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United States General Accounting Office
Washington, DC 20548

May 23, 2003

The Honorable John Ensign
Chairman
The Honorable Daniel Akaka
Ranking Minority Member
Subcommittee on Readiness and Management Support
Committee on Armed Services
United States Senate

Subject: *Use of Value Engineering in Defense Acquisitions*

Value engineering (VE) is a recognized technique for reducing costs while maintaining or improving productivity and quality. DOD's VE program consists of both government- and contractor-developed cost-reduction projects designed to reduce a system's life-cycle costs. In response to your request, we agreed to provide information on (1) the role the VE program has played in supporting cost reduction in DOD weapons system programs and (2) the alternative measures program managers take to reduce costs and/or incentivize contractors. This letter transmits the information we presented to your staff at a briefing on February 27, 2003 (see encl. I).

To complete our review, we identified the extent VE projects were being undertaken at several buying activities.[1] We also reviewed the relevant statute, regulations, and guidance and interviewed key DOD and contractor officials. We also made use of our work on commercial best practices that identified opportunities leading organizations use to reduce life-cycle costs. We did not rely on DOD reports of VE savings because the DOD inspector general had determined in earlier audits that the reports included savings from other, non-VE initiatives. To identify the measures program managers take to reduce costs, we reviewed the approaches taken on 11 weapons system programs. At the buying activities we covered, we selected programs for review that were in production and/or previously reported VE savings. We performed our work between August 2002 and March 2003 in accordance with generally accepted government auditing standards.

[1] These buying activities were the Army Aviation Missile Command, Army Tank and Automotive Command, Air Force Materiel Command, Space and Naval Warfare System Command, and Naval Sea Systems Command. They were selected to cover all services and a range of programs.

Summary

In summary, we found that the VE program has made a minimal contribution to cost reduction in DOD. Value engineering is only one of a number of approaches used by the services to control costs, and its use varied significantly from project to project. In part, its limited use is attributable to new cost-reduction initiatives introduced by the department since the 1990s and in part due to the cumbersome processes required to implement the program. Perhaps, more importantly VE projects are typically undertaken during production or after a system has been fielded. At this point, opportunities for substantially reducing costs are more limited. Our work on commercial best practices suggests that the opportunities to significantly influence costs occur earlier in the life cycle of a system.[2]

Generally we found significant variance in both the use and support of value engineering throughout the services. For example, neither the Air Force or the Navy have full-time staff resources dedicated to the VE program and consider VE just one of many tools available to reduce costs. At one Navy buying activity, we could not identify any VE projects, while at other Air Force and Navy buying activities we identified isolated instances where VE projects were being undertaken. In contrast, the Army has a more structured program with staff resources committed to managing the program and developing VE projects. However, even within the Army, there were variances in management emphasis from command to command.

For the 11 weapons system programs we examined, we found that DOD program managers use a variety of strategies as alternatives to or in conjunction with VE. But how or when VE or other strategies are used varies by project. Like VE, other strategies often seek to motivate contractors to submit cost-reduction ideas and sometimes provide opportunities for contractors to share in the savings. Some program managers said they consider the VE tool or methodology, but said they use other approaches better suited to their programs or integrated into their management approach.

The limited use of the VE program has been the result of a changing acquisition environment and the administrative burdens associated with the program. DOD introduced a variety of new cost-reduction initiatives in the 1990s as it looked for ways to reduce costs and create a more efficient acquisition environment. DOD also changed its procedures and processes to foster greater efficiency and cost effectiveness. For example, DOD encouraged programs to replace military specifications and standards with performance specifications, giving contractors configuration control and resulting in less need for contractors to submit changes to DOD for approval. Administrative requirements also contributed to limited contractor participation in the VE program. The proposal process is seen as complex and resource intensive.

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[2] U.S. General Accounting Office, *Best Practices: Setting Requirements Differently Could Reduce Weapon Systems' Total Ownership Costs*, GAO-03-57 (Washington D.C.: Feb. 11, 2003).

We are not making recommendations in this letter. We believe that program managers should continue to have the option of using VE where appropriate. However, given the varied use of VE and the availability of other cost-savings measures, management emphasis on VE as a preferred approach to reducing costs is not justified.

Agency Comments and Our Evaluation

In its written comments (see encl. II) on a draft of this letter, DOD stated that it agrees that VE is a useful tool for reducing costs. However, DOD also commented that our report did not consider that the fiscal year 2002 VE statistics showed $2.5 billion of VE savings and costs avoidances.

We reviewed but did not rely on the annual reports in making our assessment of VE. The DOD Inspector General had found that past reports did not accurately reflect VE savings. The fiscal year 2002 report, as in prior years, includes savings from a number of initiatives, not just VE. The data request for fiscal year 2002 referenced criteria contained in an audit resolution agreement with the Inspector General. The agreement states "…DOD Components should be encouraged to integrate VE with other similar programs and capture the savings in the annual VE report whenever possible."

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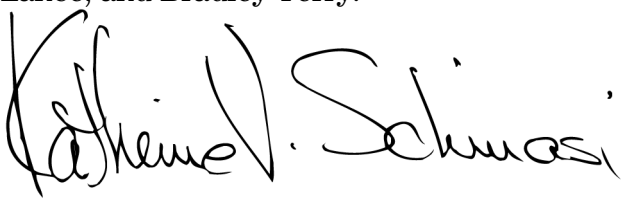
We are sending copies of this report to the Secretary of Defense; the Director, Office of Management and Budget; and interested congressional committees. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at http://www.gao.gov.

Should you or your staff have any questions on matters discussed in this report, please contact me on (202) 512-4383 or Karen Zuckerstein at 202-512-6785. Principal contributors to this report were Maria Durant, Jean Harker, Carlos Garcia, Noel Lance, and Bradley Terry.



Katherine V. Schinasi
Director, Acquisition and Sourcing Management

Enclosures

DOD's Value Engineering Program

Briefing to Subcommittee on Readiness and Management Support Senate Armed Services Committee

February 27, 2003

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Briefing Contents

- Key Questions
- Scope of Work
- Background
  - What is Value Engineering (VE)?
  - Components of Department of Defense's (DOD) VE Program
  - DOD's Management of VE
- GAO's Findings
  - DOD's VE Program has made a minimal contribution to cost reduction within DOD
  - Program managers use various cost-savings strategies
- Conclusion

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Key Questions

1. What role has the VE program played in supporting cost reduction in DOD weapons system programs?

2. What alternative measures do program managers take to reduce costs and/or incentivize contractors?

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Scope of Work

- Reviewed statute (41 U.S.C. sec. 432), FAR, OMB, and DOD regulations, directives, and guidance pertaining to VE.
- Did not rely on DOD annual reports of VE savings. Earlier DOD Inspector General audits found that certain reports included non-VE initiatives. In 1997, new criteria developed for reporting annual savings that defined VE as including any "best value" cost-reduction effort. Annual report to OMB discontinued in 2002.
- Interviewed DOD and program officials at each of the services and DLA headquarters. Also interviewed defense contractors.
  - Looked at scope of VE efforts at selected buying activities.
  - Reviewed the approaches taken by selected programs to reduce costs. Programs reviewed were ones in production, including programs that had previously reported VE savings.

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What is Value Engineering?

- VE is a systematic tool or methodology used to reduce costs and improve value. It can be applied during any phase of the life cycle of a project, but it is most effective when used early in the life cycle.

- Within DOD, VE efforts are directed at analyzing the functions of DOD systems, supplies, services, and facilities for the purpose of achieving the required function at the lowest total cost.

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Components to DOD's VE Program

- DOD's program consists of government-developed value engineering proposals (VEP) and contractor-developed value engineering change proposals (VECP)
  - In-house VEPs
    - Are generally funded, developed, and implemented by the government personnel within the services
    - Government retains 100 percent of the VE savings
  - Contractor VECPs
    - VE clause included in contracts
    - VE clause can be voluntary or mandatory
    - Are developed and submitted by contractors
    - Must be reviewed and approved by the government
    - Both the government and contractor share in VE savings

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DOD's Management of VE

- DOD approved a 1996/1997 Strategic Plan to:
  - implement VE guidance consistently throughout DOD,
  - build a cohesive integrated DOD VE management structure,
  - encourage expansion of VE by recognizing accomplishments and publicizing VE activities,
  - increase cost savings and cost avoidance by establishing a VE savings goal of 1-percent of total obligation authority,
  - improve VE guidance and contractor participation,
  - increase VE expertise by developing competencies and training requirements, and
  - improve the quality, timeliness, and utility of VE annual reports.

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DOD's Management of VE

- In 1996, DOD established a team to identify existing barriers to the use of VECPs. In the following year, the team recommended specific actions to improve the effectiveness and encourage the use of VECPs in DOD.
- In 2002, the OSD Systems Engineering group acquired leadership of the VE program and is sponsoring new efforts to facilitate the use of VE. The services also have focal points for monitoring VE efforts.
- In late 2002, OSD asked the services to submit VE data to document VE investment and savings trends.

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GAO's Findings

- The VE program has made a minimal contribution to cost reduction within DOD
  - DOD typically uses VE during production and support. Best Practices suggest that opportunities to reduce costs are greatest during early system design.
  - Limited VE activity outside of Army.
- Program Managers use various cost-savings strategies
  - A range of approaches, including VE, used to reduce costs.
  - Changes in the acquisition environment and administrative burdens have contributed to the minimal use of VE.

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Production Costs Are Shaped by Early Design Decisions

- By the time design of a system is finalized, 90 percent of operating and support costs have been determined.
- Greatest impact on costs and cost reduction is during requirements setting and early design.
- Because VE is focused on reducing costs during latter phases of the program--when the system is in production or already fielded--the potential for affecting costs is limited.

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Limited VE Activity Outside of Army

- Army was the only service that professed to have a structured VE program, but we still found variances in management emphasis within the Army.
  - Aviation Missile Command–Has an active in-house program that includes 18 full-time staff, provides training and establishes cost reduction goals. In FY2002, 73 VEPs were implemented and 2 VECPs were finalized.
  - Tank and Automotive Command–Has an active, but less extensive in-house program with 6 full-time staff. Had 39 VEPs and 3 VECPs in FY 2002.
- The Army requires that in-house VEPs use the VE methodology.

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Limited VE Activity Outside of Army

- The Air Force and Navy consider VE one of many options for cost reduction and do not put as much management emphasis on VE.
  - Air Force Materiel, Naval Sea Systems, and Space and Naval Warfare System Commands currently do not have full-time staff dedicated to VE.
  - We found isolated examples of programs using VECPs or the VE methodology:
    - Air Force Materiel and Space and Naval Warfare System Commands–Had no VEPs or VECPs in FY 2002.
    - Naval Sea Systems Command–Had no VEPs and 2 VECPs in FY 2002.

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Various Strategies Used to Reduce Costs

- Program managers use their discretion in determining what strategies/initiatives are appropriate for their projects.
- Our review of selected Army, Navy, and Air Force weapons system programs revealed that program managers use a variety of strategies/initiatives, including VE, to reduce costs.
- Following are examples of weapons systems programs that reduced costs using VE and other strategies/initiatives.

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Air Force Strategies/Initiatives

Air Force-F-22: Replacement for the F-15 Eagle air-superiority fighter. F-22s are currently undergoing flight testing.

Cost Savings Initiative: Affordability team developed product and process improvement projects in an attempt to achieve cost reduction in line with contractor agreed-to-price goals. Profit and fees tied to achieving price goals. Contractor incentives for cost reduction investments. Cost-reduction ideas incorporated without administrative burden of VECP process. VE methodology employed as a tool in efforts to improve production processes.

Source: DOD.

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Air Force Strategies/Initiatives

Air Force-C-17: The current planned buy is for 180 strategic air lifters.

Cost Savings Initiative: In 1994, DOD introduced price competition with an alternative non-developmental air lifter. Air Force increased production rates, shared should cost analysis results, and developed joint cost model to encourage lower contractor prices before negotiating 1996 multi-year contract. Separate contract for product and process improvement. In 1999, contractor agreed to allocate up to $275 million in contract funds for cost-reduction efforts, if like amount was provided as an incentive.

Source: DOD.

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Air Force Strategies/Initiatives

Air Force AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM): An air-to-air missile that has an all-weather, beyond-visual-range capability. Deployed beginning in 1991 for the Air Force, U.S. Navy, and America's allies.

Cost Savings Initiative: In the mid-1990s, the program reported over $451 million in validated savings using VECPs. However, the program no longer uses VECPs since contractor has configuration control. It now uses a long-term pricing agreement and price analysis to establish price reasonableness. Incentive fees as part of a preplanned product improvement program are used to motivate the contractor to continue to improve the missiles and achieve targeted average unit prices.

Source: DOD.

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Army Strategies/Initiatives

Army Tactical Missile System (ATACMS): A long-range ground-launched missile in production since 1990 with several variants fielded.

Cost Saving Initiative: In October 2002, the contractor submitted a VECP to redesign the missile guidance set and upgrade obsolete components. The government has invested $24 million and the contractor invested $13 million for development costs. If approved, the VECP is projected to save about $103,000 per missile for about 724 missiles.

Source: DOD.

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Army Strategies/Initiatives

Army-Javelin: A man portable, antitank system that has a "fire-and-forget" technology allowing the gunner to fire and immediately take cover. In production since 1994.

Cost Saving Initiative: In FY 2001, reported cost savings of nearly $6 million from three in-house VE proposals and over $400,000 from one VECP. In FY 2002, government personnel developed an in-house VE proposal to reduce the cost of repairing the command launch unit that resulted in a $1.5 million cost reduction.

Source: DOD.

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Army Strategies/Initiatives

Army/Marine Corps Lightweight 155 Howitzer : A British designed weapon that replaces the aging operationally deficient Howitzer with a lighter weight version. Program is entering low-rate initial production.

Cost Saving Initiative: Used government integrated product teams to determine if titanium castings could replace titanium plates, forgings, and associated welding operations. Change is estimated to save about $29.4 million. Program office chose not to submit this project as a VEP.

Source: DOD.

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Army Strategies/Initiatives

Army Heavy Expanded Mobility Tactical Truck: A truck that provides transport capabilities for re-supply of combat vehicles and weapons systems.

Cost Saving Initiative: Replaced high-failure rate running lights with new long lasting lights. Program did not have funds but found an industry partner willing to finance development and recover the costs in future sales. Program office chose not to use VE for this project.

Source: DOD.

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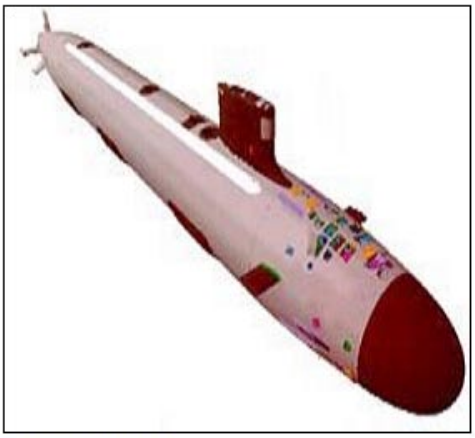
Navy Strategies/Initiatives

Navy-Virginia Class Nuclear-Powered Attack Submarine: Currently in production with first delivery scheduled for 2004.

Cost Saving Initiative: Invited contractors and Navy personnel to submit ideas for reducing costs into a "good ideas" database prior to awarding a design contract. During production the contractor can submit other design changes and share in the savings on the current contract. The production contract for the first four submarines includes an incentive for the contractor to earn up to $84 million for reducing the price of a fifth submarine at or below a targeted price.



Source: DOD.

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Navy Strategies/Initiatives

Navy-DDG51 Guided Missile Destroyer: The DDG 51 was commissioned in 1991.

Cost-Saving Initiative: Used an Affordability Program that funds various cost-reduction proposals developed by shipbuilders. Savings shared on current production contracts only. As of September 2002, program reported $818 million in government savings has resulted from the implementation of 385 cost-reduction proposals. In addition, contracts with shipbuilders include incentive fees to motivate additional cost reduction.

Source: DOD.

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Navy Strategies/Initiatives

Navy Standard Missile: The Navy's primary surface-to-air missile fleet defense weapon. Medium and extended range missiles were introduced in 1981.

Cost Savings Initiative: Program uses VECPs as a primary cost-reduction tool. There is an informal agreement with prime contractor to share VECP savings on a 50/50 basis. To date, 12 VECPs have been approved. One VECP to upgrade a missile transceiver could save an estimated $14 million. Another VECP will qualify a second source for seeker head gyroscopes and could save about $6 million on the purchase of 945 missiles through FY 2002.

Source: DOD.

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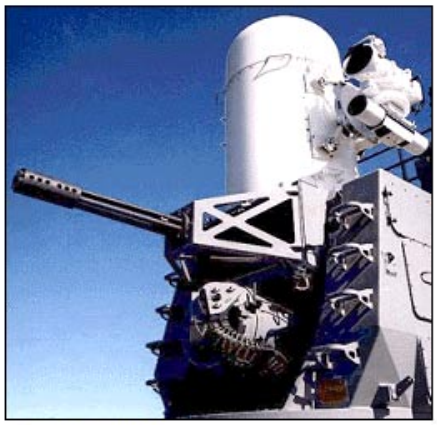
Navy Strategies/Initiatives

Navy-Phalanx: Close-In weapons system provides a rapid-fire 20-millimeter gun giving Navy ships a "last-chance" defense against missiles and littoral warfare threats. Program received $1.3 billion to upgrade 280 systems over a 8-year period (FY02-09).

Cost Savings Initiative: The contractor has received preliminary approval on 3 VECPs. One VECP will redesign the circuit card assembly and require $700,000 in redesign and testing costs, but could reduce costs by $3.2 million.



Source: DOD.

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Reasons for Minimal Participation in the VE Program

- Changes in the acquisition environment:
  - Performance specifications have increasingly replaced military specifications, giving contractors configuration control and possibly resulting in fewer contract changes. VECPs are tied to contract changes.
  - Constrained service budgets have resulted in lower procurement quantities creating difficulties in achieving acceptable returns on investment for VECPs.
  - A reduced DOD workforce resulted in a loss of engineering expertise and dedicated VE staff.
  - DOD's promotion of various cost-reduction initiatives such as IPTs, CAIV, and RTOC has provided other options for program managers.

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Reasons for Minimal Participation in the VE Program

- Reported administrative burdens include:
  - VECP process is complex, lengthy, and resource intensive.
  - Contractors view VECPs as high risk investments because proposals may not be approved.
  - Funding availability and color of money issues affect willingness to pay for O&S cost reductions.
  - VECP process puts funding burden on program managers for development and implementation costs.
  - Program managers lose motivation when savings are removed from future program budgets.
  - Senior management has not emphasized VE.

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DOD Efforts to Promote Cost Reduction

- Currently OSD is planning to:
  - Seek approval on the use of the Defense Modernization Account (as a self-financing fund to cover development costs on cost savings initiatives).
  - Provide outreach to DOD and industry to promote VE.
  - Update the 1996/97 Strategic Plan and develop new policy and procedures.
  - Continue an awards program to recognize VE efforts.
  - Collect data on the accomplishments of the VE program. OSD considers it necessary to track the results of VE in light of its efforts to reinvigorate the program.

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GAO Conclusion

- Participation in DOD's VE program has been limited and the program has made minimal contributions to overall cost reduction in DOD.
- Changes in DOD's acquisition environment and administrative barriers have impacted the effectiveness and relevance of the program.
- The VE tool or methodology is recognized as useful; however VE is just one of a variety of cost-reduction techniques available to program managers. Program managers consider VE complementary to other approaches, but is not a preferred approach to cost reduction.

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ACQUISITION,
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MAY 01 2003

Ms. Katherine V. Schinasi
Director, Acquisition and Sourcing Management
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Ms. Schinasi:

This is the Department of Defense (DoD) response to the GAO draft report, "VALUE ENGINEERING," dated April 2, 2003 (GAO Code 120166/GAO-03-590R).

The Department agrees with GAO's finding that value engineering is a useful tool for reducing costs and is taking steps to ensure that program managers can use this and other cost savings tools to a greater extent. DoD uses many cost savings approaches as a function of the specific circumstances and there never has been a single "preferred approach."

In its report, the GAO states "the value engineering (VE) program has made a minimal contribution to cost reduction in DoD." The Department considers this statement to be confusing. During this inquiry, the GAO did not consider current reports of value engineering savings due to a 1996 Inspector General (IG) finding of reporting errors in the value engineering process. Currently, DoD VE Program savings conform with the IG resolution on how to resolve those errors and, in FY 2002, $2.5 billion of VE savings and cost avoidances were reported.

My point of contact for this report is Dr. Jay Mandelbaum and he can be reached at (703) 695-0472 or Jay.Mandelbaum@osd.mil.

Sincerely,

Glenn F. Lamartin
Director
Defense Systems

(120166)

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