How Value Engineering (VE) Enhances Diminishing Manufacturing Sources and Material Shortages (DMSMS) Solutions

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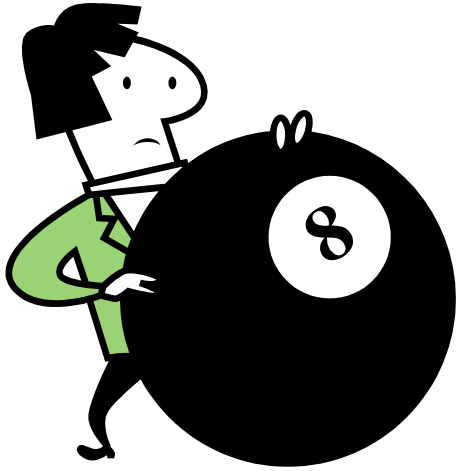
Outline

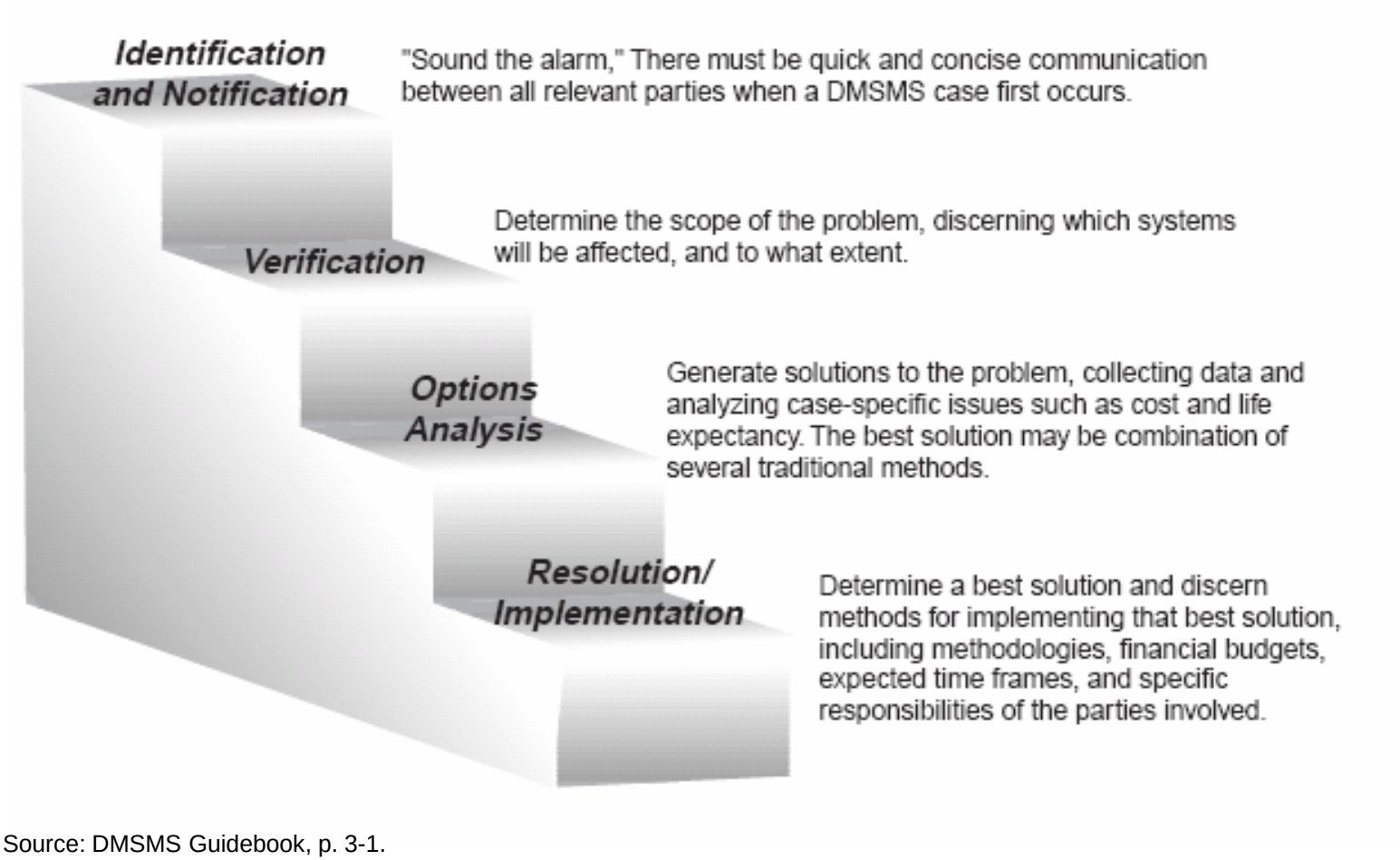
- **Introduction to DMSMS**
- **Introduction to VE**
- **Relationship of the VE methodology to the DMSMS risk management process**
- **Real VE examples for DMSMS resolution options**
- **Conclusions and next steps**

Problems DMSMS Addresses



- ***Technology improvements:*** **As new products are developed, the technology used in predecessor products becomes outdated, making it more difficult to maintain the older equipment**
- ***Decreasing demand*****: The parts needed to repair products may become more difficult and expensive to acquire because fewer are produced as demand for them decreases**
- ***Non-availability of materials:*** **The materials required to manufacture products may no longer be available, or they may be uneconomical to procure**

DMSMS Risk Management Process



Source: DMSMS Guidebook, p. 3-1.

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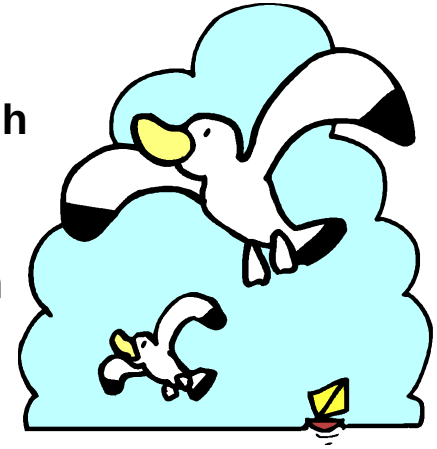
What is VE?

- **According to Public Law 104-106 value engineering means an analysis of the functions of a program, project, system, product, item of equipment, building, facility, service, or supply of an executive agency, performed by qualified agency or contractor personnel, directed at improving performance, reliability, quality, safety, and life cycle costs.**
- **Characteristics**
  - **Systems engineering tool**
  - **Contractually authorized**
  - **Employs a simple, flexible and structured methodology**
  - **Promotes innovation and creativity**
  - **Incentivizes contractor to help government's value proposition**

An Actual VECP for the Evolved Sea Sparrow Missile (ESSM)

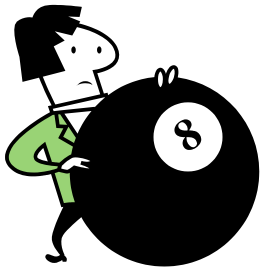


- **Background**
  - **The ESSM is an advanced a radar-guided missile with a high explosive warhead used for surface-to-air anti-missile defense**
  - **A missile safe and arm fuze prevents an unintended launch and, once launched, arms the warhead when the proper stimuli (e.g., speed, gravitational force) are received**
- **DMSMS situation**
  - **ESSM design called for an obsolete mechanical safe and arming fuze**
  - **Number of suppliers was limited and costs were high**
    - **Highly skilled artisans were needed for the manufacturing process, and much of the world fuze market had adapted to electronic fuzes**
- **The contractor proposed a VECP to replace the mechanical safe and arm fuze with an electronic one adapted from the Sidewinder missile**
  - **Development and implementation costs were $1,873,911; took approximately 2 years to offset**
  - **Total recurring cost savings equaled $6,832,000, which, when spread over the 1,600 units involved, resulted in a net savings per unit of $4,270**
  - **Savings shared equally between the Navy and the contractor**

Factors Leading to VE Solutions

- Advances in technology
- Excessive cost
- Questioning specifications
- Additional design effort
- Changes in user's needs
- Feedback from test/use
- Opportunities for design improvements
- Miscellaneous

Problems DMSMS Addresses



- *Technology improvements:* As new products are developed, the technology used in predecessor products becomes outdated, making it more difficult to maintain the older equipment
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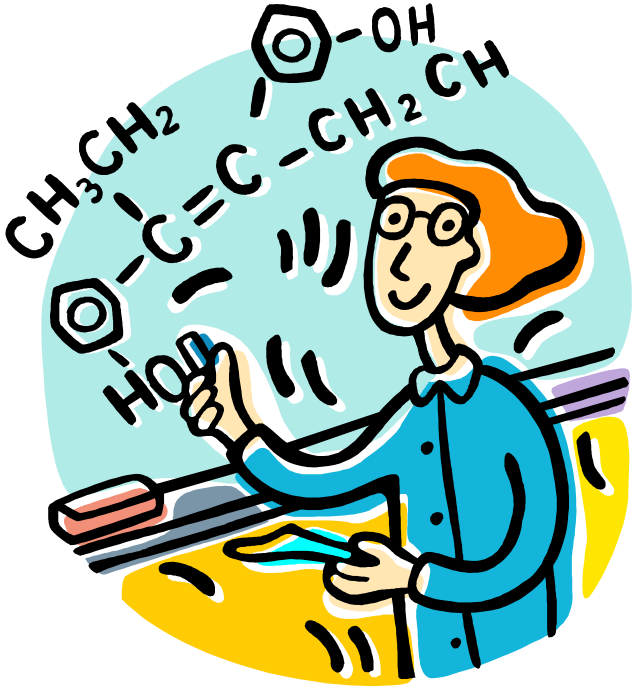
- *Non-availability of materials:* The materials required to manufacture products may no longer be available, or they may be uneconomical to procure

Phases of the VE Methodology (Job Plan)

- Orientation Phase
- Information Phase
- Function Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase
- Implementation Phase



Often carried out in a Workshop format

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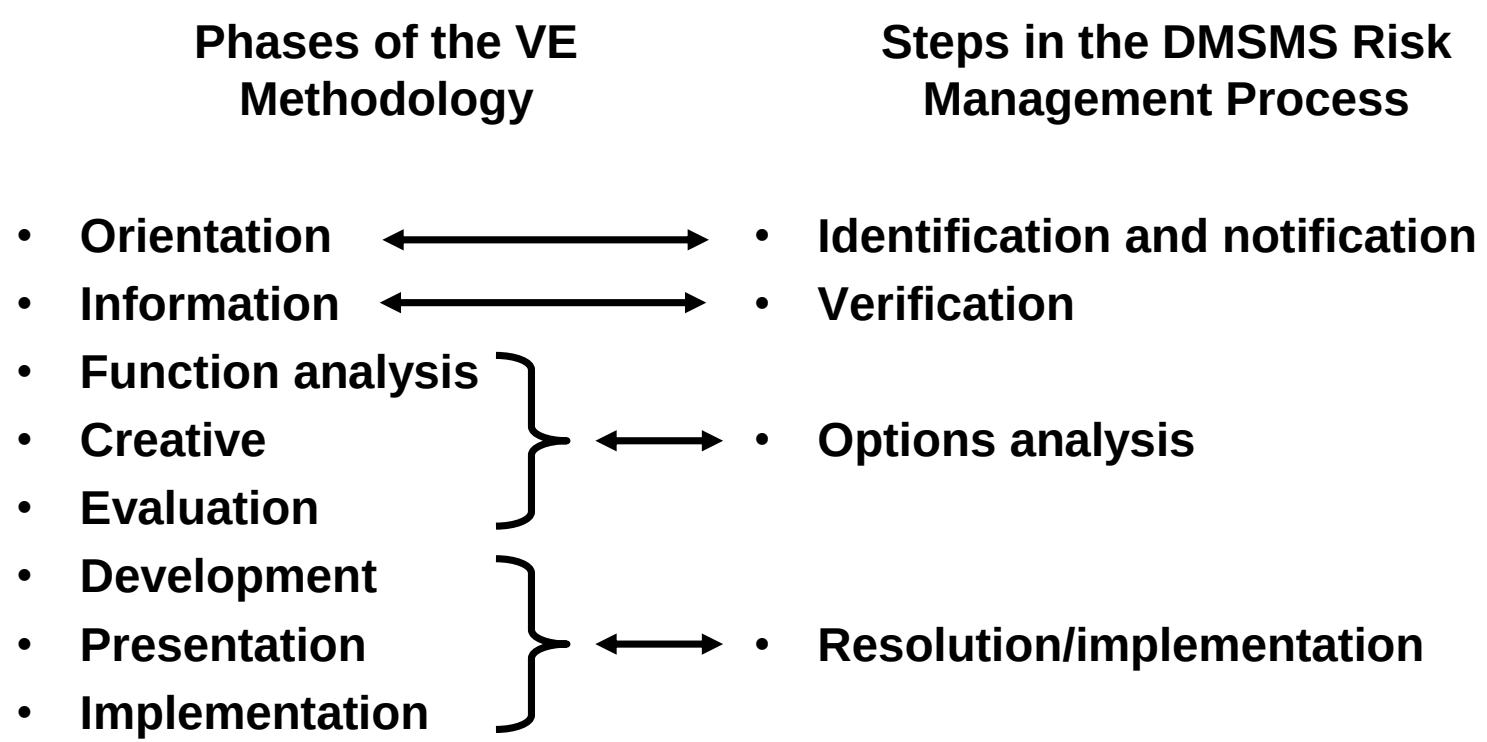
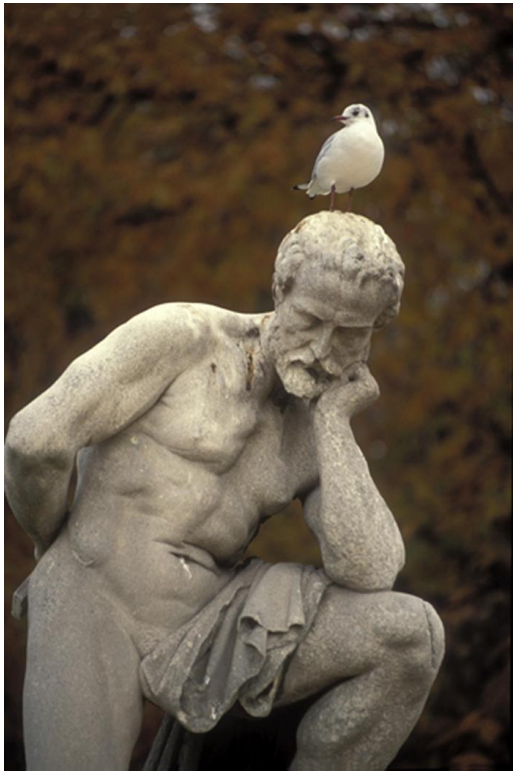
Linking the two Methodologies



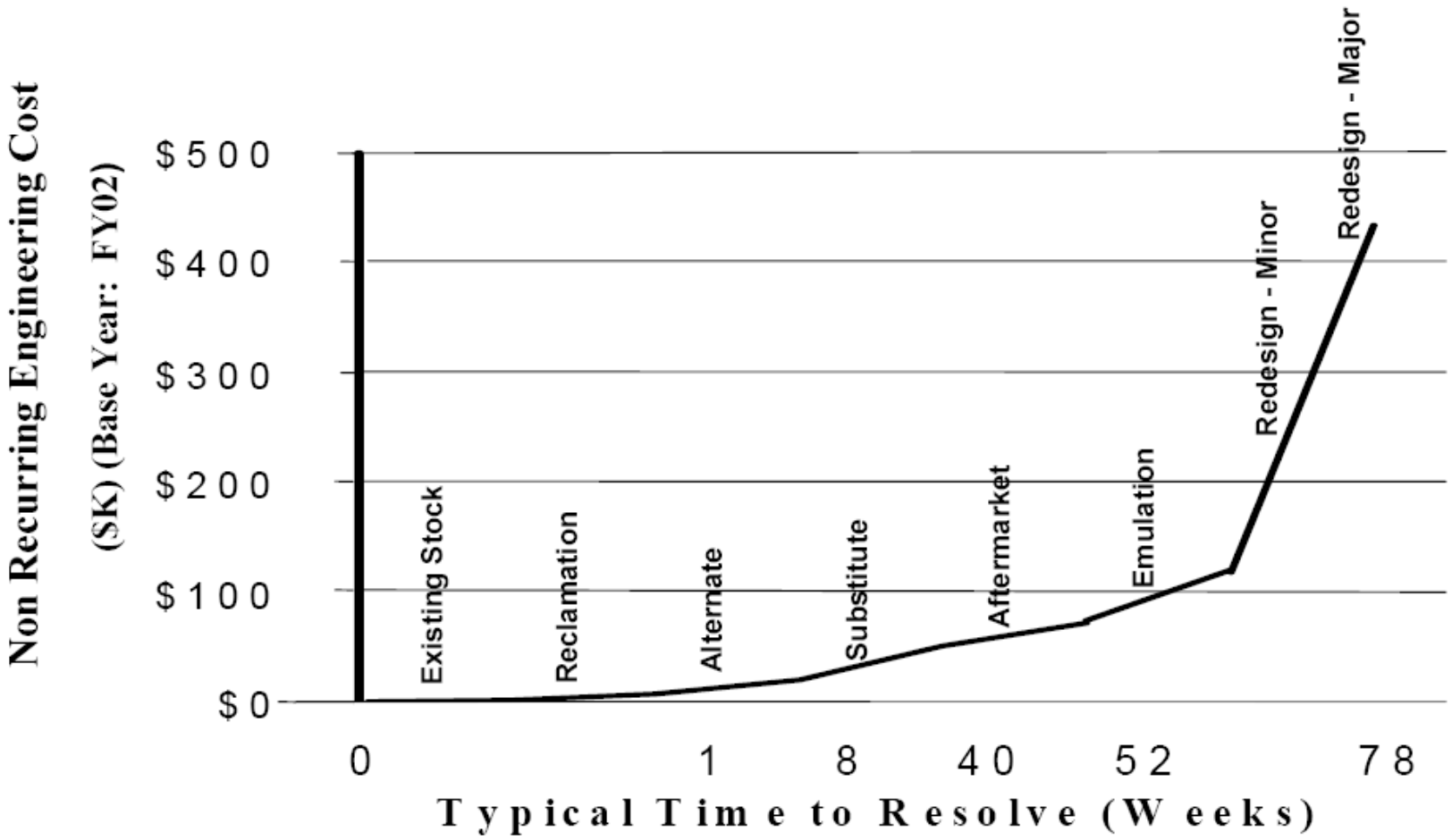
There is a strong synergy

Potential VE Contributions to DMSMS

- **Finds innovative approaches to problem solving that might not otherwise be considered using the creative elements of the VE methodology**
- **Incentivizes DoD participants and their industry partners to increase their joint value proposition in achieving best value solutions as part of a successful business relationship**
  - **Provides businesses with a strong profit-based incentive for using its skilled engineering workforce to mitigate DoD's DMSMS issues**
- **Rewards contractors for making investments in DMSMS resolution options**
- **Allows the DoD to spread non-recurring engineering costs over time, making them far easier to fund**



Benefits Realized Regardless of the DMSMS Resolution Option



Source: DMSMS Guidebook p. 4-11

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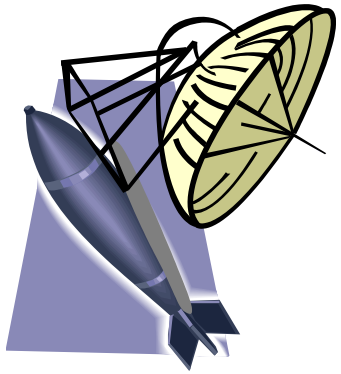
VE Contributions to an Existing Stock Approach

- **Definition**
  - **The *current* supplier utilizes *on-hand* inventories or agrees to continue to produce the item in question**
  - **Typically use a life-of-type or bridge purchase**
- **Drawbacks to this approach**
  - **Costs for material management including packaging, storage, transportation, shelf life, and upkeep of the inventory**
  - **Difficult to estimate demand**
- **How VE can help**
  - **Value engineering incentivizes the contractor to perform the material management function and solves short-term budget problems associated with a quantity purchase**

Standard Missile Radome VE Example for Existing Stock Approach

- **Background**
  - **The Standard Missile is a surface-to-air air defense weapon is a fleet area air defense and ship self defense weapon**
  - **The radome is a dome that covers the radar on the outside of the missile**



- **DMSMS situation**
  - **There are few radome suppliers because of the complexity involved in finishing them to both withstand high heat and acceleration and allow signals to penetrate without distortion**
  - **Due to reduced program funding, the Navy halved its Standard Missile procurement rate**
  - **If the radomes were to be purchased on the revised procurement schedule, the unit price would increase by 50 percent due to production slow down**
  - **The Navy wanted to make a quantity purchase to reduce the overall cost, however it did not have the resources in the current fiscal year**
- **The contractor used a VECP to make the quantity radome purchase and sell future radome lots back to the Navy at the lower price, thus leading to significant savings**
  - **Total savings was $1,153,500 shared equally by the contractor and the Navy**

VE Contributions to a Reclamation Approach

- **Definition**
  - **Examines marginal or out-of-service equipment or supplies as a potential source of DMSMS parts**
  - **Equipment that is in a long supply, perhaps as a result of a planned product improvement or modernization effort where baseline equipment could be cannibalized**
- **Drawbacks to this approach**
  - **Reclaimed parts may be unserviceable or damaged**
  - **Probably represents only a short-term solution**
- **How VE can help**
  - **Value engineering can play an important role in making reclamation feasible**

Artillery VE Example for Reclamation Approach

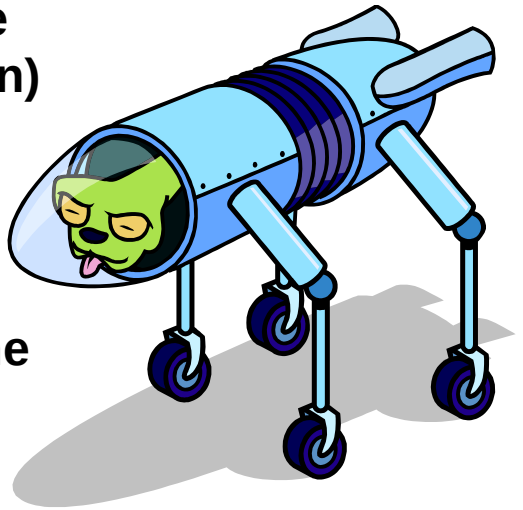
- **Background**
  - **The M795 is a 155-millimeter high-explosive artillery projectile with a high-fragmentation steel body**
  - **It provides increased effectiveness against major ground-force threats at greater ranges for anti-personnel and anti-materiel targets**
- **DMSMS situation**
  - **Because of a world-wide scrap steel shortage, it was difficult to maintain a source for M795 steel**
- **A VE study was initiated to develop a process to reutilize the steel from a large demilitarization stockpile of surplus M106 8-inch projectile shells**
  - **The steel could not be reclaimed directly since the projectiles contained trace amounts of explosives**
  - **A process was developed to decontaminate and mill the surplus M106 projectiles to reclaim the steel**
  - **M795 production costs were decreased**
  - **The demilitarization stockpile was reduced**
  - **Total cost avoidance savings in FY 2006 for the 197,000 projectiles processed amounted to $9.2 million**

VE Contributions to an Alternative Source Approach

- **Definition**
  - **Items currently in production that are form, fit, function, and interface qualified replacements such as a superseding part listed in a specification or standard**
  - **May apply to aftermarket or reverse-engineered sources (discussed later)**
- **Drawbacks to this approach**
  - **Same as existing stock**
- **How VE can help**
  - **VE can increase the efficiency of the new suppliers's production process**

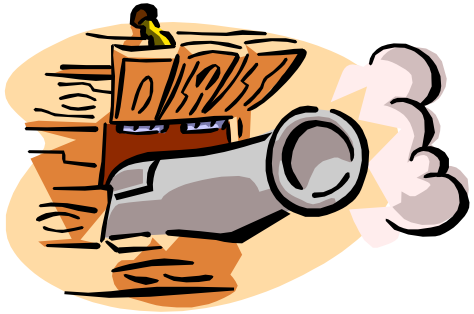
VE Contributions to an Existing Substitute Approach

- **Definition**
  - **A different part that is *currently* being produced for a different application but is (or can be made) capable of performing fully (in terms of form, fit, and function) in place of the DMSMS item**
- **Drawbacks to this approach**
  - **Non-recurring engineering expenses**
  - **Market conditions may not have a favorable outcome for the new source**
  - **Qualifying and testing the replacement item**
  - **The unit cost may be higher**
- **How VE can help**
  - **Value engineering function analysis identifies viable options for items to be used as an existing substitute and incentivizes the prime contractor to invest in them -- represents probably the most prevalent use of VE for DoD weapon systems**



Phalanx VE Example for Existing Substitute Approach

- **Background**
  - **The Phalanx Close-In-Weapon-System is a fast-reaction, rapid-fire 20-millimeter gun system that provides Navy ships with a terminal defense against anti-ship missiles, fixed-wing aircraft, small gunboats, and helicopters**
  - **A contract was awarded to retrofit Phalanx with a manual controller to direct fire against targets of opportunity**

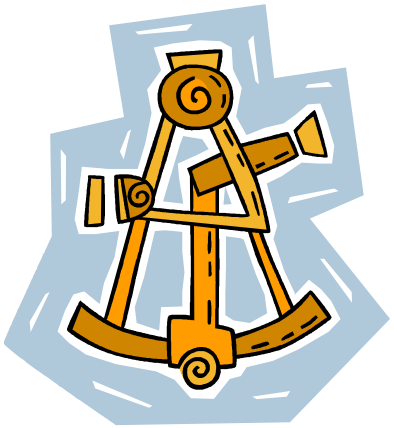


- **The contractor submitted a VECP to replace the standard military controller with a ruggedized commercial derivative**
  - **On its own initiative, the contractor produced a modified unit**
  - **Based on the test results, the contractor had confidence that the commercial derivative met all of the technical requirements at a lower cost**
  - **The military standard controller would cost $7,600, while the commercial derivative was only $2,100**
  - **Since each gun required three controllers, net savings was $16,500 per system**
  - **Approximately $2 million in savings were shared by the Navy and the contractor**

VE Contributions to an Aftermarket Approach

- **Definition**
  - **The original equipment manufacturer authorizes the assembly of an obsolete part and provides necessary tech data**
  - **A smaller company might undertake production that is no longer sufficiently profitable for a larger company at a lower price; competition also leads to lower cost**
- **Drawbacks to this approach**
  - **Market conditions may not have a favorable outcome for the new source**
  - **Non-recurring engineering expenses will be incurred**
  - **The unit cost may be higher**
- **How VE can help**
  - **Value engineering enables the development of viable aftermarket sources**

AMRAAM VE Example for Aftermarket Approach

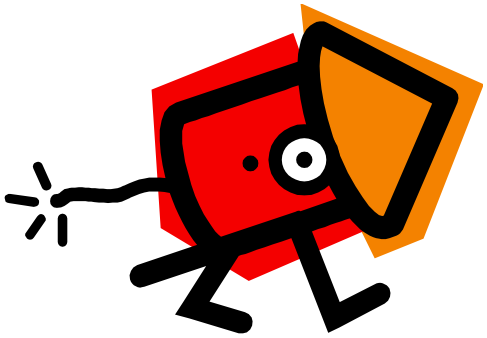


- **Background**
  - **AMRAAM is a fire-and-forget air-to-air missile capable of attacking beyond-visual-range targets**
  - **The Inertial Reference Unit (IRU) accurately measures the missile vertical velocity and position enabling in-flight steering and targeting adjustments**
- **DMSMS situation**
  - **Originally, there was only one source for this expensive item**
  - **The contractor was aware that others were interested in furnishing this item, so the contractor provided the requirements and helped encourage others in the development of the IRU**
- **The contract contained a mandatory VE program and DoD recognized the value of having a second source for the IRU**
  - **Approximately $4 million in non-recurring engineering costs were required**
  - **These efforts saved $2,000 per unit**
  - **The existence of a second source through the VECP probably prevented the price of the IRU from increasing**

VE Contributions to a Reverse Engineering Approach

- **Definition**
  - **A producer obtains and maintains the design, equipment, and process rights to manufacture a replacement item by analyzing the part's structure, function, and operation**
- **Drawbacks to this approach**
  - **Market conditions may not have a favorable outcome for the new source**
  - **Non-recurring engineering expenses**
  - **The new unit cost may be higher**
  - **Intellectual property rights**
- **How VE can help**
  - **Value engineering function analysis identifies viable options for reverse engineering parts**

Missile VE Example for Reverse Engineering Approach



- **Background**
  - **A defense missile contractor had a sole-source subcontractor for a costly warhead**
  - **The subcontractor was having problems meeting "insensitive munitions capability" requirements for the warhead to not explode in a fire or if dropped**
- **With DoD cooperation, a VECP was submitted to develop an alternative, and less expensive, source for the warhead by reverse engineering**
  - **Insensitive munitions capability improved by using a different process for making the explosive portion of the warhead**
  - **Approximately $12 million is being invested to develop the new source**
  - **Estimated savings is $15,000 per warhead**
  - **Second source also expected to control future cost increases**

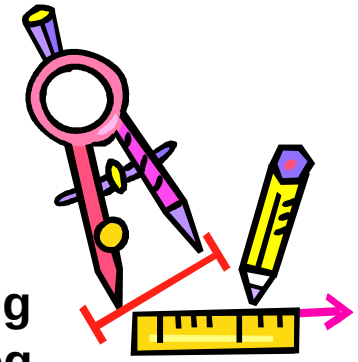
VE Contributions to a Redesign Approach

- **Definition**
  - **Either eliminate the need for the part in question or replace it with another – may occur at many levels**
    - **The DMSMS part itself**
    - **The next higher level configuration item**
    - **An entire subsystem**
    - **The end item itself**

- **Drawbacks to this approach**
  - **Non-recurring engineering expenses for building and testing the new production capability**
  - **Qualification and certification to meet requirements**
- **How VE can help**
  - **Value engineering function analysis identifies viable minor redesign options and it systematically identifies economically viable opportunities for a major redesign when there is a high degree of interdependence among parts**

AMRAAM VE Example for a Major Redesign Approach

- **Early in its production, the AMRAAM missile used an Analog Range Correlator**
  - **The unit was scheduled to be replaced by a Digital Range Correlator as a pre-planned product improvement**
  - **With implementation several years in the future, the contractor was faced with producing the missile using a very difficult to build and extremely sensitive Analog Range Correlator**



- **The contractor submitted a VECP to use an Interim Digital Range Correlator**
  - **Implementation occurred four years in advance of the pre-planned version**
- **Savings**
  - **$13,000 per unit**
  - **Government shared exceeded $100 million**
  - **Contractor received over $20 million in VE incentives after being reimbursed for approximately $9 million in NRE**

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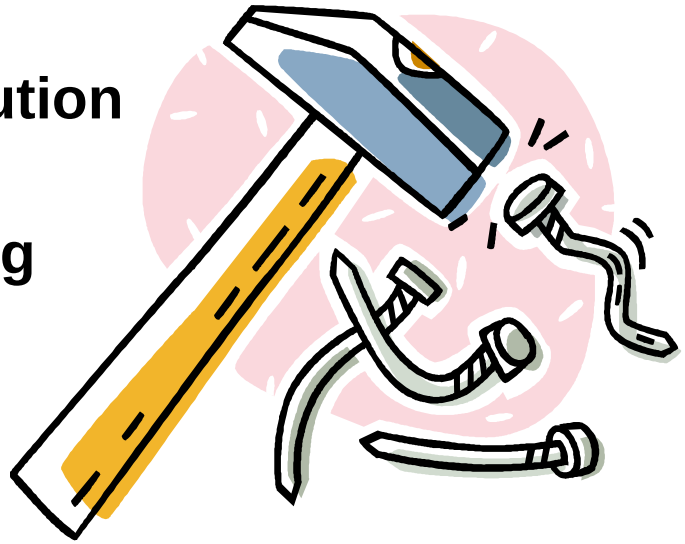
VE Enriches DMSMS Resolution Options

- **VE is an extremely powerful tool and methodology for**
  - **Identifying a large number of resolution options**
  - **Evaluating their potential for solving the problem**
  - **Developing recommendations**
  - **Providing incentives for the investments needed for successful implementation**



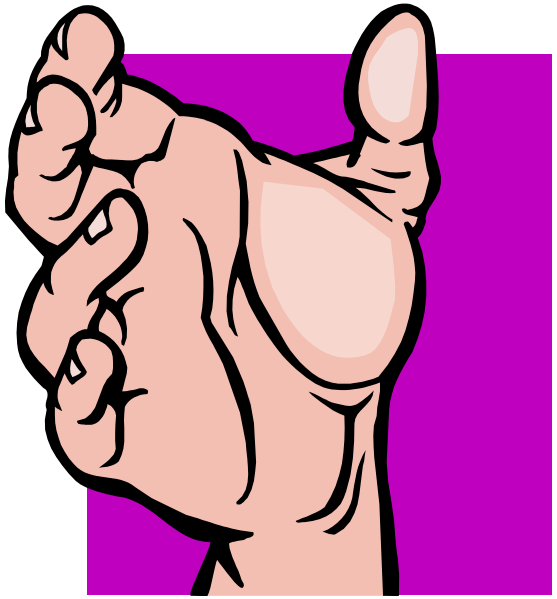
Using the VE methodology provides *greater opportunity* for developing and implementing innovative solutions to DMSMS problems

A VE / DMSMS Partnership Would be Beneficial

- **Nature of the partnership**
  - **DMSMS community identifies problems**
  - **VE provides and incentivizes alternative solutions**
- **Potential actions to develop a partnership**
  - **Update the DMSMS Guidebook with a comprehensive treatment of VE and its application to DMSMS**
  - **Incorporate DMSMS examples into the DAU VE distance learning course**
  - **Incorporate DMSMS into the introductory VE certification training**
  - **Establish a DMSMS track at the annual VE professional society conference**
  - **Maintain and strengthen the VE track at the annual DMSMS conference**
  - **Augment the DAU DMSMS distance learning courses to include a section on VE**
  - **Include VE lessons in appropriate DAU DMSMS classroom material**

Additional Actions

- **Outreach to contractors and program managers**
- **Outreach to the PBL community**
  - **Use of Value Engineering Program Requirement clause**
- **Potential DFARS changes**



Sources of More Information

- **Contractual aspects of value engineering**
  - **DAU CON 236 (online course)**
  - **Value Engineering Proposal Training Course – Ball Associates, www.ballassociates.com**
- **VE methodology**
  - **SAVE International http://www.value-eng.org/**
  - **Certified facilitators and consultants**
- **Publications**
  - **Value Engineering Handbook**
  - **Contracting Guide to Value Engineering**
  - **Value Engineering Change Proposals in Supplies or Services Contracts**
  - **Value Methodology Pocket Guide www.goalqpc.com**
- **R-TOC/VE websites: http://rtoc.ida.org or http://ve.ida.org**