



Highlights of [GAO-04-393](#), a report to the Committee on Armed Services, U.S. Senate

Why GAO Did This Study

The Department of Defense (DOD) has been relying increasingly on computer software to introduce or enhance performance capabilities of major weapon systems. To ensure successful outcomes, software acquisition requires disciplined processes and practices. Without such discipline, weapon programs encounter difficulty in meeting cost and schedule targets. For example, in fiscal year 2003, DOD might have spent as much as \$8 billion to rework software because of quality-related issues.

GAO was asked to identify the practices used by leading companies to acquire software and to analyze the causes of poor outcomes of selected DOD programs. GAO also was asked to evaluate DOD's efforts to develop programs for improving software acquisition processes and to assess how those efforts compare with leading companies' practices.

What GAO Recommends

GAO recommends that the Secretary of Defense direct the military services and agencies to adopt specific controls to improve software acquisition outcomes. These practices should be incorporated into DOD policy, software process improvement plans, and development contracts. DOD concurred with two revised recommendations and partially concurred with two others.

www.gao.gov/cgi-bin/getrpt?GAO-04-393.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Katherine V. Schinasi at (202) 512-4841 or schinasi@gao.gov.

DEFENSE ACQUISITIONS

Stronger Management Practices Are Needed to Improve DOD's Software-Intensive Weapon Acquisitions

What GAO Found

Software developers and acquirers at firms that GAO visited use three fundamental management strategies to ensure the delivery of high-quality products on time and within budget: working in an evolutionary environment, following disciplined development processes, and collecting and analyzing meaningful metrics to measure progress. When these strategies are used together, leading firms are better equipped to improve their software development processes on a continuous basis. An evolutionary approach sets up a more manageable environment—one in which expectations are realistic and developers are permitted to make incremental improvements. The customer benefits because the initial product is available sooner and at a lower, more predictable cost. This avoids the pressure to incorporate all the desired capabilities into a single product right away. Within an evolutionary environment, there are four phases that are common to software development: setting requirements, establishing a stable design, writing code, and testing. At the end of each of these phases, developers must demonstrate that they have acquired the right knowledge before proceeding to the next development phase. To provide evidence that the right knowledge was captured, leading developers emphasize the use of meaningful metrics, which helps developers, managers, and acquirers to measure progress. These metrics focus on cost, schedule, the size of a project, performance requirements, testing, defects, and quality.

In a review of five DOD programs, GAO found that outcomes were mixed for software-intensive acquisitions. The F/A-18 C/D, a fighter and attack aircraft, and the Tactical Tomahawk missile had fewer additional cost and schedule delays. For these programs, developers used an evolutionary approach, disciplined processes, and meaningful metrics. In contrast, the following programs, which did not follow these management strategies, experienced schedule delays and cost growth: F/A-22, an air dominance aircraft; Space-Based Infrared System, a missile-detection satellite system; and Comanche, a multimission helicopter.

In response to congressional requirements, DOD, the military services, and the Missile Defense Agency have taken positive steps to improve the environment for acquiring software-intensive systems. However, their plans to implement software process improvement programs are not yet complete and more work is required to ensure controls that would help managers increase the chances of successful acquisition outcomes. Such controls include documenting baseline requirements agreements between the developer and acquirer that leverage systems engineering knowledge, meeting with the developer for periodic reviews (gates) during the development process, and obtaining meaningful metrics from the developer to manage the program. Furthermore, there are no assurances that program managers will be held accountable for using the plans once they are completed.