RAND PROJECT AIR FORCE

RESEARCH BRIEF

Estimating the Costs of Future Weapon Systems

Focus on Testing and Evaluation

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Testing and evaluation (T&E) is a key step in the development of military weapon systems. It is the primary means of ensuring that the system will actually perform its intended function in its intended environment. T&E is an involved and often lengthy process, accounting on average for 21 percent of development costs for fixed-wing aircraft and 15 percent for guided weapons.

Advocates of acquisition streamlining have questioned the scope, duration, cost, and organizational responsibilities of the traditional T&E process. These questions are especially urgent because most T&E expenditures occur later in development, when cost overruns and schedule slips from other activities are more apparent. Some program managers have suggested streamlining measures such as relying on modeling and simulation to dramatically reduce the amount of "open air" testing, combining contractor and government testing, and applying total system performance responsibility (TSPR) contracting to shift certain responsibilities to the contractor rather than the government. In estimating the cost of future acquisitions, decisionmakers need to know whether such measures can in fact achieve their projected savings.

RAND Project AIR FORCE (PAF) studied T&E costs for recent Air Force and Navy fixed-wing aircraft, tactical missile, and guided munition systems to identify trends that might affect such costs in the future. Researchers found that although streamlining initiatives may have reduced the cost of individual tests, the proportion of development costs dedicated to T&E has remained relatively constant. Specific findings include the following:

- **Integrated contractor-government teams can help optimize testing.** Traditionally, contractors and the government have performed separate tests to determine whether a system meets its technical and performance specifications (*development testing* by the contractor and government) and whether it is operationally effective under realistic conditions (*operational testing* by the government). Where feasible, combining these tests avoids redundancy; and involving the operational testers in development testing highlights operational issues for early resolution, resulting in both cost and schedule savings.
- **Modeling and simulation are necessary, but they do not preclude the need for live testing.** Modeling and simulation appear to be a good investment because they can reduce the number, risk, and often the duration of live tests. However, their usefulness may be limited by the level of fidelity to real-world conditions, the specific range of applicability, the high cost of developing and validating models, and the challenges of integrating various models and hardware. Live testing is still needed to supplement and confirm the results of modeling and simulation.
- **TSPR can save government costs, but it may create other problems.** For example, test data may not be available to the government for other uses. Cross-platform integration may not be adequately coordinated, especially in guided-weapon development. TSPR contracts should be carefully planned to avoid these problems.
- **Software-intensive systems have been driving T&E costs higher.** Although advances in computer technology have improved the performance of major weapon systems, software-intensive systems require more complex testing. This is particularly true where multiple systems must be integrated. Estimates of future T&E costs should carefully consider the realism of software development and test plans.

To further improve their estimates of T&E costs, analysts should have a fuller understanding of what the government actually spends on testing. It is currently more difficult to collect and analyze cost data from government organizations than it is from contractors. Consistent accumulation and reporting of such costs (to standards similar to those for contractor data) would greatly improve the accuracy of future cost estimates and provide government personnel better information for planning and management. ■

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Corporate Headquarters
1776 Main Street
P.O. Box 2138
Santa Monica, California
90407-2138
Tel 310.393.0411
Fax 310.393.4818

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