA generally developed its systems in-house. Since then, the agency has begun to acquire systems, relying on contractors for system development and managing the acquisition of these systems. Currently, DLA is in the process of acquiring two systems: Business Systems Modernization (BSM) and Fuels Automated System (FAS).

⁵Consumable items include such commodities as subsistence (food), fuels, medical supplies, clothing, and construction equipment.

⁶These repair items are spare and repair parts that support about 1,400 DOD weapons systems. Each of the military services also manages its own service-unique repair items.

⁷"Strategic materiel" is defined as any item needed to sustain the United States in the event of a national emergency.

⁸DLA defines "item cataloging" to include all activities that describe the technical characteristics and data for an individual item of supply.

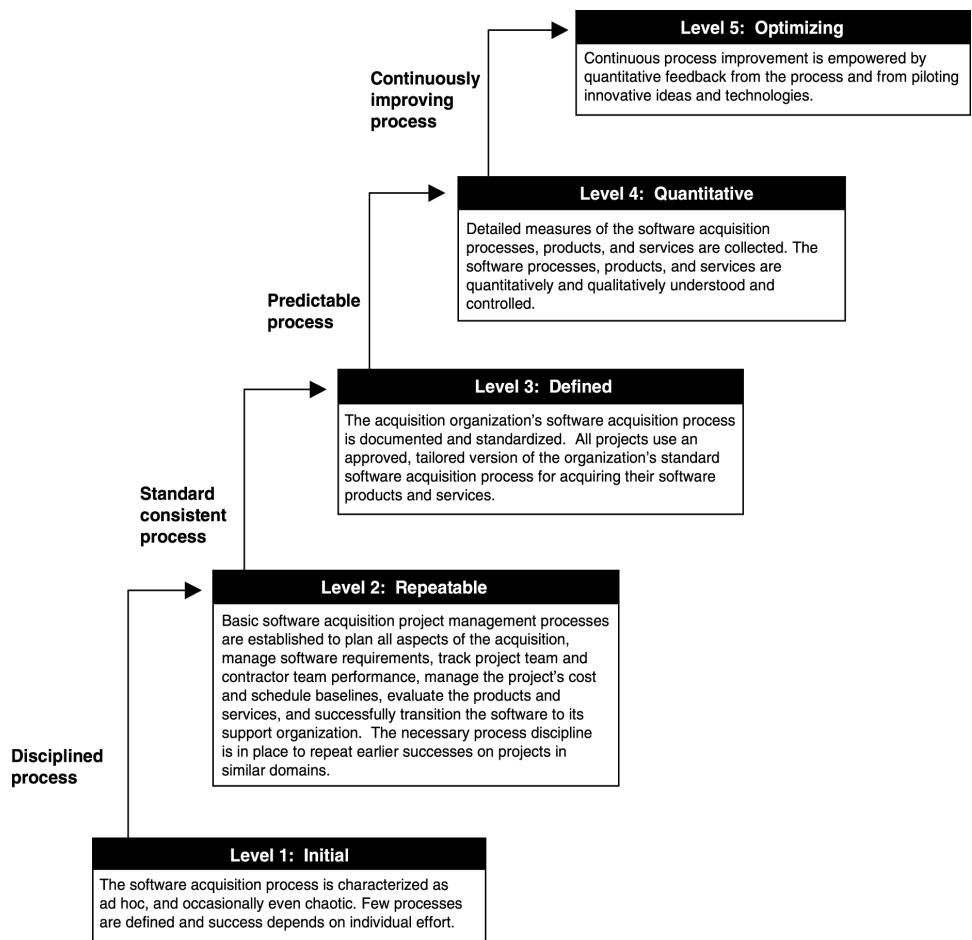
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- BSM is intended to modernize DLA's materiel management business function, changing the agency from being solely a provider and manager of physical inventory to being a manager of supply chains. In this role, DLA would link customers with appropriate suppliers and track physical and financial business practices. It is planning to replace two large legacy systems, as well as several supporting programs, that are more than 30 years old and are not integrated. BSM is based on commercially available software products. DLA plans to acquire and deploy its BSM system solution through a series of four system releases/increments. First, it plans to demonstrate successful application of its new concept of doing business for selected commodities—namely, earth-moving equipment, medical/pharmaceutical supplies, and F/A-18 engine components—at the three Defense Supply Centers. If this first release is successfully demonstrated, DLA plans to expand the system solution to other commodities in three additional increments. DLA plans to invest approximately \$658 million to acquire and implement BSM from fiscal years 2000 through 2005.
 - FAS is intended to help the Defense Energy Support Center manage about \$5 billion in contracts with petroleum suppliers each year. FAS is to be a multifunctional system that provides for, among other things, point-of-sale data collection inventory control, finance and accounting, procurement, and facilities management. FAS, which relies on a commercially available software package, is being fielded incrementally. Increment 1 is the base-level operational module that is currently being deployed to base-level sites worldwide. The second increment is the enterprise-level system, which is to be deployed to its direct delivery commodity business unit. DLA plans to invest \$293 million in FAS from fiscal year 1995 through 2002.

SEI's SA-CMM is used to measure an organization's capability to manage the acquisition of software. SEI's expertise in, and model and methods for, determining software process assessment are recognized and accepted throughout the software industry. The model defines five levels of software acquisition maturity. Each level of maturity (except level 1) indicates process capability in relation to key process areas. For a maturity level to be achieved, all key process areas related to that level must be implemented effectively.

The second level of process maturity, level 2 (referred to as the repeatable level), demonstrates that basic management processes are established to track performance, cost, and schedule, and the necessary discipline is in place to repeat earlier successes on similar projects. Organizations that do not effectively implement all key process areas for the repeatable level are,

by default, at level 1, the initial level of maturity. Level-1 processes can be described as immature, ad hoc, and sometimes chaotic; success in software acquisition for these organizations depends on the ability and commitment of the staff involved. Figure 1 further explains the five-level software acquisition model.

Figure 1: SA-CMM Levels and Descriptions



Source: Software Engineering Institute (SEI).

We evaluated DLA against six of the seven level-2 (repeatable) key process areas in the SA-CMM. We did not evaluate DLA on the seventh key process area—transition to support—because the contractors who are implementing BSM and FAS will support these systems when they are operational, rendering transition to support irrelevant for these

acquisitions. We evaluated DLA against one level-3 (defined) key process area—acquisition risk management—because many software acquisition experts consider it to be one of the most important key process areas. These key process areas are described in table 1.

Table 1: Six SA-CMM Level-2 and One Level-3 Key Process Areas

Key process areas	Description	Examples of SA-CMM required practices ^a
SA-CMM level 2		
Software acquisition planning	Ensuring that reasonable planning for the software acquisition is conducted and that all elements of the project are included.	Includes (1) having a written software acquisition policy, (2) having adequate resources for software acquisition planning, (3) developing and documenting the software acquisition strategy and plan, (4) having management review software acquisition planning activities, and (5) making and using measurements to determine the status of software acquisition planning activities.
Solicitation	Ensuring that award is made to the contractor most capable of satisfying the specified requirements.	Includes (1) designating responsibility for the software portion of the solicitation, (2) preparing cost and schedule estimates for the software products and services being acquired, (3) having a written policy for the conduct of the software portion of the solicitation, and (4) having an independent review of cost and schedule estimates for the software products and services being acquired.
Requirements development and management	Establishing a common and unambiguous definition of software acquisition requirements that is understood by the acquisition team, system users, and contractor(s). This key process area involves two subprocesses: (1) developing a baseline set of software-related contractual requirements and (2) managing these requirements and changes to these requirements for the duration of the acquisition.	Includes (1) having a written policy for managing the software-related contractual requirements, (2) having a group that is responsible for performing requirements development and management activities, (3) ensuring that the team performs its activities in accordance with its documented requirements development and management plans, (4) appraising system requirements change requests for their impact on the software being acquired, (5) appraising changes to the software-related contractual requirements for their impact on performance and contract schedule and cost, and (6) measuring and reporting on the status of requirements development and management activities to management.
Project management	Managing the activities of the project office and supporting contractor(s) to ensure a timely, efficient, and effective software acquisition.	Includes (1) designating responsibility for project management, (2) having a written policy for the management of the software project, (3) having adequate resources for the duration of the software acquisition project, (4) documenting the roles, responsibilities, and authority for the project functions, (5) tracking the risks associated with cost, schedule, and resources, and (6) using a corrective action system for identifying, recording, tracking, and correcting problems.

Key process areas	Description	Examples of SA-CMM required practices ^a
Contract tracking and oversight	Ensuring that the software activities under contract are being performed in accordance with contract requirements and that products and services will satisfy contract requirements.	Includes (1) designating responsibility for contract tracking and oversight, (2) including contract specialists in the project team, (3) ensuring that individuals performing contract tracking and oversight activities have experience or receive training, (4) having a documented plan for contract tracking and oversight, and (5) comparing the actual cost and schedule of the contractor's software engineering effort to planned schedules and budgets.
Evaluation	Determining that the acquired software products and services satisfy contract requirements before acceptance.	Includes (1) designating responsibility for planning, managing, and performing evaluation activities, (2) ensuring that adequate resources are provided for evaluation activities, (3) documenting evaluation plans and conducting evaluation activities in accordance with the plan, (4) developing and managing evaluation requirements in conjunction with developing software technical requirements, and (5) measuring and reporting on the status of evaluation activities to management.
SA-CMM level 3		
Acquisition risk management	Identifying risks as early as possible and adjusting the acquisition to mitigate those risks.	Includes (1) having a written policy for managing software acquisition risk, (2) designating responsibility for software acquisition risk activities, (3) providing adequate resources for software acquisition risk management activities, (4) developing a software acquisition risk management plan, and (5) measuring and reporting on the status of acquisition risk management activities to management.

^aWe included only examples of the SA-CMM key practices.

Source: GAO, based on SEI data.

As established by the model, each key process area contains five common features—commitment to perform, ability to perform, activities to be performed, measurement and analysis of activities, and verification of activities' implementation. These five features collectively provide a framework for the implementation and institutionalization of the key process areas. The common feature definitions are as follows:

- *Commitment to perform:* This feature describes the actions that the organization takes to establish the process and ensure that it can endure. Key practices typically involve establishing organizational policies and sponsorship.
- *Ability to perform:* This feature describes the preconditions that must exist in the project or organization to implement the software acquisition process competently. Key practices typically include assigning responsibility and providing training.
- *Activities to be performed:* This feature describes the roles and procedures necessary to implement a key process area. Key practices typically involve establishing plans and procedures, performing the work, tracking it, and taking appropriate management actions.
- *Measurement and analysis of activities:* This feature describes the steps necessary to measure progress and analyze the measurements. Key

practices typically involve defining the measurements to be taken and the analyses to be conducted to determine the status and effectiveness of the activities performed.

- *Verification of activities' implementation:* This feature describes the steps the organization must take to ensure that project activities are performed in accordance with established processes. Key practices typically involve regular reviews by management.

Each common feature consists of a number of key practices—specific actions such as developing an organizational policy for software acquisition, developing various plans for software acquisition activities, and tracking a contractor's progress. When an organization is evaluated against the SA-CMM, comparisons of actual performance against a key practice can result in one of four possible outcomes or ratings:

- Strength: The key practice involved was effectively implemented.
- Weakness: The key practice was not effectively implemented or was not implemented.
- Observation: The key practice was evaluated, but cannot be characterized as a strength because (1) the project team did not provide sufficient evidence to support a strength rating or (2) the key practice was only partially performed.
- Not rated: The key practice is not relevant to the project.

To achieve the repeatable level, DLA would have to demonstrate that the key practices related to this level were implemented effectively in the software acquisition projects being evaluated, and thus the project successes can be repeated in future projects.

DLA Lacks the Capability to Acquire Software Effectively

DLA is not at level 2 (the repeatable level of maturity) when compared with the SA-CMM—meaning that DLA does not possess an agencywide or corporate ability to effectively acquire software-intensive systems. Whereas DLA's BSM project fully or substantially satisfied SEI's SA-CMM requirements for the key process areas for level 2, as well as requirements for one level 3 (defined level) key process area, its FAS project did not satisfy all the criteria for any of these key process areas. A discussion of how each system compared with the SA-CMM is summarized below.

BSM Satisfied or
Substantially Satisfied
All Key Process Areas

BSM completely satisfied requirements for three of the level-2 key process areas, as well as for the one level-3 key process area, and substantially satisfied requirements for the remaining three level-2 key process areas that we evaluated.⁹ (See table 2 for the percentage of strengths and weakness for each area evaluated.) According to BSM officials, satisfying the criteria for the key process areas is attributable to the following factors: allocating adequate resources; following good program management practices, as defined in DOD Directive 5000; and working closely with relevant oversight groups. To address those few weaknesses that we identified, project officials told us that they have initiated corrective action.

Table 2: Key Process Area Strengths and Weaknesses for BSM

Key process area	Strengths (%)	Weaknesses (%)	Observations (%)
Software acquisition planning	100	0	0
Solicitation	94	6	0
Requirements development and management	79	21	0
Project management	100	0	0
Contract tracking and oversight	100	0	0
Evaluation	93	0	7
Acquisition risk management	100	0	0

Source: GAO calculations, based on data and interviews with Business Systems Modernization officials.

BSM satisfied all key practices in

- software acquisition planning, such as (1) having a written software acquisition policy, (2) having adequate resources for software acquisition planning activities, (3) developing and documenting the software acquisition strategy and plan, and (4) making and using measurements to determine the status of software acquisition planning activities.
- project management, including (1) designating responsibility for project management, (2) having a written policy for the management of the software project, (3) having adequate resources for the duration of the

⁹We did not evaluate BSM against the transition-to-support key process area because the contractor who is implementing BSM will also support this system when it is operational, rendering transition to support irrelevant.

-
- software acquisition project, and (4) tracking the risks associated with cost, schedule, resources, and the technical aspects of the project.
 - contract tracking and oversight, including (1) designating responsibility for contract tracking and oversight, (2) including contract specialists in the project team, and (3) having a documented plan for contract tracking and oversight.
 - acquisition risk management, such as (1) having a risk management plan, (2) having a written policy for the management of software acquisition risk, and (3) measuring and reporting on the status of acquisition risk management activities to management.

BSM also satisfied all but one key practice in solicitation. Strengths included (1) designating responsibility for the software portion of the solicitation, (2) preparing cost and schedule estimates for the software products and services being acquired, and (3) having an independent review of cost and schedule estimates for the software products and services being acquired. BSM's one weakness in this key process area was in not having a written policy for the software portion of the solicitation. This is significant because, according to the SEI, an institutional policy provides for establishing an enduring process.

BSM also satisfied all but three key practices in requirements development and management. Strengths included (1) having a written policy for managing the software-related contractual requirements, (2) having a group that is responsible for performing requirements development and management activities, and (3) measuring and reporting to management on the status of requirements development and management activities. One of the three weaknesses was the lack of a documented requirements development and management plan. Such a plan provides a roadmap for completing important requirements development and management activities. Without it, projects risk either not performing important tasks or not performing them effectively. The other two weaknesses involved the project office's appraisal of system requirements changes. Specifically, BSM did not appraise (1) requests to change system requirements for their impact on the software being acquired or (2) all changes to the requirements for impact on performance and contract schedule and cost. These activities are critical to making informed, risk-based decisions about whether to approve requirements changes.

Last, BSM satisfied all but one key practice in evaluation, and we do not view that practice as significant. Strengths included (1) designating responsibility for contract tracking and oversight, (2) documenting evaluation plans and conducting evaluation activities in accordance with

the plan, and (3) developing and managing evaluation requirements in conjunction with developing software technical requirements.

By generally satisfying these key process areas for its BSM project, DLA has increased the chances that the software acquired on this project will meet stated requirements and will be delivered on time and within budget.

See appendix II for more detailed information on key process areas and our findings on BSM.

FAS Did Not Satisfy Any of the Key Process Areas

Because of the number and severity of its key practice weaknesses, FAS did not fully satisfy all the criteria for any of the five level-2 SA-CMM key process areas or for the one level-3 key process area that we evaluated.¹⁰ (See table 3 for the percentage of strengths and weakness for each area evaluated.) According to FAS officials, these weaknesses are attributable to a lack of adequate resources for the process areas. However, these officials stated that they are currently in the process of reorganizing and addressing resource shortages.

Table 3: Key Process Area Strengths and Weaknesses for FAS

Key process area	Strengths (%)	Weaknesses (%)	Observations (%)	Not rated (%)
Software acquisition planning	80	13	7	—
Requirements development and management	43	43	14	—
Project management	63	37	—	—
Contract tracking and oversight	65	29	6	—
Evaluation	60	13	13	14
Acquisition risk management	20	73	7	—

Source: GAO calculations, based on data and interviews with Fuels Automated System officials.

In the software-acquisition-planning key process area, FAS had 12 strengths, 2 weaknesses, and 1 observation. Strengths included, among other things, (1) having a written software acquisition policy, (2) developing and documenting the software acquisition strategy and plan,

¹⁰We did not evaluate FAS on solicitation because it was a sole-source purchase, or on transition to support because the contractor who is implementing FAS will also support this system when it is operational, rendering transition to support irrelevant.

and (3) having management review software-acquisition-planning activities. Weaknesses included (1) not having adequate resources for software-acquisition-planning activities and (2) not measuring the status of the software-acquisition-planning activities and resultant products. The weaknesses are significant because they could prevent management from developing effective plans, from being aware of problems in meeting planned commitments, or from taking necessary corrective actions expeditiously.

In the requirements development and management key process area, FAS had six strengths, six weaknesses, and two observations. Examples of strengths included (1) having a written policy for managing the software-related contractual requirements and (2) having a group that is responsible for performing requirements development and management activities. However, we found weaknesses in important key practices that jeopardize effective control of the requirements baseline and can result in software products that do not meet cost, schedule, or performance objectives. Specific examples of weaknesses included (1) not having a documented requirements development and management plan, (2) not appraising requests to change system requirements for their impact on the software being acquired, (3) not appraising changes to the software-related contractual requirements for their impact on performance and contract schedule and cost, and (4) not measuring and reporting to management on the status of requirements development and management activities.

In the project management key process area, FAS had 10 strengths and 6 weaknesses. Strengths included, among other things, (1) designating responsibility for project management, (2) having a written policy for the management of the software project, and (3) using a corrective action system for identifying, recording, tracking, and correcting problems. Examples of weaknesses included (1) not having adequate resources for the duration of the software acquisition project, (2) not documenting the roles, responsibilities, and authority for the project functions, and (3) not tracking the risks associated with cost, schedule, and resources. These weaknesses are significant because they could jeopardize the project's ability to ensure that important project management and contractor activities are defined, understood, and completed.

FAS had 11 strengths, 5 weaknesses, and 1 observation in the contract tracking and oversight key process area. Strengths included, among other things, (1) designating responsibility for contract tracking and oversight, (2) including contract specialists on the project team, and (3) ensuring that individuals performing contract tracking and oversight activities had

experience or received training. Examples of weaknesses included (1) not having a documented plan for contract tracking and oversight and (2) not comparing the actual cost and schedule of the contractor's software engineering effort with planned schedules and budgets. Because of these weaknesses, FAS contractor tracking and oversight activities are undisciplined and unstructured, thereby increasing the chances of FAS software acquisitions being late, costing more than expected, and not performing as intended.

In the evaluation key process area, FAS had nine strengths, two weaknesses, two observations, and two areas that were not rated. Strengths included, among other things, (1) designating responsibility for planning, managing, and performing evaluation activities, (2) documenting evaluation plans and conducting evaluation activities in accordance with the plan, and (3) developing and managing evaluation requirements in conjunction with developing software technical requirements. Weaknesses were (1) not ensuring that adequate resources were provided for evaluating activities and (2) not measuring and reporting on the status of evaluation activities to management. These weaknesses are significant because they preclude DLA decisionmakers from knowing whether contractor-developed software is meeting defined requirements.

FAS performed poorly in the one level-3 key process area that we evaluated—acquisition risk management—with 3 strengths, 11 weaknesses, and 1 observation. Examples of strengths included (1) having a written policy for the management of software acquisition risk and (2) designating responsibility for software acquisition risk activities. Weaknesses included, among others, (1) not having adequate resources for performing risk management activities, (2) not having a software risk management plan, and (3) not measuring and reporting on the status of acquisition risk management activities to management. Because of these weaknesses, the project office does not have adequate assurance that it will promptly identify risks and effectively mitigate them before they become problems.

By not satisfying any of these key process areas for its FAS project, DLA is unnecessarily increasing the risk that the software acquired on this project will not meet stated requirements and will not be delivered on time and within budget.

Appendix III provides more details on the key process areas and our findings on FAS.

DLA Lacks Effective Software Process Improvement

The quality of the processes involved in developing, acquiring, and engineering software and systems has a significant effect on the quality of the resulting products. Accordingly, process improvement programs can increase product quality and decrease product costs. Public and private organizations have reported significant returns on investment through such process improvement programs. In particular, SEI has published reports of benefits realized through process improvement programs. For example, SEI reported in 1995¹¹ that a major defense contractor had implemented a process improvement program in 1988 and by 1995 had reduced its re-work costs from about 40 percent of project cost to about 10 percent, increased staff productivity by about 170 percent, and reduced defects by about 75 percent. According to a 1999 SEI report,¹² a software development contractor reduced its average deviation from estimated schedule time from 112 percent to 5 percent between 1988 and 1996. During the same period, SEI reported that this contractor reduced its average deviation from estimated cost from 87 percent to minus 4 percent.

DLA does not currently have a software process improvement program, and recent efforts to establish one have not made much progress. We recently reported on DOD's software process improvement efforts, including those within DLA. Specifically, we reported that before 1998, DLA had a software process improvement program;¹³ however, DLA eliminated it during a reorganization in 1998. In response to our report, DLA's Chief Information Officer said that the software process improvement program was to be reestablished during fiscal year 2001 and that DLA's goal would be for its system developers and acquirers to reach a level 2 on the CMM by fiscal year 2002.

To date, DLA has established an integrated product team for software process improvement that is tasked to study DLA's software processes and, based on this study, to make recommendations on areas in which DLA needs to improve. DLA has also dropped its goal of achieving level 2 by 2002, and it does not intend to specify a CMM level for its contractors. The software process improvement team has produced several draft papers and a draft policy, but it does not have a plan or milestones for achieving software process improvement. According to an agency official

¹¹Technical report CMU/SEI-95-TR-017, November 1995.

¹²Technical Report CMU/SEI-99-TR-027, November 1999.

¹³[GAO-01-116](#), March 30, 2001.

associated with DLA's process improvement effort, funding to develop and implement a software process improvement program has not been approved because of other agency IT funding priorities, such as BSM.

Conclusions

DLA does not have the institutional management capabilities necessary for effectively acquiring quality software repeatedly on one project after another. This lack of agencywide consistency in software acquisition management controls means that software project success at DLA currently depends more on the individuals assigned to a given project than on the rules governing how any assigned individuals will function. That has proven to be a risky way to manage software-intensive acquisitions.

To DLA's benefit, it currently has a model software acquisition project (BSM) that, albeit not perfect, is a solid example from which to leverage lessons learned and replicate effective software acquisition practices across the agency. To do so effectively, however, DLA will need to implement a formal software process improvement program and devote adequate resources to correct the weaknesses in the software acquisition processes discussed in this report. It will also have to commit the resources needed to implement a software process improvement program.

Recommendations for Executive Action

To reduce the software acquisition risks associated with its two ongoing acquisition projects, we recommend that the Secretary of Defense direct the Director of DLA to immediately correct each BSM and FAS software-acquisition-practice weakness identified in this report.

To ensure that DLA has in place the necessary process controls to acquire quality software consistently on future acquisition projects, we recommend that the Secretary also direct the DLA Director to

- issue a policy requiring that (1) DLA software-intensive acquisition projects satisfy all applicable SEI SA-CMM level-2 key process areas and the level-3 risk management key process area and (2) DLA software contractors have comparable software process maturity levels; and
- direct the Chief Information Officer (CIO) to establish and sustain a software process improvement program, including (1) developing and implementing a software process improvement plan that specifies measurable goals and milestones, (2) providing adequate resources to the program, and (3) reporting to the Director every 6 months on progress against plans.

Agency Comments

DOD provided what it termed “official oral comments” from the Deputy Under Secretary for Logistics and Materiel Readiness on a draft of this report. In its comments, DOD stated that it generally concurred with the report and concurred with the recommendations. In particular, DOD stated that it will issue policy directives requiring the Director of DLA to (1) correct identified software acquisition practice weaknesses, except in circumstances in which corrections to past events make doing so impractical; (2) implement a plan in all software-intensive projects to satisfy all applicable SEI SA-CMM level-2 and level-3 key process areas, and require all DLA software contractors to have comparable software process maturity levels; and (3) establish and sustain a software process improvement program that includes a plan specifying measurable goals and milestones, provides adequate resources, and reports to the Director of DLA every 6 months on progress against the plan.

We are sending copies of this report to the Chairmen and Ranking Minority Members of the Senate Appropriations Subcommittee on Defense; the Subcommittee on Readiness and Management Support, Senate Committee on Armed Services; the House Appropriations Subcommittee on Defense; and the Subcommittee on Readiness, House Committee on Armed Services. We are also sending copies to the Director, Office of Management and Budget; the Under Secretary of Defense for Acquisition and Technology; the Deputy Under Secretary of Defense for Logistics and Materiel Readiness; and the Director, Defense Logistics Agency. Copies will be made available to others upon request.

If you have any questions regarding this report, please contact me at (202) 512-3439 or by e-mail at hiter@gao.gov. An additional GAO contact and staff acknowledgements are listed in appendix IV.



Randolph C. Hite
Director, Information Technology Systems Issues

Appendix I: Objectives, Scope, and Methodology

Our objectives were to determine (1) whether the Defense Logistics Agency (DLA) has the effective software acquisition processes necessary to modernize and maintain systems and (2) what actions DLA has planned or in place to improve these processes.

To determine whether DLA has effective software acquisition processes, we applied the Software Engineering Institute's (SEI) Software Acquisition Capability Maturity Model using our SEI-trained analysts. We focused on the key process areas necessary to obtain a repeatable level of maturity, the second level of SEI's five-level model. We also evaluated against one level-3 key process area—acquisition risk management—because of its importance. We met with project managers and project team members to determine whether and to what extent they implemented each key practice, and to obtain relevant documentation. In accordance with the SEI model, for each key process area we reviewed,¹⁴ we evaluated DLA's institutional policies and practices and compared project-specific guidance and practices against the required key practices.

More specifically, for each key practice we reviewed, we compared project-specific documentation and practices against the criteria in the software acquisition model. If the project met the criteria for the key practice reviewed, we rated it as a strength. If the project did not meet the criteria for the key practice reviewed, we rated it as a weakness. If the evidence was mixed or inconclusive and did not support a rating of either a strength or a weakness, we treated it as an observation. If the key practice was not relevant to the project, we did not rate it.

We evaluated DLA's only two software acquisition projects underway at the time of our review: the Business Systems Modernization (BSM) and the Fuels Automated System (FAS).

To determine what actions DLA has planned or in place to improve its software processes, we identified the group within DLA that is tasked with

¹⁴We evaluated BSM in six of the seven level-2 key process areas—software acquisition planning, solicitation, requirements development and management, project management, contract tracking and oversight, and evaluation. We evaluated FAS in five of the seven level-2 key process areas, as listed above, except for solicitation. We did not evaluate FAS on solicitation because it is a sole-source procurement. We did not evaluate BSM or FAS on the seventh key practice area—transition to support—because the contractors who are implementing these systems will also support the systems when they are operational, rendering transition to support irrelevant. We also evaluated BSM and FAS on one level-3 key process area—acquisition risk management.

performing this function. We interviewed agency officials who are involved in software process improvement, collected data, and analyzed draft policies and draft working papers describing planned work.

We performed our work from May through October 2001, in accordance with generally accepted government auditing standards.

Appendix II: Results of Software Acquisition Capability Maturity Model Evaluation for Business Systems Modernization

Table 3: Software Acquisition Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for planning the software acquisition.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for planning the software acquisition.	Strength ^a
Commitment 2	Responsibility for software acquisition planning activities is designated.	Responsibility for software acquisition planning activities is assigned to the BSM program manager.	Strength
Ability 1	A group that is responsible for planning the software acquisition exists.	The BSM program office is responsible for planning the software acquisition.	Strength
Ability 2	The acquisition organization provides experienced software acquisition management personnel to support project software acquisition planning.	DLA provides experienced software acquisition management personnel to support program software acquisition planning.	Strength
Ability 3	Adequate resources are provided for software acquisition planning activities.	According to BSM program officials, adequate resources are provided for software acquisition planning activities.	Strength
Activity 1	Software acquisition planning personnel are involved in system acquisition planning.	Software acquisition planning personnel are involved in system acquisition planning.	Strength
Activity 2	The project's software acquisition planning is accomplished in conjunction with system acquisition planning.	The BSM program's software acquisition planning is accomplished in conjunction with system acquisition planning.	Strength
Activity 3	The software acquisition strategy for the project is developed and documented.	The software acquisition strategy for the program is developed and documented in the Acquisition Strategy Plan.	Strength
Activity 4	Software acquisition planning addresses the elements of the software acquisition process.	Software acquisition planning addresses the elements of the software acquisition process, such as program management, requirements development and management, contract tracking and oversight, and evaluation.	Strength
Activity 5	The project's software acquisition planning is documented and the planning documentation is maintained over the life of the project.	The BSM program's software acquisition planning is documented and the planning documentation is maintained over the life of the program.	Strength
Activity 6	Life-cycle support of the software is included in software acquisition planning documentation.	Life-cycle support of the software, such as identifying adequate facilities and resources for the software support organization, is included in software acquisition planning documentation.	Strength
Activity 7	Life-cycle cost and schedule estimates for the software products and services being acquired are prepared and independently reviewed.	Life-cycle cost and schedule estimates for the software products and services being acquired are prepared by the BSM program office and independently reviewed by the Naval Center for Cost Analysis.	Strength
Measurement 1	Measurements are made and used to determine the status of the software acquisition planning activities and resultant products.	Measurements, such as metrics that track software acquisition planning activities and compare them to baselines, are made and used to determine the status of the software acquisition planning activities and resultant products.	Strength

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Common feature	Key practice	Finding	Rating
Verification 1	Software acquisition planning activities are reviewed by acquisition organization management on a periodic basis.	Software acquisition planning activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Software acquisition planning activities are reviewed by the project manager on both a periodic and event-driven basis.	Software acquisition planning activities are reviewed by the program manager on both a weekly and event-driven basis.	Strength

*Strength = Key practice effectively implemented.

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 4: Solicitation Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for the conduct of the software portion of the solicitation.	The BSM program officials stated that The Defense Acquisition System (DODD 5000) is the written policy for the conduct of the software portion of the solicitation; however, this directive does not address the conduct of the software portion of the solicitation.	Weakness ^a
Commitment 2	Responsibility for the software portion of the solicitation is designated.	Responsibility for the software portion of the solicitation is assigned to the Contracting Officer.	Strength
Commitment 3	A selection official has been designated to be responsible for the selection process and the decision.	The Contracting Officer has been designated the selection official responsible for the selection process and the decision.	Strength
Ability 1	A group that is responsible for coordinating and conducting solicitation activities exists.	The BSM Acquisition Integrated Product Team is responsible for coordinating and conducting solicitation activities.	Strength
Ability 2	Adequate resources are provided for solicitation activities.	According to BSM program officials, adequate resources are provided for solicitation activities.	Strength
Ability 3	Individuals performing solicitation activities have experience or receive training.	Individuals performing solicitation activities have experience and receive training.	Strength
Ability 4	The groups supporting the solicitation (e.g., end user, systems engineering, software support organization, and application domain experts) receive orientation on the solicitation's objectives and procedures.	The groups supporting the solicitation (e.g., end user, systems engineering, software support organization, and application domain experts) receive orientation on the solicitation's objectives and procedures.	Strength
Activity 1	The project team performs its activities in accordance with its documented solicitation plans.	The BSM program office performs its activities in accordance with its documented solicitation plans.	Strength
Activity 2	Solicitation activities are conducted in a manner compliant with relevant laws, policies, and guidance.	Solicitation activities are conducted in a manner compliant with relevant laws, policies, and guidance.	Strength
Activity 3	The software and evaluation requirements are incorporated into the solicitation package and resulting contract.	The software and evaluation requirements are incorporated into the solicitation package and resulting contract.	Strength
Activity 4	Proposals are evaluated in accordance with documented solicitation plans.	Proposals are evaluated in accordance with documented solicitation plans.	Strength
Activity 5	Cost and schedule estimates for the software products and services being sought are prepared.	Cost and schedule estimates for the software products and services being sought are prepared.	Strength
Activity 6	Software cost and schedule estimates are independently reviewed for comprehensiveness and realism.	Software cost and schedule estimates are independently reviewed by the Naval Center for Cost Analysis for comprehensiveness and realism.	Strength
Activity 7	The selection official uses proposal evaluation results to support his or her decision to select an offeror.	The selection official uses proposal evaluation results to support his decision to select an offeror.	Strength
Activity 8	The project team takes action to ensure the mutual understanding of software requirements and plans with the selected offeror(s) prior to contract signing.	The BSM program office takes actions, such as meetings, e-mails, and question and answer sessions, to ensure the mutual understanding of software requirements and plans with the selected offeror(s) prior to contract signing.	Strength

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Common feature	Key practice	Finding	Rating
Measurement 1	Measurements are made and used to determine the status of the solicitation activities and resultant products.	Measurements, such as metrics that track solicitation activities and compare them to baselines, are made and used to determine the status of the solicitation activities and resultant products.	Strength
Verification 1	Solicitation activities are reviewed by the acquisition organization management on a periodic basis.	Solicitation activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Solicitation activities are reviewed by the project manager or designated selection official on both a periodic and event-driven basis.	Solicitation activities are reviewed by the program manager and designated selection official on both a weekly and event-driven basis.	Strength

^aWeakness = Key practice not effectively implemented or not implemented.

Source: Key practice data from SEI; findings and ratings from GAO.

**Appendix II: Results of Software Acquisition
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Table 5: Requirements Development and Management Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for establishing and managing the software-related contractual requirements.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for establishing and managing the software-related contractual requirements.	Strength
Commitment 2	Responsibility for requirements development and management is designated.	Responsibility for requirements development and management is assigned to the BSM Core Integrated Product Team.	Strength
Ability 1	A group that is responsible for performing requirements development and management activities exists.	The BSM Requirements Development and Management Integrated Product Team is responsible for performing requirements development and management activities.	Strength
Ability 2	Adequate resources are provided for requirements development and management activities.	According to BSM program officials, adequate resources are provided for requirements development and management activities.	Strength
Ability 3	Individuals performing requirements development and management activities have experience or receive training.	Individuals performing requirements development and management activities have experience and receive training.	Strength
Activity 1	The project team performs its activities in accordance with its documented requirements development and management plans.	The BSM program does not have documented requirements development and management plans.	Weakness
Activity 2	The project team develops, baselines, and maintains software-related contractual requirements and places them under change control early in the project, but not later than release of the solicitation package.	The BSM program office team developed, baselined, and maintained software-related contractual requirements and placed them under change control at the same time the solicitation package was released.	Strength
Activity 3	The project team appraises system requirements change requests for their impact on the software being acquired.	The BSM program office does not appraise system requirements change requests for their impact on the software being acquired.	Weakness
Activity 4	The project team appraises all changes to the software-related contractual requirements for their impact on performance, architecture, supportability, system resource utilization, and contract schedule and cost.	The BSM program office does not appraise all changes to the software-related contractual requirements for their impact on performance, architecture, supportability, system resource utilization, and contract schedule and cost.	Weakness
Activity 5	Bi-directional traceability between the contractual requirements and the contractor's team software work products and services is maintained throughout the effort.	The BSM program office has a traceability matrix that it uses to trace between the contractual requirements and the contractor's team software work products and services. The matrix is maintained throughout the effort.	Strength
Activity 6	The end user and other affected groups are involved in the development of all software-related contractual requirements and any subsequent change activity.	The end user and other affected groups, such as the program management group, change management group, and technical management group, are involved in the development of all software-related contractual requirements and any subsequent change activity.	Strength
Measurement 1	Measurements are made and used to determine the status of the requirements development and management activities and resultant products.	Measurements, such as metrics that track requirements development and management activities and compare them to baselines, are made and used to determine the status of the requirements development and management activities and resultant products.	Strength

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Common feature	Key practice	Finding	Rating
Verification 1	Requirements development and management activities are reviewed by acquisition organization management (and the contractor) on a periodic basis.	Requirements development and management activities are reviewed by the DLA Executive Board on a quarterly basis and by the contractor on a weekly basis.	Strength
Verification 2	Requirements development and management activities are reviewed by the project manager on both a periodic and event-driven basis.	Requirements development and management activities are reviewed by the program manager on both a weekly and event-driven basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 6: Project Management Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for execution of the software project.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for execution of the software program.	Strength
Commitment 2	Responsibility for project management is designated.	Responsibility for program management is assigned to the BSM program manager.	Strength
Ability 1	A team that is responsible for performing the project's software acquisition management activities exists.	The BSM Program Management Office is responsible for performing the program's software acquisition management activities.	Strength
Ability 2	Adequate resources for the project team are provided for the duration of the software acquisition project.	According to BSM program officials, adequate resources for the program team are provided for the duration of the software acquisition program.	Strength
Ability 3	When project trade-offs are necessary, the project manager is permitted to alter the performance, cost, or schedule software acquisition baseline.	When program trade-offs are necessary, the program manager is permitted to alter the performance, cost, or schedule software acquisition baseline.	Strength
Ability 4	The project team has experience or receives training in project software acquisition management activities.	The BSM program office has experience and receives training in program software acquisition management activities.	Strength
Activity 1	The project team performs its activities in accordance with its documented software acquisition management plans.	The BSM program office performs its activities in accordance with its Acquisition Strategy Plan.	Strength
Activity 2	The roles, responsibilities, and authority for the project functions are documented, maintained, and communicated to affected groups.	The roles, responsibilities, and authority for the program functions are documented in the Acquisition Strategy Plan and are maintained and communicated to affected groups.	Strength
Activity 3	The project team's commitments, and changes to commitments, are communicated to affected groups.	The BSM program office's commitments, and changes to commitments, are communicated to affected groups during weekly status meetings.	Strength
Activity 4	The project team tracks the risks associated with cost, schedule, resources, and the technical aspects of the project.	The BSM program office tracks the risks associated with cost, schedule, resources, and the technical aspects of the program.	Strength
Activity 5	The project team tracks project issues, status, execution, funding, and expenditures against project plans and takes action.	The BSM program office tracks program issues, status, execution, funding, and expenditures against program plans and takes action.	Strength
Activity 6	The project team implements a corrective action system for the identification, recording, tracking, and correction of problems discovered during the software acquisition.	The BSM program office implemented a corrective action system for the identification, recording, tracking, and correction of problems discovered during the software acquisition.	Strength
Activity 7	The project team keeps its plans current during the life of the project as replanning occurs, issues are resolved, requirements are changed, and new risks are discovered.	The BSM program office keeps its plans current during the life of the program as replanning occurs, issues are resolved, requirements are changed, and new risks are discovered.	Strength
Measurement 1	Measurements are made and used to determine the status of the project management activities and resultant products.	Measurements, such as metrics that track program management activities and compare them to baselines, are made and used to determine the status of the program management activities and resultant products.	Strength

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Common feature	Key practice	Finding	Rating
Verification 1	Project management activities are reviewed by acquisition organization management on a periodic basis.	Program management activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Project management activities are reviewed by the project manager on both a periodic and event-driven basis.	Program management activities are reviewed by the program manager on both a weekly and event-driven basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 7: Contract Tracking and Oversight Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for the contract tracking and oversight of the contracted software effort.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for the contract tracking and oversight of the contracted software effort.	Strength
Commitment 2	Responsibility for contract tracking and oversight activities is designated.	Responsibility for contract tracking and oversight activities is assigned to the Contract Management Office.	Strength
Commitment 3	The project team includes contracting specialists in the execution of the contract.	The BSM program office includes contracting specialists in the execution of the contract.	Strength
Ability 1	A group that is responsible for managing contract tracking and oversight activities exists.	The BSM Acquisition and Contract Management Integrated Product Team is responsible for managing contract tracking and oversight activities.	Strength
Ability 2	Adequate resources are provided for contract tracking and oversight activities.	According to BSM program officials, adequate resources are provided for contract tracking and oversight activities.	Strength
Ability 3	Individuals performing contract tracking and oversight activities have experience or receive training.	Individuals performing contract tracking and oversight activities have experience and receive training.	Strength
Activity 1	The project team performs its activities in accordance with its documented contract tracking and oversight plans.	The BSM program office performs its activities in accordance with its documented contract tracking and oversight plans.	Strength
Activity 2	The project team reviews required contractor software planning documents which, when satisfactory, are used to oversee the contractor team's software engineering effort.	The BSM program office reviews required contractor software planning documents such as the program management plan, software risk management plan, and subcontract management plan which, when satisfactory, it uses to oversee the contractor team's software engineering effort.	Strength
Activity 3	The project team conducts periodic reviews and interchanges with the contractor team.	The BSM program office conducts daily reviews and interchanges with the contractor team.	Strength
Activity 4	The actual cost and schedule of the contractor's software engineering effort are compared to planned schedules and budgets and issues are identified.	The actual cost and schedule of the contractor's software engineering effort are compared to planned schedules and budgets and issues are identified.	Strength
Activity 5	The size, critical computer resources, and technical activities associated with the contractor team's work products are tracked and issues identified.	The size, critical computer resources, and technical activities associated with the contractor team's work products are tracked and issues identified.	Strength
Activity 6	The project team reviews and tracks the development of the software engineering environment required to provide life cycle support for the acquired software and issues are identified.	The BSM program office reviews and tracks the development of the software engineering environment required to provide life cycle support for the acquired software and issues are identified.	Strength
Activity 7	Any issues found by the project team during contract tracking and oversight are recorded in the appropriate corrective action system, action taken, and tracked to closure.	Any issues found by the BSM program office during contract tracking and oversight are recorded in the appropriate corrective action system, action taken, and tracked to closure.	Strength

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Common feature	Key practice	Finding	Rating
Activity 8	The project team ensures that changes to the software-related contractual requirements are coordinated with all affected groups and individuals, such as the contracting official, contractor, and end user.	The BSM program office ensures that changes to the software-related contractual requirements are coordinated with all affected groups and individuals, such as the contracting official, contractor, and end user.	Strength
Measurement 1	Measurements are made and used to determine the status of the contract tracking and oversight activities and resultant products.	Measurements, such as metrics that track contract tracking and oversight activities and compare them to baselines, are made and used to determine the status of the contract tracking and oversight activities and resultant products.	Strength
Verification 1	Contract tracking and oversight activities are reviewed by acquisition organization management on a periodic basis.	Contract tracking and oversight activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Contract tracking and oversight activities are reviewed by the project manager on both a periodic and event-driven basis.	Contract tracking and oversight activities are reviewed by the program manager on both a weekly and event-driven basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 8: Evaluation Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for managing the evaluation of the acquired software products and services.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for managing the evaluation of the acquired software products and services.	Strength
Commitment 2	Responsibility for evaluation activities is designated.	Responsibility for evaluation activities is assigned to the BSM Program Management Office.	Strength
Ability 1	A group that is responsible for planning, managing, and performing evaluation activities for the project exists.	The BSM Test and Evaluation Integrated Product Team is responsible for planning, managing, and performing evaluation activities for the program.	Strength
Ability 2	Adequate resources are provided for evaluation activities.	According to BSM program officials, adequate resources are provided for evaluation activities.	Strength
Ability 3	Individuals performing evaluation activities have experience or receive training.	Individuals performing evaluation activities have experience and receive training.	Strength
Ability 4	Members of the project team and groups supporting the software acquisition receive orientation on the objectives of the evaluation approach.	Members of the BSM program office stated that they received orientation on the objectives of the evaluation approach; however, they could not provide documentation to support this.	Observation ^a
Activity 1	The project team performs its activities in accordance with its documented evaluation plans.	The BSM program office performs its activities, such as assessing technical risk, reviewing the integration approach, and ensuring that resources are sufficient, in accordance with its documented evaluation plans.	Strength
Activity 2	The project's evaluation requirements are developed in conjunction with the development of the system or software technical requirements.	The BSM program's evaluation requirements are developed in conjunction with the development of the system technical requirements.	Strength
Activity 3	The project's evaluation activities are planned to minimize duplication and take advantage of all evaluation results, where appropriate.	The BSM program's evaluation activities, as stated in the Test and Evaluation Master Plan, are planned to minimize duplication and take advantage of all evaluation results, where appropriate.	Strength
Activity 4	The project team appraises the contractor team's performance over the total period of the contract for compliance with requirements.	The BSM program team appraises the contractor team's performance over the total period of the contract for compliance with requirements.	Strength
Activity 5	Planned evaluations are performed on the evolving software products and services prior to acceptance for operational use.	Planned evaluations are performed on the evolving software products and services prior to acceptance for operational use.	Strength
Activity 6	Results of the evaluations are analyzed and compared to the contract's requirements to establish an objective basis to support the decision to accept the products and services or to take further action.	Results of the evaluations are analyzed and compared to the contract's requirements to establish an objective basis to support the decision to accept the products and services or to take further action.	Strength

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Common feature	Key practice	Finding	Rating
Measurement 1	Measurements are made and used to determine the status of the evaluation activities and resultant products.	Measurements, such as metrics that track evaluation activities and compare them to baselines, are made and used to determine the status of the evaluation activities and resultant products.	Strength
Verification 1	Evaluation activities are reviewed by acquisition organization management on a periodic basis.	Evaluation activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Evaluation activities are reviewed by the project manager on both a periodic and event-driven basis.	Evaluation activities are reviewed by the program manager on both a weekly and event-driven basis.	Strength

^aObservation = Key practice evaluated, but the practice cannot be rated as either a strength or a weakness because (1) documentation was not provided or (2) the practice was only partially implemented.

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 9: Acquisition Risk Management Findings for BSM

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for the management of software acquisition risk.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for the management of software acquisition risk.	Strength
Commitment 2	Responsibility for software acquisition risk management activities is designated.	Responsibility for software acquisition risk management activities is assigned to the Risk Management Office.	Strength
Ability 1	A group that is responsible for coordinating software acquisition risk management activities exists.	BSM's Risk and Issue Management Integrated Product Team is responsible for coordinating software acquisition risk management activities.	Strength
Ability 2	Adequate resources are provided for software acquisition risk management activities.	According to BSM program officials, adequate resources are provided for software acquisition risk management activities.	Strength
Ability 3	Individuals performing software acquisition risk management activities have experience or receive required training.	Individuals performing software acquisition risk management activities have experience and receive required training.	Strength
Activity 1	Software acquisition risk management activities are integrated into software acquisition planning.	Software acquisition risk management activities are integrated into software acquisition planning.	Strength
Activity 2	The Software Acquisition Risk Management Plan is developed in accordance with the project's defined software acquisition process.	The Acquisition Risk Management Plan is developed in accordance with the program's defined software acquisition process.	Strength
Activity 3	The project team performs its software acquisition risk management activities in accordance with its documented plans.	The BSM program office performs its software acquisition risk management activities in accordance with its documented Acquisition Risk Management Plan.	Strength
Activity 4	The project team encourages and rewards project-wide participation in the identification and mitigation of risks.	The BSM program office encourages and rewards program-wide participation in the identification and mitigation of risks. For example, staff who identify risks are publicly commended during weekly status meetings.	Strength
Activity 5	Risk management is conducted as an integral part of the solicitation, project performance management, and contract performance management processes.	Risk management is conducted as an integral part of the solicitation, program performance management, and contract performance management processes.	Strength
Activity 6	Software acquisition risks are analyzed, tracked, and controlled until mitigated.	Software acquisition risks are analyzed, tracked, and controlled until mitigated.	Strength
Activity 7	Project reviews include the status of identified risks.	Program reviews include the status of identified risks.	Strength
Measurement 1	Measurements are made and used to determine the status of the acquisition risk management activities and resultant products.	Measurements, such as metrics that track identified risks from discovery to mitigation to closure, are made and used to determine the status of the acquisition risk management activities and resultant products.	Strength
Verification 1	Acquisition risk management activities are reviewed by acquisition organization management on a periodic basis.	Acquisition risk management activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength

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Common feature	Key practice	Finding	Rating
Verification 2	Acquisition risk management activities are reviewed by the project manager on both a periodic and event-driven basis.	Acquisition risk management activities are reviewed by the program manager on both a weekly and event-driven basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

Appendix III: Results of Software Acquisition Capability Maturity Model Evaluation for Fuels Automated System

Table 10: Software Acquisition Planning Findings for FAS

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for planning the software acquisition.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for planning the software acquisition.	Strength ^a
Commitment 2	Responsibility for software acquisition planning activities is designated.	Responsibility for software acquisition planning activities is assigned to the FAS program manager.	Strength
Ability 1	A group that is responsible for planning the software acquisition exists.	The FAS program office is responsible for planning the software acquisition.	Strength
Ability 2	The acquisition organization provides experienced software acquisition management personnel to support project software acquisition planning.	DLA provides experienced software acquisition management personnel to support program software acquisition planning.	Strength
Ability 3	Adequate resources are provided for software acquisition planning activities.	According to FAS program officials, adequate resources are not provided for software acquisition planning activities.	Weakness ^b
Activity 1	Software acquisition planning personnel are involved in system acquisition planning.	Software acquisition planning personnel are involved in system acquisition planning.	Strength
Activity 2	The project's software acquisition planning is accomplished in conjunction with system acquisition planning.	The program's software acquisition planning is accomplished in conjunction with system acquisition planning.	Strength
Activity 3	The software acquisition strategy for the project is developed and documented.	The software acquisition strategy for the program is developed and documented in the Acquisition Strategy Plan.	Strength
Activity 4	Software acquisition planning addresses the elements of the software acquisition process.	Software acquisition planning addresses the elements of the software acquisition process, such as program management, requirements development and management, contract tracking and oversight, and evaluation.	Strength
Activity 5	The project's software acquisition planning is documented and the planning documentation is maintained over the life of the project.	The program's software acquisition planning is documented; however, there is no evidence that the planning documentation is maintained over the life of the program.	Observation ^c
Activity 6	Life-cycle support of the software is included in software acquisition planning documentation.	Life-cycle support of the software, such as identifying adequate facilities and resources for the software support organization, are included in software acquisition planning documentation.	Strength
Activity 7	Life-cycle cost and schedule estimates for the software products and services being acquired are prepared and independently reviewed.	Life-cycle cost and schedule estimates for the software products and services being acquired are prepared and independently reviewed.	Strength
Measurement 1	Measurements are made and used to determine the status of the software acquisition planning activities and resultant products.	Measurements are not made and used to determine the status of the software acquisition planning activities and resultant products.	Weakness
Verification 1	Software acquisition planning activities are reviewed by acquisition organization management on a periodic basis.	Software acquisition planning activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength

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Common feature	Key practice	Finding	Rating
Verification 2	Software acquisition planning activities are reviewed by the project manager on both a periodic and event-driven basis.	Software acquisition planning activities are reviewed by the program manager on a daily basis.	Strength

^aStrength = Key practice effectively implemented.

^bWeakness = Key practice not effectively implemented or not implemented.

^cObservation = Key practice evaluated, but the practice cannot be rated as either a strength or a weakness because (1) documentation was not provided or (2) the practice was only partially implemented.

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 11: Requirements Development and Management Findings for FAS

Common features	Key Practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for establishing and managing the software-related contractual requirements.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for establishing and managing the software-related contractual requirements.	Strength
Commitment 2	Responsibility for requirements development and management is designated.	Responsibility for requirements development and management is assigned to the FAS program manager.	Strength
Ability 1	A group that is responsible for performing requirements development and management activities exists.	The Product Assurance Group is responsible for performing requirements development and management activities.	Strength
Ability 2	Adequate resources are provided for requirements development and management activities.	According to FAS program officials, adequate resources are not provided for requirements development and management activities.	Weakness
Ability 3	Individuals performing requirements development and management activities have experience or receive training.	FAS program officials said that individuals performing requirements development and management activities have experience and receive training. However, they could not provide documents to support this.	Observation
Activity 1	The project team performs its activities in accordance with its documented requirements development and management plans.	The FAS program does not have documented requirements development and management plans.	Weakness
Activity 2	The project team develops, baselines, and maintains software-related contractual requirements and places them under change control early in the project, but not later than release of the solicitation package.	The FAS program office did not develop, baseline, and maintain software-related contractual requirements and place them under change control before the contract was awarded.	Weakness
Activity 3	The project team appraises system requirements change requests for their impact on the software being acquired.	The FAS program office does not appraise system requirements change requests for their impact on the software being acquired.	Weakness
Activity 4	The project team appraises all changes to the software-related contractual requirements for their impact on performance, architecture, supportability, system resource utilization, and contract schedule and cost.	The FAS program office does not appraise changes to the software-related contractual requirements for their impact on performance, architecture, supportability, system resource utilization, and contract schedule and cost.	Weakness
Activity 5	Bi-directional traceability between the contractual requirements and the contractor's team software work products and services is maintained throughout the effort.	The FAS program office has a traceability matrix that it uses to trace between the contractual requirements and the contractor's team software work products and services. The matrix is maintained throughout the effort.	Strength
Activity 6	The end user and other affected groups are involved in the development of all software-related contractual requirements and any subsequent change activity.	The end user and other affected groups are involved in the development of all software-related contractual requirements; however, the team could not provide evidence of how affected groups were involved in changes to software requirements.	Observation

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Common feature	Key practice	Finding	Rating
Measurement 1	Measurements are made and used to determine the status of the requirements development and management activities and resultant products.	Measurements are not made and used to determine the status of the requirements development and management activities and resultant products.	Weakness
Verification 1	Requirements development and management activities are reviewed by acquisition organization management (and the contractor) on a periodic basis.	Requirements development and management activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Requirements development and management activities are reviewed by the project manager on both a periodic and event-driven basis.	Requirements development and management activities are reviewed by the program manager on a daily basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 12: Project Management Findings for FAS

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for execution of the software project.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for execution of the software program.	Strength
Commitment 2	Responsibility for project management is designated.	Responsibility for program management is assigned to the FAS program manager.	Strength
Ability 1	A team that is responsible for performing the project's software acquisition management activities exists.	The FAS program office is responsible for performing the program's software acquisition management activities.	Strength
Ability 2	Adequate resources for the project team are provided for the duration of the software acquisition project.	According to FAS program officials, adequate resources for the program team are not provided for the duration of the software acquisition program.	Weakness
Ability 3	When project trade-offs are necessary, the project manager is permitted to alter the performance, cost, or schedule software acquisition baseline.	When project trade-offs are necessary, the program manager is permitted to alter the performance, cost, or schedule software acquisition baseline.	Strength
Ability 4	The project team has experience or receives training in project software acquisition management activities.	The FAS program office receives training in program software acquisition management activities.	Strength
Activity 1	The project team performs its activities in accordance with its documented software acquisition management plans.	The FAS program office performs its activities in accordance with its documented Acquisition Strategy Plan.	Strength
Activity 2	The roles, responsibilities, and authority for the project functions are documented, maintained, and communicated to affected groups.	The roles, responsibilities, and authority for the program functions are not documented, maintained, and communicated to affected groups.	Weakness
Activity 3	The project team's commitments, and changes to commitments, are communicated to affected groups.	The FAS program office's commitments, and changes to commitments, are communicated to affected groups during weekly status meetings.	Strength
Activity 4	The project team tracks the risks associated with cost, schedule, resources, and the technical aspects of the project.	The FAS program office does not track the risks associated with cost, schedule, resources, and the technical aspects of the program.	Weakness
Activity 5	The project team tracks project issues, status, execution, funding, and expenditures against project plans and takes action.	The FAS program office does not track program issues, status, execution, funding, and expenditures against program plans and take action.	Weakness
Activity 6	The project team implements a corrective action system for the identification, recording, tracking, and correction of problems discovered during the software acquisition.	The FAS program office implemented a corrective action system for the identification, recording, tracking, and correction of problems discovered during the software acquisition.	Strength
Activity 7	The project team keeps its plans current during the life of the project as replanning occurs, issues are resolved, requirements are changed, and new risks are discovered.	The FAS program office has not kept its plans current during the life of the program.	Weakness
Measurement 1	Measurements are made and used to determine the status of the project management activities and resultant products.	Measurements are not made and used to determine the status of the program management activities and resultant products.	Weakness

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Common feature	Key practice	Finding	Rating
Verification 1	Project management activities are reviewed by acquisition organization management on a periodic basis.	Program management activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Project management activities are reviewed by the project manager on both a periodic and event-driven basis.	Program management activities are reviewed by the program manager on a daily basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 13: Contract Tracking and Oversight Findings for FAS

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for the contract tracking and oversight of the contracted software effort.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for the contract tracking and oversight of the contracted software effort.	Strength
Commitment 2	Responsibility for contract tracking and oversight activities is designated.	Responsibility for contract tracking and oversight activities is assigned to the contracting officer's technical representative.	Strength
Commitment 3	The project team includes contracting specialists in the execution of the contract.	The FAS program office includes contracting specialists in the execution of the contract.	Strength
Ability 1	A group that is responsible for managing contract tracking and oversight activities exists.	The FAS program office is responsible for managing contract tracking and oversight activities.	Strength
Ability 2	Adequate resources are provided for contract tracking and oversight activities.	According to FAS program officials, adequate resources are not provided for contract tracking and oversight activities.	Weakness
Ability 3	Individuals performing contract tracking and oversight activities have experience or receive training.	Individuals performing contract tracking and oversight activities have experience.	Strength
Activity 1	The project team performs its activities in accordance with its documented contract tracking and oversight plans.	The FAS program office does not have a contract tracking and oversight plan.	Weakness
Activity 2	The project team reviews required contractor software planning documents which, when satisfactory, are used to oversee the contractor team's software engineering effort.	Although FAS program officials indicate that they review many of the program's planning documents, they could not provide evidence that these reviews take place.	Observation
Activity 3	The project team conducts periodic reviews and interchanges with the contractor team.	FAS program team conducts periodic reviews and interchanges with the contractor team.	Strength
Activity 4	The actual cost and schedule of the contractor's software engineering effort are compared to planned schedules and budgets and issues are identified.	The actual cost and schedule of the contractor's software engineering effort are not compared to planned schedules and budgets and issues are not identified.	Weakness
Activity 5	The size, critical computer resources, and technical activities associated with the contractor team's work products are tracked, and issues identified.	The size, critical computer resources, and technical activities associated with the contractor team's work products are tracked, and issues identified.	Strength
Activity 6	The project team reviews and tracks the development of the software engineering environment required to provide life-cycle support for the acquired software and issues are identified.	The FAS program office reviews and tracks the development of the software engineering environment required to provide life-cycle support for the acquired software and issues are identified.	Strength
Activity 7	Any issues found by the project team during contract tracking and oversight are recorded in the appropriate corrective action system, action taken, and tracked to closure.	Issues found by the project team during contract tracking and oversight are recorded in the appropriate corrective action system, action taken, and tracked to closure.	Strength
Activity 8	The project team ensures that changes to the software-related contractual requirements are coordinated with all affected groups and individuals, such as the contracting official, contractor, and end user.	The program team does not ensure that changes to the software-related contractual requirements are coordinated with all affected groups and individuals, such as the contracting official, contractor, and end user.	Weakness

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Common feature	Key practice	Finding	Rating
Measurement 1	Measurements are made and used to determine the status of the contract tracking and oversight activities and resultant products.	Measurements are not made and used to determine the status of the contract tracking and oversight activities and resultant products.	Weakness
Verification 1	Contract tracking and oversight activities are reviewed by acquisition organization management on a periodic basis.	Contract tracking and oversight activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Contract tracking and oversight activities are reviewed by the project manager on both a periodic and event-driven basis.	Contract tracking and oversight activities are reviewed by the program manager on a daily basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 14: Evaluation Findings for FAS

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for managing the evaluation of the acquired software products and services.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for managing the evaluation of the acquired software products and services.	Strength
Commitment 2	Responsibility for evaluation activities is designated.	Responsibility for evaluation activities is assigned to the FAS Product Assurance Office.	Strength
Ability 1	A group that is responsible for planning, managing, and performing evaluation activities for the project exists.	The FAS Working Level Test and Evaluation Integrated Product Team is responsible for planning, managing, and performing evaluation activities for the program.	Strength
Ability 2	Adequate resources are provided for evaluation activities.	According to FAS program officials, adequate resources are not provided for evaluation activities.	Weakness
Ability 3	Individuals performing evaluation activities have experience or receive training.	Although FAS program officials said individuals performing evaluation activities have experience or receive training, they could not provide documents to support this.	Observation
Ability 4	Members of the project team and groups supporting the software acquisition receive orientation on the objectives of the evaluation approach.	Members of the program team and groups supporting the software acquisition received orientation on the objectives of the evaluation approach.	Strength
Activity 1	The project team performs its activities in accordance with its documented evaluation plans.	The FAS program office performs its activities in accordance with its Testing and Evaluation Master Plan.	Strength
Activity 2	The project's evaluation requirements are developed in conjunction with the development of the system or software technical requirements.	The FAS program's evaluation requirements were developed in conjunction with the development of the system technical requirements.	Strength
Activity 3	The project's evaluation activities are planned to minimize duplication and take advantage of all evaluation results, where appropriate.	The FAS program's evaluation activities, as stated in the Testing and Evaluation Master Plan, are planned to minimize duplication and take advantage of all evaluation results, where appropriate.	Strength
Activity 4	The project team appraises the contractor team's performance over the total period of the contract for compliance with requirements.	FAS program officials said that they appraise the contractor team's performance over the total period of the contract for compliance with requirements. However, they could not provide evidence to support this.	Observation
Activity 5	Planned evaluations are performed on the evolving software products and services prior to acceptance for operational use.	The FAS program office plans to perform evaluations prior to operational use.	Not rated
Activity 6	Results of the evaluations are analyzed and compared with the contract's requirements to establish an objective basis to support the decision to accept the products and services or to take further action.	The FAS program office has done some evaluations and will finish in August 2001. At that time, the results of the evaluations will be analyzed and compared with the contract's requirements to establish an objective basis to support the decision to accept the products and services or to take further action.	Not rated

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Common feature	Key practice	Finding	Rating
Measurement 1	Measurements are made and used to determine the status of the evaluation activities and resultant products.	Measurements are not made and used to determine the status of the evaluation activities and resultant products.	Weakness
Verification 1	Evaluation activities are reviewed by acquisition organization management on a periodic basis.	Evaluation activities are reviewed by the DLA Executive Board on a quarterly basis.	Strength
Verification 2	Evaluation activities are reviewed by the project manager on both a periodic and event-driven basis.	Evaluation activities are reviewed by the program manager on a daily basis.	Strength

Source: Key practice data from SEI; findings and ratings from GAO.

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Table 15: Acquisition Risk Management Findings for FAS

Common feature	Key practice	Finding	Rating
Commitment 1	The acquisition organization has a written policy for the management of software acquisition risk.	The acquisition organization, which is DLA, has a written policy—The Defense Acquisition System (DODD 5000)—for the management of software acquisition risk.	Strength
Commitment 2	Responsibility for software acquisition risk management activities is designated.	Responsibility for software acquisition risk management activities is assigned to the FAS program office.	Strength
Ability 1	A group that is responsible for coordinating software acquisition risk management activities exists.	The Risk Review Board is responsible for coordinating software acquisition risk management activities.	Strength
Ability 2	Adequate resources are provided for software acquisition risk management activities.	According to FAS program officials, adequate resources are not provided for software acquisition risk management activities.	Weakness
Ability 3	Individuals performing software acquisition risk management activities have experience or receive required training.	The FAS program office stated that individuals performing acquisition risk management activities have experience; however, they could not provide us with evidence.	Observation
Activity 1	Software acquisition risk management activities are integrated into software acquisition planning.	Software acquisition risk management activities are not integrated into software acquisition planning.	Weakness
Activity 2	The Software Acquisition Risk Management Plan is developed in accordance with the project's defined software acquisition process.	The Software Acquisition Risk Management Plan was not developed in accordance with the program's defined software acquisition process.	Weakness
Activity 3	The project team performs its software acquisition risk management activities in accordance with its documented plans.	The FAS program office does not perform software acquisition risk management activities.	Weakness
Activity 4	The project team encourages and rewards project-wide participation in the identification and mitigation of risks.	The FAS program office does not encourage and reward program-wide participation in the identification and mitigation of risks.	Weakness
Activity 5	Risk management is conducted as an integral part of the solicitation, project performance management, and contract performance management processes.	Risk management is not conducted as an integral part of the solicitation, program performance management, and contract performance management process.	Weakness
Activity 6	Software acquisition risks are analyzed, tracked, and controlled until mitigated.	Software acquisition risks are not analyzed, tracked, and controlled until mitigated.	Weakness
Activity 7	Project reviews include the status of identified risks.	Meeting minutes of program reviews do not include the status of identified risks.	Weakness
Measurement 1	Measurements are made and used to determine the status of the acquisition risk management activities and resultant products.	Measurements are not made and used to determine the status of the acquisition risk management activities and resultant products.	Weakness
Verification 1	Acquisition risk management activities are reviewed by acquisition organization management on a periodic basis.	Acquisition risk management activities are not reviewed by acquisition organization management.	Weakness
Verification 2	Acquisition risk management activities are reviewed by the project manager on both a periodic and event-driven basis.	Acquisition risk management activities are not reviewed by the program manager.	Weakness

Source: Key practice data from SEI; findings and ratings from GAO.

Appendix IV: GAO Contact and Staff Acknowledgments

GAO Contact

Carl Urie (202) 512-6231

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