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JANUARY - FEBRUARY 1994

ACQUISITION REFORM

Section 800 Report
Lean Production
Integrated Product/Process Development
Defense Science Board Report
Industrial Base
Concurrent Engineering
Agile Manufacturing

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Official:

MILTON H. HAMILTON
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Research Development Acquisition

ARMY RD&A BULLETIN

Professional Bulletin of the RD&A Community

FEATURES

Acquisition Reform Special

DEPARTMENTS

★ ★ ★ **SEE IMPORTANT NOTICE ON PAGE 56** ★ ★ ★

COVER

A number of major articles related to DOD and Army acquisition reform efforts are highlighted in this issue, including the Section 800 Report, Lean Production, the Industrial Base, Agile Manufacturing, Concurrent Engineering, and the Defense Science Board Report.

Acquisition Reform...

AN ARMY PERSPECTIVE

By Bruce H. Waldschmidt
and COL Danny L. Abbott

Introduction

Why reform? Declining procurement dollars, the dwindling of the Army's industrial base, and the accelerating pace in the development of commercial technology have led to fewer suppliers willing and able to do business the government way. Furthermore, our Army continues to serve in difficult situations where world-class equipment is a necessity.

The new DOD senior civilian leadership has signaled their commitment to change by establishing the Deputy Under Secretary of Defense for Acquisition Reform (DUSD(AR)). Fortunately, the Army has been moving forward rapidly during the last three years and finds itself able to demonstrate success in many of the initiatives proposed by the new DUSD(AR).

Our goal is to eliminate non-productive costs thereby dramatically improving the development, testing, acquisition, and fielding of weapons and information systems. This article discusses a number of broad acquisition reform initiatives that will substantially help the Army reduce costs.

Regulatory Reduction

In April of 1993 the Army published AR 70-1, Army Acquisition Policy, which significantly changes the authority of program managers (PM). In the past, the "burden of proof" for not incorporating functional requirements (e.g., specifications and standards) into acquisition programs rested with the PMs. That policy changed with the latest rewrite of AR 70-1. Now the functional proponent must justify why it is in the best interests of the PM and the Army to include a functional requirement. The "burden of proof" lies with the functional proponent, not with the PM.

The Office of the Assistant Secretary of the Army (Research, Development and Acquisition (OASA(RDA)) has embarked on a significant effort to eliminate unneeded Army regulations. During the past year we identified 41 acquisition regulations for potential elimination. After a vigorous review, we eliminated 17 of those regulations and transferred two additional regulations to the Army staff for their consolidation. The remaining 22 regulations are still under review for possible elimination.

Streamlining acquisition policy enables PMs to develop, acquire, and field weapons systems more efficiently and effectively. For example, we eliminated AR 705-19, Electrical Systems and Motor Vehicles. This regulation required the use of 24 volt electrical systems in motor vehicles even though the commercial market had moved to 12 volt systems decades ago. Other examples of regulations that we consolidated or eliminated include Configuration Management, Post Production Testing of Army Materiel, and the Army Conversion To Metric Systems of Measurement.

Our goal is to eliminate non-productive costs thereby dramatically improving the development, testing, acquisition and fielding of weapons and information systems.

Roadshows

The acquisition reform effort also encompasses the education of thousands of government and industry professionals regarding the new way of doing business. This is where Army Materiel Command's Roadshows come in. The Roadshows use the case study method and bring in experts from the Army Materiel Command and the Department of the Army to educate participants on how we can streamline the acquisition process. The Army Materiel Command has conducted three series of Roadshows to date.

Many studies estimate that the Army pays a 30 percent premium over the commercial cost for building similar products. Part of that 30 percent cost differential is due to the tight regulatory controls the Army has instituted in decades past. Regulatory controls may reduce risk for the Army, but the controls also drive up the cost of doing business for everyone.

The Roadshows focus on eliminating the 30 percent premium we pay for goods and services. The Roadshows emphasize concurrent engineering, improvement in research and development of products and processes, the early integration of test and evaluation, obtaining the best value for the full life cycle, looking at the commercial and world market for better products, electronic data transfer, and, of course, reducing functional requirements and military specifications and standards.

Industry Roundtables

Private industry has played a significant role in acquisition reform through their participation in Roundtable I, May 1991, and Roundtable II, July 1992.

More than 100 government and industry executives met for three days and developed 99 recommendations for improvement of the acquisition process. Today more than 80 recommendations have been implemented.

An example of where we implemented an industry streamlining recommendation is the automation of the business process during solicitation, proposal, evaluation, negotiation, award, and administration. Industry recommended expanded use of electronic data interchange and standardized software government wide. The Army agreed and is aggressively pursuing the recommendation. Currently, there are major thrusts in DOD for Electronic Data Interchange (EDI) and the Army is developing a strategic plan to accomplish this cost saving measure.

Non-Developmental Items

The Army has always been the DOD leader in Non-Developmental Items (NDI). The Army continues to pursue a number of initiatives to increase the use of commercial products. We have a network of associate advocates for NDI at 13 different Army acquisition sites. These advocates challenge local barriers and increase the dialogue with the using community to enable greater potential of NDI.

Advanced Planning Briefings

The Army has developed the advanced planning briefing for industry as an effort to provide procurement information to private industry. This program encourages early dialogue with industry during all phases of acquisition. The program uses three levels of briefing for industry. Level I addresses the commands projected requirements in all business areas three to five years before solicitation. The second level reviews projected requirements 12 to 24 months into the future. The third level looks one to six months prior to the solicitation. Industry response is enthusiastic and attendance is high at the briefings.

Acquisition Policy

There have been numerous acquisition policies published emphasizing acquisition reform by the Army. Two of note, however, deal with reducing functional requirements and developing a team concept for PMs.

The Army has developed the advanced planning briefing for industry as an effort to provide procurement information to private industry. This program encourages early dialogue with industry during all phases of acquisition.

The first memorandum, Reducing Functional Requirements, was authored in August 1992. This memorandum tells the acquisition community to eliminate those functional requirements that add little or no value or are not cost effective. The head of the contracting activity, in coordination with the PM, must ensure that the functional requirements included in solicitations are justified as essential and cost effective measures. The policy also required PMs to review all non-contractual functional requirements and challenge those that appear excessive or do not add value to the Army.

The second memorandum, Team Concept for Program Management, was authored a few months later. This memorandum emphasizes cooperation between government and industry. We need a "free and open exchange of information" among all parties in order to ensure program success. The memorandum encourages top management to be involved earlier so that project managers will know the critical processes and management actions required at program onset.

Success Stories

We have had numerous success stories over the last few years that are a direct result of acquisition reform efforts. Our first story relates to Battlefield Combat Identification Systems. It involved the PM pulling government and industry officials together to solve the fratricide problem. The Army used process action teams and a senior management committee for problem resolution. As a result, the PM successfully passed Milestone I/II only 11 months after Milestone O.

Our second success story is the new training helicopter. We streamlined the request for proposal and used no military specifications. For provisioning, the Army requested commercial off-the-shelf products. Furthermore, the Army specified commercial publications. The Army even waived many Milestone I&II documentation requirements thereby reducing the PMs "paper burden" by 44 percent. All of these actions resulted in the new helicopter being fielded sooner with minimum investment by private industry. The Army is now reaping approximately $50 million/year in operations and support cost savings.

Conclusion

The Army has pursued acquisition reform across a broad spectrum through the use of written policy and increased dialogue with our industry partners. We have used every possible means to spread the acquisition reform message. Our focus remains steady. We look to develop good business relationships. We look at best value, not cost. And finally, we empower our personnel to do the best job they can.

BRUCE H. WALDSCHMIDT is chief of the Acquisition Policy Division, OSARDA. He holds a B.A. degree in economics from Cornell College and an M.S. degree in contract acquisition management from the Florida Institute of Technology. He has also completed the Industrial College of the Armed Forces.

COL DANNY L. ABBOTT is director of the U.S. Army Acquisition Policy Reform Working Group, OSARDA. He holds a B.S. degree in aeronautical science from Embry-Riddle, and an M.A. degree in business management and economics from Central Michigan. He has also completed the PM course at the Defense Systems Management College and the Army War College.

DEFENSE SCIENCE BOARD TASK FORCE ON ACQUISITION REFORM

By Dr. Robert J. Hermann

Introduction

Acquisition reform was identified as an early part of the new administration's thrust for the Department of Defense. Dr. William J. Perry, deputy secretary of defense, signaled his convictions as the architect of a letter to the then president-elect by the Carnegie Commission on Science, Technology, and Government. Soon after taking office the new administration formed the Office of Deputy Under Secretary of Defense for Acquisition Reform with Colleen Preston as its leader. In April, John Deutch, the under secretary of defense for acquisition (USD(A)), launched a task force of the Defense Science Board with the following objectives:

1. Review the Section 800 study results for both immediately actionable items and contributions to a comprehensive program;

2. Review the data collected in the 1990 USD(A) initiative on "Streamlining the Defense Acquisition Process," and other relevant studies to assure the best possible numerical estimate of the absolute and relative costs of the current process;

3. Collect a comprehensive list of historical examples which can be used to convey the nature of the issues involved to the administration, the Congress, and the general public;

4. Recommend a method for proceeding with a radical change to the current process; and

5. Perform a preliminary review of the impact of the current military requirements process on the acquisition system and recommend an approach for change which will be consistent with number 4 above.

Task force members were: Robert J. Hermann (chairman), senior vice president, science and technology, United Technologies Corporation; Anthony F. Bronzo, COL USAF(Ret.); Robert L. Cattoi, senior vice president, research, engineering and manufacturing processes, Rockwell International Corporation; George Donovan, vice president, government relations, Smiths Industries; Leon A. Edney, Admiral USN(Ret.); Robert R. Everett, trustee, The MITRE Corporation; Robert A. Fuhrman, president (Ret.), Lockheed Corporation; Jacques S. Gansler, senior vice president, The Analytic Sciences Corporation; Joan E. Habermann, vice president, Logistics Management Institute; George H. Heilmeier, vice president and chief executive officer, Bellcore; Wendy T. Kirby, Esq., partner, Hogan & Hartson; Edward C. Meyer, General, USA(Ret.); Ralph C. Nash Jr., professor (Ret.), George Washington University; Philip A. Odeen, president and chief executive officer, BDM International, Inc.; and Bernard P. Randolph, General, USAF(Ret.), vice president, product integrity and total quality management, TRW, Inc.

The results of this study were reported to Dr. Perry on Jun. 30, 1993. This article presents information included in the executive summary of the task force report.

Imperative for Reform

The most important and urgent imperative for defense acquisition reform is the need to integrate major parts of the defense industrial base with the commercial industrial base. This is required to meet several objectives. Integration of major parts of the defense and commercial industrial bases will give DOD access to those technologies, products, and processes which are dominated by the commercial market place. Electronics, software, computer systems, telecommunications, and flexible manufacturing are examples where commercial technology is far more advanced than military technology.

Secondly, this initiative will broaden the industrial base upon which the department depends. The current base, which is essentially dedicated and thus isolated, is eroding, is not attracting capital, is losing technology leadership, is not using the most advanced industrial practices, and is not capable of the required surge capability for crisis response.

Another objective of the integration of commercial and defense industrial bases is to become more efficient and save money. Inefficiencies exist in all three segments of the acquisition process— program definition, program execution, and the defense industrial base. Acquisition emphasizing commercial practices will enable DOD to stretch its available resources significantly. The amount of the potential savings is not subject to precise calculation. The task force has examined many case studies and has reached the judgement that efficiencies in the order of tens of billions per year could be achieved after four or five years of determined reform.

Finally, greater integration of the industrial base will make the large R&D and production resources of the DOD more readily available to the U.S. economy overall—to foster economic growth and industrial competitiveness.

Elements of a Solution

• **Adopting Commercial Practices.** This initiative requires profound changes and difficult choices. It means DOD must move away from the current cost-based acquisition system and increase the use of practices which will encourage commercial entities to serve the defense market. Areas impacted involve unique government procurement, accounting and auditing practices.

Adopting commercial practices also means that commercial functional specifications must be applied. DOD unique product and process specifications must not be imposed which inhibit the delivery of defense products and services by commercial sources.

In addition, data and intellectual property rights must be treated in a manner consistent with commercial practice.

• **Maintaining the Public Trust.** Monitoring costs as the way to determine a fair price is deeply imbedded in the

current acquisition process and viewed by many as a major element in protecting the public interest. Moving away from cost-based acquisition raises questions about how to maintain the public trust while using commercial practices.

We believe the public protection offered by the current system is not a very high standard. It encourages the supplier to increase the cost of goods because that is one of the few ways available to increase profit over the long run. It discourages a supplier from investing in more efficient production processes. It creates an immense regime of contention between the government and its suppliers around which large numbers of government auditors, accountants, and other overseers scrimmage with an equally large number of supplier personnel. The result is a constant flow of charges and counter charges about false claims, unallowable costs, pricing deficiencies, and a host of other opportunities for differences which we believe can safely be avoided. It is very clear that the effect of this is not public trust.

There are a number of tools available to DOD in the commercial market place that can better protect the public trust. Emphasizing a broad use of competition is one such tool. Another is using formal, collective, and accountable judgement of fair price using market surveys. Greater involvement of users in the program definition process would provide a better understanding of value. Keeping a track record of past performance of contractors would also help in this area. In addition, the public trust could be better maintained through the use of the general regulatory environment governing the conduct of commercial business, including commercial accounting and auditing.

• **The "Requirements" Process—Flexibility Needed.** One of the most important elements of this new approach is flexibility in the process that determines what DOD needs to acquire. The commercial market place depends heavily on competition not only between competitors for identical items, but among functionally similar items and alternative courses of action. This requires that the program definition process be more closely linked to an understanding of the objectives and plans of the military user and thus a better sense of the value of the alternatives and their affordability.

This means giving the unified commanders (the users) and the CJCS/joint staff a more powerful role in the acquisition process—and more access to technical resources to fulfill that role. The activities of the CJCS/joint staff must be integrated with those of the USD(A) and the acquisition community. A direct relationship must be established between the acquiring service/agency and the user CINC to permit a more effective dialogue over how the functional needs are to be met and at what cost.

Integration of major parts of the defense and commercial industrial bases will give DOD access to those technologies, products, and processes which are dominated by the commercial market place.

These needs must be linked to the long-term budget process to assure affordability.

• **Recommendations—How to Begin.** According to the Task Force, DOD should begin by taking several steps which already have been defined by prior policy decisions and studies.

DOD should broaden the procurement of commercial products. This means that DOD should implement and enforce DFARS 211 which would relax the requirement for cost or pricing data and technical data rights. DOD should implement, by regulation wherever possible, the Section 800 panel recommendations and should support the related legislative proposals of the Section 800 panel. In addition, DOD should substitute commercial item descriptions for milspecs in every procurement of a commercial item. The use of a DOD specification or process standard should be prohibited unless it is the only practical alternative.

Increased use of simplified procurement procedures by supporting the legislative proposal of the Section 800 panel to raise the threshold to $100,000 is another recommendation made by the task force.

Also, the task force recommended reducing reliance on cost or pricing data. This means eliminating cost or pricing data when there is adequate price competition or where fair and reasonable price can be established through "other means," such as independent price analysis via market research. Also, this means supporting the Section 800 panel's recommendation that the definition of adequate price competition be expanded and be adopted in the DFARS. This can be done without legislation. The last recommendation among those already defined by prior policy decisions and studies was to support the Section 800 panel's recommendations to make permanent the current $500,000 threshold for submission of cost or pricing data.

In parallel, the task force recommended the introduction of commercial practices in key industrial sectors.

Beginning with the selection of some industrial sectors which are dominated by the commercial market, but are also important to defense, DOD should acquire systems and services in those selected sectors with commercial practices. For this selection, the task force recommended three broad candidate areas—information systems, electronics, and jet engines. Within these sectors limited segments of these industrial sectors should be carved out as pilot initiatives that involve entire plants. The electronics and jet engine industries were recommended as candidates for pilot segments. DOD should begin immediately to bring together the private and public participants in the industries to evolve the correct practices for each.

The task force recommended the selection of two major unified commands (LANTCOM should be considered as one.) and that these commands' military systems capabilities for technology insertion and requirements definition be increased.

Also, the first of a series of annual plans for "commercialization" should be prepared in January 1994, and should lay out, in detail, goals, action steps, time schedules, and responsible parties.

The task force recommended that DOD establish a standing outside review group and also establish a comprehensive education, training, communications, and outreach program for government, industry, and the public.

Conclusion

Dr. John Deutch, USD(A), has approved a second phase of activity by the Defense Science Board which includes the following objectives:

• Further define the elements of pilot industry initiatives for jet engines and a segment of electronics;

• Further define the elements of pilot initiatives for two unified commands;

• Assess the comments on the Phase I report and recommend changes in approach, if appropriate; and

• Provide a status report on our activities in December 1993 and May 1994.

These activities by the Defense Science Board are advisory in nature and intended to assist operating officials in the Department of Defense who have the responsibilities for acquisition functions.

DR. ROBERT J. HERMANN is senior vice president, science and technology at United Technologies Corporation in Hartford, CT. He serves on the Defense Science Board as chairman of the Defense Science Board/Defense Acquisition Reform. Hermann holds B.S., M.S., and Ph.D. degrees in electrical engineering from Iowa State University.

Architect's Associate...

APPLYING CONCURRENT ENGINEERING TO FACILITY DESIGN

By L. Michael Golish

Introduction

The Department of Defense (DOD) spends $8.8 billion per year to build facilities and another $89.1 billion to operate, maintain, and repair them. At these funding levels, substantial savings could be realized by limiting the number of errors and improving trade-offs between competing design goals in facility design. Many design errors go undetected until the facility is under construction or in operation. At this point, correcting the errors costs considerably more than if they had been found and rectified during design.

Facility design is a fragmented, serial process with specialized disciplines working independently. Because of organizational barriers, designers tend to develop solutions based on their span of control, limiting the need for interaction and coordination with others. The result is a suboptimized facility.

An approach called "concurrent engineering" could reduce design time and cost by 35 percent, construction costs by nine percent, and life-cycle costs by 25-45 percent, depending on the facility type. This approach emphasizes collaboration, robust model representation, and facility optimization. Rather than being another attempt to automate pieces of the design work, concurrent engineering seeks to reinvent the design process (Figure 1).

Broken Processes

Adam Smith, the 18th century economist, redefined the manufacturing process and created an industrial revolution that has lasted 200 years. By simplifying complex work into smaller tasks, a relatively untrained worker could become extremely productive and provide a product of superior quality at a very low cost.

Adam Smith's concept had its drawbacks. It created large hierachical organizations, multiple management levels, extensive checking and reconcilation, and in general, bureaucratic processes. Many relatively simple processes have evolved into bulky, awkward, processes due to task specialization and the need to handle all cases within a single process. In manufacturing, this is called the "over-the-wall" problem; that is, each worker contributes his or her expertise to the sequential process and passes the information on to the next specialist. As these sequential processes become more complex with more specialists involved, the opportunities for error increase with every handoff and "dead time" between transactions slows the process to a crawl.

The construction business has a very decentralized structure. Until recently, advances in automation have focused on providing tools for the individual players in design and construction, without addressing the process as a whole (Figure 2). The tools must evolve to support collaboration at the work group, organizational, and eventually, the entire enterprise levels.

There is significant evidence that many processes in the construction industry are broken. In 1991, the University of Maryland studied performance failures (requiring litigation) in 5,000 buildings and found that 43 percent of these failures were attributable to failures in the design process (Figure 3). Studies by the U.S. Army Construction Engineering Research Laboratories (USACERL) of corps design reviews supports that contention and identifies in detail where many of the failures occur (Figure 4). In addition, one large architecture/engineering (AE) firm in the Midwest reported documenting that over 35 percent of its work in developing facility designs was unnecessary, primarily due to reiterative work resulting from the serial process.

For many processes, whether in manufacturing or construction, continuous

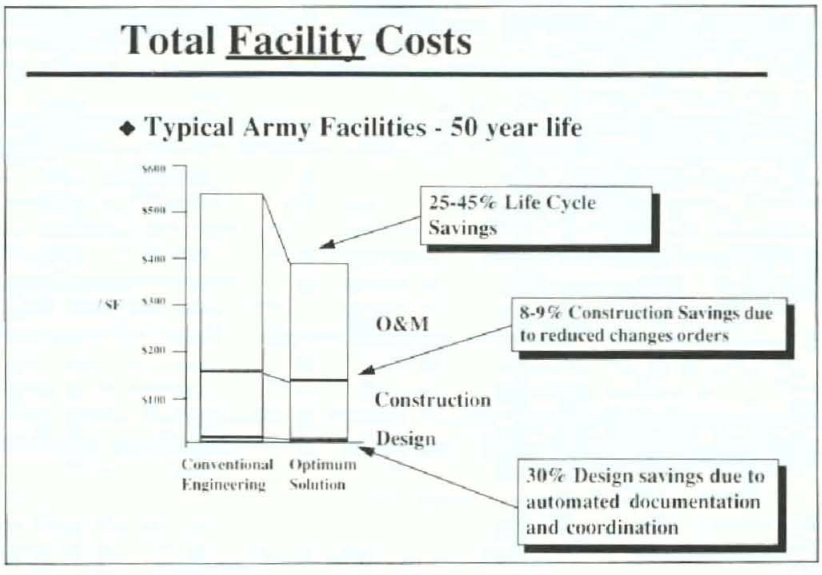


Figure 1.
Potential for reduced life-cycle cost.

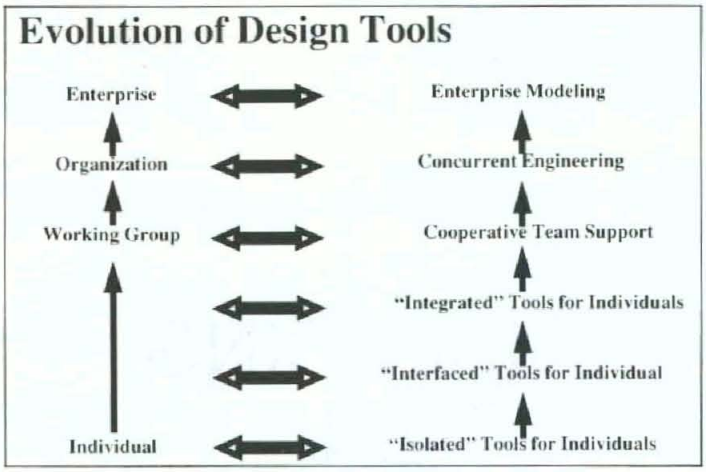


Figure 2.
Evolution of design tools.

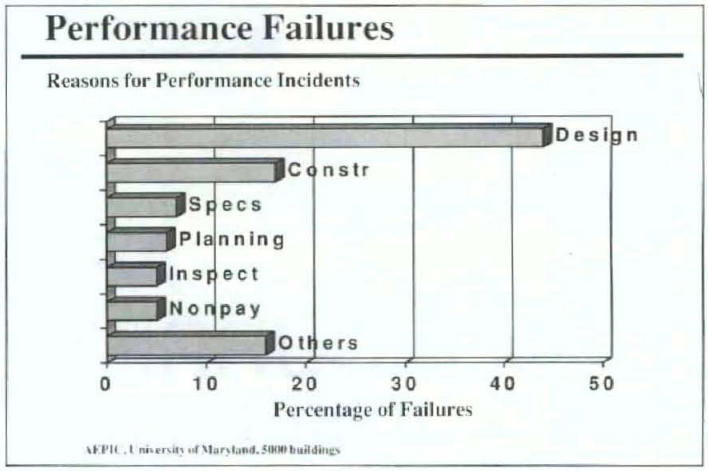


Figure 3.
Reasons for facility performance failures.

improvement will not help. As Michael Hammer's *Reengineering the Corporation* (1993) charged, making significant improvements means starting over. Variably termed "reengineering" or "reinvention," it begins with evaluating the basic assumptions of why this process exists.

Facilities vs. Manufactured Goods

Many lessons learned in the manufacturing industry can be applied to the construction industry. Indeed, many technologies implemented in the past 20 years have been borrowed from the manufacturing sector. Concepts such as "manufactured buildings" in the 1970s directly applied the assembly line approach to what had previously been the construction equivalent of manufacturing before Henry Ford's time. Management tools such as PERT diagrams are now common in construction offices, where they help in managing and coordinating project schedules.

Despite the similarities, major differences between the construction and manufacturing industries make it impossible to apply manufacturing technologies to construction across the board. In traditional construction practice, AE design firms are independent agents for building owners. The firms are generally small, often having less than eight employees. Architects, usually the lead designers, subcontract for other engineering and consulting services because very few firms have all of the necessary skills in-house. Constructors competitively bid a project against a well defined set of contract documents developed by the designers. This type of facility delivery strategy creates and reinforces organizational boundaries, many of which are adversarial due to the traditional roles of designers and constructors.

With a few exceptions in the fast food and housing industries, most facilities are built individually from custom designs. The AE generally does not repeat a particular design due to owners' varying needs for the facility, siting issues, or weather conditions at different locales. Although the Army has over 20 standard designs, they are usually conceptual in nature and require detailed engineering, material selection, and site adaption prior to construction. Thus, even these "standard" structures are customized to some extent. This custom design process prevents the designer from getting useful feedback as to the relative success of the design and makes it much harder to measure quality using statistical methods common to manufacturing.

Enter Concurrent Engineering

A research program at USACERL called "Architect's Associate" (AA) represents an effort to make concurrent engineering a reality for the facility delivery process. USACERL is partnering with several other organizations to redefine the design process and develop enabling technologies to support the new process(es).

The definition of concurrent engineering varies somewhat, but for the AA work, the emphasis is on four principles: a technology-based approach to support redefinition of existing serial processes to make them more concurrent; optimization of facilities at the highest level through support for team collaboration and negotiation; downstream requirements such as maintenance, operations, environment, and other life-cycle issues brought to the front of the design process; and robust, integrated model representations that can evolve and be used throughout the facility life-cycle.

In this age, reengineering any process must consider automation because computers support almost every facet of business and industry. Opportunities for reengineering can be lost without sufficiently powerful software tools to support the new process. However, automation alone will not make significant improvements. As an example, automating the existing design processes through technologies such as computer-aided design (CAD) has had only marginal benefits in saving time and improving quality.

In the late 1980s, the DOD Advanced Research Projects Agency (ARPA) funded a large basic research program in technologies to support concurrent engineering. These technologies focused on collaboration and robust model representation. The AA research borrows heavily from these technologies where appropriate, creates some new technologies to support a decentralized approach to collaboration, and addresses domain-specific research requirements needed to implement this approach in the construction industry.

USACERL's research focuses on two main technical areas: agent-based design tools and collaboration between agents in heterogeneous systems.

Agent-Based Design Tools

Agents are expert systems that are tightly integrated with both traditional CAD tools and engineering applications. They are, in effect, the glue that can integrate various applications together in a coordinated design environment and provide a repository for the symbolic model of the facility. Agent-based systems have several unique characteristics. They consist of rules that capture design knowledge. They have constraints to allow logical connections between related design objects and support second-order relationships that often occur. They contain design rationale for decisions made by either the designer or the software agent. They are opportunistic—if any information changes or information is added or deleted, they determine how this impacts the agent's "viewpoint" and respond appropriately.

Agents provide several benefits. For

example, they can become a consultant to the designer by preserving knowledge of experts. This capablity is particularly important in the very early stages of the design when design consultants or other facility members such as maintenance personnel are not available to advise the lead designer.

In addition, agents can orchestrate the use of one or more analysis tools. For example, an energy agent controls a very powerful energy analysis tool called BLAST. The agent determines appropriate information to feed the analysis and then reviews the results. The agent makes an intelligent determination as to which parameters should be changed, to what extent, and in what sequence. The agent represents the knowledge of a very experienced BLAST user and helps users with only limited experience. This process optimizes the design quickly with minimum iteration, saving the designer significant time in developing an energy-efficient facility.

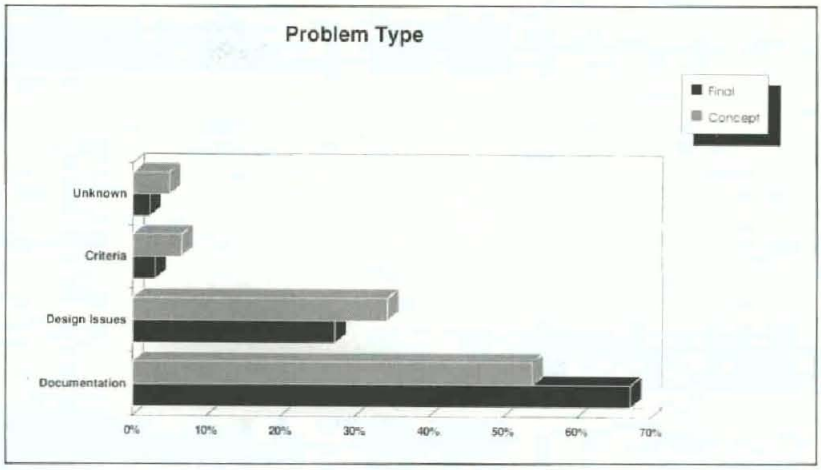


Figure 4.
Reasons for changes during design review (USACERL study).

Collaborative Systems

When more than one agent is involved, there is an opportunity for conflicting points of view. Indeed, even the simplest building is a compromise of competing goals. The second focus of USACERL's work is to develop a *software facilitator* to manage conflict between the agents. Since each agent represents particular points of view and goals, conflict is inevitable. In traditional design processes, these conflicts are often not identified and resolved during the design process. Decisions made by one designer often impact other designers without their knowledge. Existing software tools often do not identify the sources of conflict. As a result, changes must often be made during construction, causing unnecessary costs and delays.

A critical issue in fielding collaborative systems is to develop a system strategy that will work in the highly decentralized domain of the construction industry. Several research systems under development are called "closely coupled." This means that they share a single "object-oriented" data base, usually operating on a single computer. This centralized approach is appropriate for large organizations and has the benefit of making it quick and easy to identify conflicts, both in the design model and between agents. However, because the average architecture design firm has only a few employees and rarely has all the needed engineering disciplines in-house, a more decentralized solution is necessary. Based on past experience with the CAD industry, it is highly unlikely that all AE disciplines would be willing to use a single system or to share proprietary data, particularly as agents evolve and better represent the engineering firms, skill and expertise. Support for a truly distributed data base will be needed.

During FY94, USACERL is collaborating with Carnegie-Mellon University, the Massachusetts Institute of Technology, the University of Illinois and Stanford University. Each of these institutions has experience in developing agent systems for both the manufacturing and construction sectors. The goal is to jointly develop an "Agent Collaboration Language" (ACL) which is needed to allow interaction (i.e., conflict identification, brokering, and negotiation) between agent-based design tools in a distributed environment. This language would support distributed collaborative design on the information superhighway.

The ACL would allow design and construction teams in different organizations to work at remote locations either asynchronously or in real time, saving meeting/travel costs and making best use of their organizations' resources. Designers would not have to use a particular agent system to participate collaboratively. While not as closely coupled as some systems, this capability will be sufficient for the construction industry as well as many other domains.

Status

An agent-based development environment called *Designer Software*, developed by USACERL, is sufficiently mature to support the creation of agents for testing in the field. The system operates in an MS Windows environment in conjunction with either AutoCAD for Windows or Intergraph Microstation, with a Windows NT version expected this year. Designer Software includes several modules including the basic development tool for creating agents with special modules to interface the software with other tools. These modules include Prolink, a general purpose interface tool for attaching to analytical and other traditional programs; Cadtalk, the interface to CAD; and SpecView, a program for generating automated construction specifications.

Several agents are completed and others are under development. The AA research prioritized agent development where there is maximum opportunity for interaction between AE disciplines or where information is critical to early decision-making by the lead designer. The first products include an architectural spatial layout agent; an energy agent; a structural-seismic agent; a product/system selector agent; and a construction planning agent. Each agent is being developed by teams with expertise in that particular domain. Field testing of designer software in a multiuser distributed enviroment is planned for late FY94.

The initiative to jointly develop an ACL will occur in two phases. In FY94, the language will be defined and each university will develop its respective interfaces. In FY95, the language will be tested for performance in collaborating on a design of a typical Corps of Engineers project of moderate scope. This language will be proposed as a standard to the National Institute of Science and Technology.

L. MICHAEL GOLISH is the leader of the Concurrent Engineering Team at the U.S. Army Construction Engineering Research Laboratories. He is a registered architect and a certified construction specifier. He has a bachelor of architecture in design from the University of Illinois and is currently studying architectural management at the University of Illinois.

The Section 800 Report...

STREAMLINING DEFENSE ACQUISITION LAW

By Bruce E. Sullivan

Introduction

In January, 1993, an 1,800-page report recommending significant changes to the current defense procurement system was delivered to Congress. Recently made part of Vice President Gore's National Performance Review, the recommendations could pave the way to a streamlined procurement system within the Defense Department.

The Section 800 Report identified that a simplified acquisition threshold would streamline over 50 percent of the contract actions over $25,000 while only affecting five percent of all contract dollars.

Background

Section 800 of the Fiscal Year 1991 National Defense Authorization Act (public law 101-510) mandated the establishment of an advisory panel to codify and simplify acquisition law. In response to that mandate, the Under Secretary of Defense for Acquisition appointed a panel of recognized public and private sector experts in acquisition law and procurement policy to review the various laws governing defense acquisition.

After selecting and reviewing 600 statutes, the Acquisition Law Advisory Panel issued their report, *Streamlining Defense Acquisition Law,* on Jan. 12, 1993. The "Section 800 Report" recommends amending, deleting, consolidating or rescinding over 300 of those statutes. These recommendations, if approved by Congress, will streamline statutes, improve access to commercial technologies, and simplify the acquisition process. Significant savings in lead time and acquisition costs are expected upon implementation.

Developing The Report

In approaching a seemingly insurmountable task, the panel developed goals to guide their journey through the maze of over 900 procurement laws. After narrowing their review to 600 laws, they identified their primary objectives to streamline the acquisition process and prepare a code of relevant acquisition laws. Laws not necessary for the establishment of normal buyer/seller relationships were recommended for repeal while laws necessary to maintain the continuing financial and ethical integrity of defense procurement programs, and to protect the best interests of the Department of Defense were recommended for retention.

The report makes for interesting as well as educational reading. Broken into eight separate chapters, the report covers the following general areas: Contract Formation; Contract Administration; Service Specific and Major Systems Statutes; Socioeconomic Laws, Small Business, and Simplified Acquisition Threshold; Intellectual Property; Standards of Conduct; Defense Trade and Cooperation; and Commercial Items.

These chapters are then further broken down into a format which more specifically includes a summary of each applicable law, the background or legislative history of the law, the law in practice with a description of implementing regulations, and finally a recommendation and justification for the laws' repeal, amendment, deletion, revision, consolidation or retention.

Significant Changes

Although the complete report offers something of interest for everyone involved in federal procurement, the recommendations which offer the largest benefits for the Defense Department are in the chapters

covering simplified acquisition threshold and commercial products.

The panel's recommendations to develop simplified acquisition procedures and an expanded use of commercial items emerge from the panel's objectives to "strike a balance between creating an efficient procurement process and implementing socioeconomic policies; and facilitating access to commercial technologies and the purchase of commercial or modified commercial products and services at or based on commercial market prices."

Simplified Acquisition Threshold

The principal recommendation in this chapter was to establish a simplified acquisition threshold. The recommendation would further simplify procedures used in current small purchases by exempting most socioeconomic requirements and corresponding contract clauses and raising the threshold from $25,000 to $100,000. The resultant reductions in acquisition leadtimes, paperwork and overhead costs would benefit both the government and its suppliers.

The Section 800 Report identified that a simplified acquisition threshold would streamline over 50 percent of the contract actions over $25,000 while only affecting 5 percent of all contract dollars. Many of the present contract requirements such as the Davis-Bacon and the Buy American Act would be removed from these procurements.

Although the panel recommended the removal of statutory synopsizing requirements for simplified acquisitions, the Defense Department supports this recommendation only for those simplified acquisitions which were processed through Electronic Data Interchange (EDI) or Electronic Commerce (EC) systems.

The report clearly establishes a need for simplified procedures due to the "downward spiraling (scarce) manpower and budget resources and an ever increasingly complex procurement process." A simplified threshold will enable us to concentrate our limited resources on those contracts presenting the highest risk. In addition to more effective management of resources, simplified acquisition procedures will further enhance small business participation.

Commercial Procurement

In an attempt to lower acquisition costs, the Defense Department must find ways to benefit from savings which can accrue through the use of commercial practices. The panel recommendations clearly establish a priority for the use of commercial or other nondevelopmental items by exempting their procurements from statutes which have acted as barriers to military-commercial market integration.

By removing the requirements for government-unique accounting standards, product specifications and processes, DOD's purchasing system would become more compatible with that of the commercial marketplace. In addition, preference for the use of commercial standards and processes will be established, technical data rights for commercial items would be protected, and a broadened exemption from cost data would be provided.

In the report's chapter on Contract Formation, the panel stated that the minimum statutory time periods that offerors have to prepare bids or proposals after notice is published in the *Commerce Business Daily* may be excessive if a commercial item is being sought. The panel therefore recommended that commercial items be exempted from these minimum time periods and that an appropriate period be developed by the administrator for federal procurement policy.

Acquisition Reform—A Dream or Reality?

Given the lack of success from previous efforts to reform defense acquisition, one may question why the Section 800 study is any more likely to succeed. The July 1993 *Report of the Defense Science Board Task Force on Defense Acquisition Reform* addresses this issue by recognizing the context in which previous reports and studies on acquisition reform were reviewed.

With a stable and growing defense market, the need for reform was not so apparent and thus, not widely accepted. However, today's landscape is significantly different from the past. Faced with declining defense dollars and manpower resources; changing force structure and requirements; and a shrinking defense industrial base, business as usual is not a viable alternative.

While the context within which reform is being reviewed has changed, it is clear that reform will only succeed when the leadership of the executive and legislative branches, their supporting bureaucracies, industry leaders and the public as well embrace the effort.

Conclusion

The deputy secretary of defense has stated publicly that acquisition reform is one of his top three priorities. Generally supporting the majority of the panel's recommendations, the Department of Defense is currently working with the Office of Management and Budget to formulate the administration's position on the panel's recommendations. Once the administration's position is developed, the Defense Department will work closely with Congress in an attempt to pass a comprehensive acquisition reform bill. While Congress intends to take action on Section 800 Report recommendations this year, the extent of that action is unclear at this time.

In an attempt to lower acquisition costs, the Defense Department must find ways to benefit from savings which can accrue through the use of commercial practices.

While the individual services and OSD elements may not be in full agreement with every report recommendation, everyone within the acquisition community recognizes the need for, and fully supports acquisition reform. Streamlining the acquisition process will allow the Department of Defense the necessary flexibility to manage our dwindling resources more efficiently and effectively.

Finally, the added emphasis and publicity placed on procurement reform by Vice President Gore's National Performance Review may be the decisive factor. The White House, the Congress, the services and the public all agree that change is necessary. Perhaps this time procurement reform will become a reality.

BRUCE E. SULLIVAN is a procurement analyst with the U.S. Army Contracting Support Agency, Office of Assistant Secretary of the Army (Research, Development and Acquisition) and is a member of the Army Acquisition Corps. He holds a Bachelor of Business Sciences degree from New Hampshire College and is a graduate of the Industrial College of the Armed Forces. Sullivan has been working with the Office of the Assistant Secretary of the Army (Research, Development and Acquisition) since 1985 and is a recipient of the Department of the Army Pace Award.

PRUDENT DEFENSE BASE BLUEPRINT CRITICAL TO U.S. SECURITY IN THE 90s

Slimmed Down Military Force Structure Demands World Class Weapons Systems

By LTG Lawrence F. Skibbie, USA (Ret.)

The U.S. defense industrial base is at a critical juncture. Defense spending will drop by more than 50 percent between 1987 and 1997. In the wake of this drastic budgetary contraction, uniformed military service end-strengths will decrease by several hundred thousand service personnel.

Army regular duty divisions will decline from 18 in 1987 to 10 in 1997. Corresponding sharp cuts will hit most of the other services with the Marine Corps, with a projected 12 percent cut, probably fairing better than the Army, Navy and Air Force.

The ripple effect of this continuing tidal wave of reductions will be felt throughout U.S. society and the economy that underpins it.

For example, in the supporting defense industry component, an estimated 2.4 million workers will lose their jobs. Deputy Defense Secretary William J. Perry recently told a group of defense contractors that "four years from now, two-thirds of you won't be here, or you'll be two-thirds smaller."

Unprecedented Era

Thus, this nation is entering an unprecedented era in our defense history. The current situation is unlike the period after World War I when our place in the world was not yet established. It is unlike the period after World War II when the world was recovering from not only devastating and all encompassing conflict but also from the depression of the 1930s, and it is decidedly unlike the phase downs in Korea and Vietnam when the communist threat continued to focus our attention and shape defense policy.

Now, in the closing years of the 20th Century, as former Soviet Premier Mikhail Gorbachev threatened, our enemy has quit the field. And with that enemy went the immediate and apparent motivation to support an unassailable U.S.

But, did the enemy really disappear? Or did it, as some new virus, mutate into smaller yet still lethal strains that are personified by a clan leader in Africa, diverse factions saddled by historical hatreds in the Balkans, a central American strongman—not to mention thousands of nuclear-tipped missiles still targeted at the United States from a multitude of points in the former Soviet Union.

Most would agree that the world remains a dangerous place with new and previously unmet challenges for the world's lone remaining superpower. While the United States may be able to significantly downsize its military, that force must be able to respond quickly, forcefully and, above all, successfully with few casualties. The United States must also be able to reconstitute a larger military force should elements of the former Soviet Union be revitalized as was threatened in Russia's October 1993 revolution.

'Fifth Service'

Essential to both responding quickly and to reconstituting a larger force is the U.S. industrial base that underpins both the actual and potential military structure. Some officials describe the defense industrial base as being equivalent to a fifth military service—a service of support without which the other four services would be impotent.

The U.S. defense industrial base has dramatically changed from its World War II heritage. While the "arsenal of Democracy" supplied equipment for many allied armies in that major conflict, it was *quantities* of materiel rather than world-class weapons systems that were supplied. One has only to read the histories of that war to be aware of the excellence of the German 88's, the Japanese Zero fighter aircraft, the Messerschmitts, Heinkels, and other state-of-the-art weapons of that period.

The United States, however, now finds itself in a new era of warfare—a high technology, remote control time of lasers, precision missiles, stealth systems, infrared devices, sophisticated communications and sensor satellites and other systems that are unparalleled. With these awesome arms has necessarily come a specialized, high technology defense industry that is dramatically different from the converted automobile and refrigerator factories that churned out quantities of weapons in World War II and the Korean conflict.

Superlative Systems

Concomitant with this superlative equipment is the evolution of American society's expectations of the wars in which the United States finds itself. A central part of that vision is the necessity for minimal casualties among U.S. forces. This came into sharp focus in Desert Storm, and was negatively affirmed with the tragic loss of 18 Army Rangers in Somalia.

The significance of these changes for the industrial base is that it has become ever more critical to retain the capability for designing, system integrating and producing weapons that provide that decisive advantage for U.S. forces. Notice the use of the word capability, rather than capacity. Capability connotes retaining the skills and know-how to produce, whereas capacity

suggests the ability to produce quantities of weapons.

There probably are few people who would deny the United States currently has excess capacity in the defense industrial base. However, there are critical capabilities which must be retained so that the United States can design systems, integrate them and produce critical weaponry on an intermittent, low or surge level as the situation demands.

The obvious questions at this point are: Has not the industrial base always been there? Has it not always responded? Didn't Desert Storm prove that U.S. equipment out performs Eastern Bloc weapons? Assuming that this is so, why then in a public policy sense should we be concerned? Hasn't industry always responded when contracts are offered and profits are to be made?

Economic Considerations

Let's examine these issues.

The bedrock upon which our economic system is founded is the profit motive. While the profit motive doesn't operate within the armed services, it does adhere in defense industry. That is one of the elements that has driven our defense industry to be as innovative as it resoundingly demonstrated in the 1991 Gulf War. While other nation's may have had one or two world class weapons systems, only the United States produced first-rate systems in practically every category that determines victory.

Propelling this innovation in industry are the owners of defense companies, individual stockholders, as well as institutions such as retirement and mutual funds. Each of those stockholders expects his investment to make the best possible return, whether the company's products are Barbie Dolls or M-16 rifles, food processors or global positioning system receivers, pickup trucks or Abrams main battle tanks. Whenever there is a better return from some other source, stockholders, not unreasonably, quickly move their money and, thus, lower the value of the company whose equities have been sold.

As defense budgets decline, however, there is less potential business for defense-related companies and they are reacting in accordance with the time-honored dynamics of the free market system. That is, these firms are withdrawing from the business of defense—either by selling entire companies or their divisions, or by converting products—or, in some cases, by simply closing the factory doors. The critical point, here, is that these companies are acting rationally within the tug and pull of the free market system that the U.S. military has sworn to defend.

Motive Force

While some people in the military may believe it is disloyal to make a profit on defense work, or that companies should retain their defense capacity in a standby mode for strictly patriotic reasons, both of those notions cannot stand up to free market forces.

The dilemma, therefore, is not that the industrial base is shrinking, but, rather that military indispensable capabilities need to be retained. However, this critical competency is not all capability nor all capacity. There are obviously some capabilities in the commercial sectors—computers, for example—which already lead the way for defense. Accordingly, military planners need not concern themselves with retaining computer capabilities in the defense industrial base.

But what of a variety of munitions that have no commercial use or source? High performance aircraft, combat vehicles, artillery, nuclear powered submarines and carriers fall into this same category. To preserve the U.S. national security shield, then, the Defense Department, the Clinton administration, Congress and industry must find a way to sustain the capability to design, system integrate, and produce these critical categories of weapons.

Some people may contend that the United States should not be concerned with sustaining industry in any critical defense sector. Their rationale is that not only would this be considered industrial policy—anathema to free markets—but that in the event of an emergency, when the money starts flowing, contractors will be there with their hands out. Unfortunately, this will not be so at the conclusion of the current massive downturn.

Greener Pastures

A recent survey of defense contractors disclosed that if they successfully converted to non-defense products that they would not reconvert to defense systems at a later date, even if given a chance. The reasons for this recalcitrance are many. The complex and arcane military acquisition system was often cited as a deterrent; likewise, the better returns on investment available in the commercial arena were a frequent reason as well as contractors tiring of the feast or famine existence that depends on the whims of Congress and the Pentagon.

An equally significant reason for contractors not being able to respond in the future is that if defense-unique facilities are closed, the skilled work forces cannot easily be reassembled once programs are terminated. Contractors without contracts cannot afford to employ idle workers; neither can those workers afford to be unemployed for long. Hence, when an industrial facility phases down, the skilled workers and technicians are permanently lost. And with their departure goes the technological know-how and institutional memory that has given the United States the unprecedented world class weaponry mentioned earlier.

Viable Methodologies

There is a way out of this enigma. The Defense Department needs to identify the critical industrial sectors needed for high technology weaponry and which would fade away for lack of commercial demand. Then, the Pentagon must find a way to sustain those defense-unique components of the industrial base that will not be sustained by reduced budgets or by commercial requirements. Defense Secretary Les Aspin in his previous role as chairman of the House Armed Services Committee enumerated several important techniques to accomplish this most important objective of sustainment.

Aspin suggested that there are five techniques that could be used to sustain critical industrial sectors. These are low rate production, modernization and upgrades, technology insertion, repetitive prototyping, and "silver bullet" production. He also suggested that, in extremis, production without a requirement might be necessary. These are so-called tools which our industrial strategists can use to sustain capability in the critical sectors.

Of importance in the application of these tools is their integrated use. We must not let the "appropriation color" of the money preclude us from integrating all tools which a service may have to apply to a critical sector. For example, sustaining the combat vehicle sector may consist of new production for foreign military sales, some upgrade work, and some spare parts production. The money involved would include foreign military sales, operations and maintenance, and procurement appropriations funds. The challenge for all the services is to integrate both the planning and the funding for industrial base sustainment when their management structure is more aligned to the different congressional appropriations.

As the lone remaining superpower, the United States must retain its first class defense industrial base, albeit—all agree—in a scaled-down version. This requires positive and supportive guidance from the Defense Department and each of the military services. This effort also requires constructive assistance from the House and Senate and it certainly begs an awareness from industry that contraction of the base is inevitable.

When all parties to this challenge make their several contributions, only then will the United States be able to maintain the vital assets upon which our national security hinges.

LTG LAWRENCE F. SKIBBIE, USA (Ret.), is the president of the American Defense Preparedness Association.

NATIONAL AUTOMOTIVE CENTER FOCUSES ON AGILE MANUFACTURING

By Jamie Florence

Jack be nimble, Jack be quick... or else Jack won't survive the global competitive environment of the 21st century. That is pretty much the consensus around the nation these days. Industry, academia, and even the government are all unanimously concerned about the ability of this nation, a great manufacturing power, to compete and win in the future.

We have all read the headlines, and seen the statistics pointing to the erosion of this country as the manufacturing giant it once was. Jobs, technology, know-how, and major industry sectors have been lost to foreign nations. There are some who believe that these are merely the rumblings of nagging "doomsayers." Most others however, believe the message, and unfortunately, many have felt the heavy, swift ax of international economic competition.

Is there a hopeful elixir? The answer is agile manufacturing, the latest in a series of evolutionary philosophies or approaches to manufacturing. To use the vernacular, it is a new paradigm replacing mass production, lean, just-in-time, and flexible manufacturing eras. This new paradigm is rapidly gaining a broad base of support as its

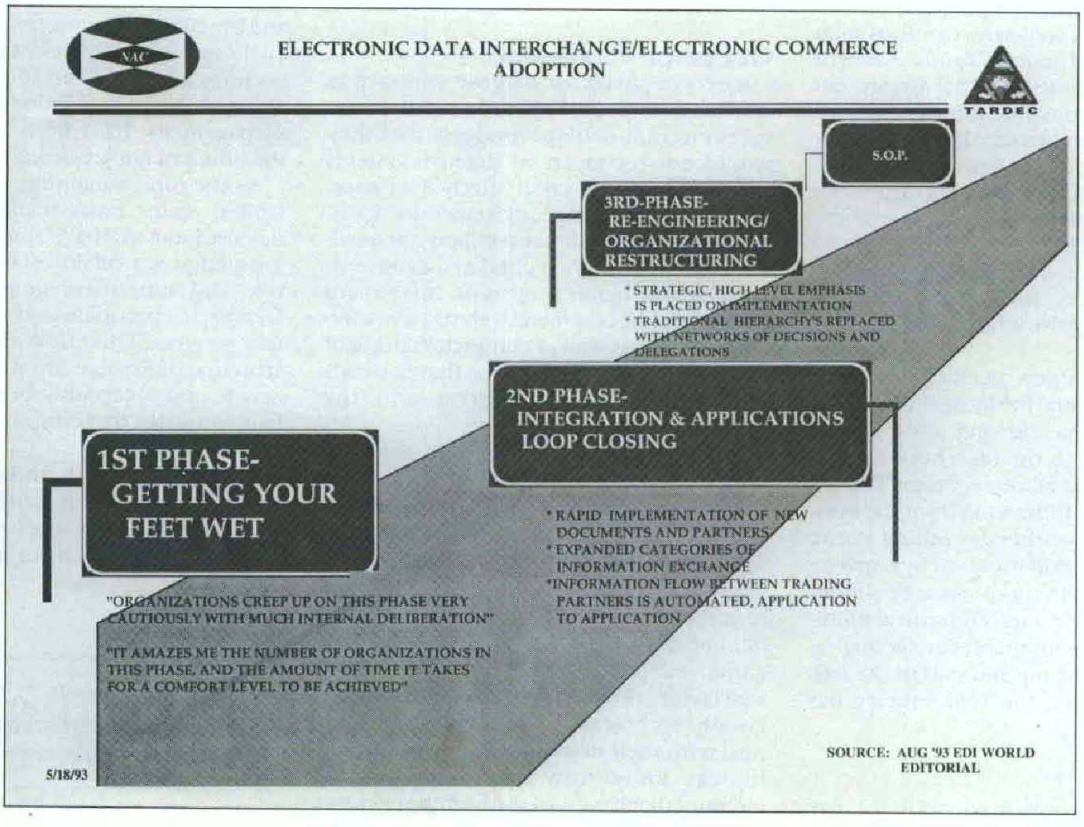


Figure 1.

"definition" evolves and as elements of it are implemented. Most importantly, perhaps for the first time in contemporary politics, it is expected to be endorsed, promoted, and proactively supported from the highest levels of government as an industrial policy. In essence, it will be a blueprint for the nation.

There is an increasing number of eloquent writings describing "agility." Simply put, it is the ability to respond rapidly, to rapidly changing, and perhaps unforeseen consumer needs and/or marketplace opportunities. Speed is of the essence and complete customer satisfaction is the focus. Without question, advanced manufacturing technology is an important enabler, but clearly insufficient by itself.

"Agility" gets its strength from the synergistic interactions of three elements: the tremendous mental skills and decision making ability of a well-trained work force, the implementation of innovative business practices, and lastly, the application of flexible computer-integrated manufacturing technology.

Although industry is expected to take charge and lead the transition into the "new paradigm," government has a strong role to play. Those of us who work for the Army, and the Department of Defense, for that matter, recognize the paradox presented by military specifications, standards, and federal acquisition regulations in the agile manufacturing era. The issues are pretty well known. Actions are underway at many levels to develop solutions to these problems, which will hopefully enable the DOD to be an "agile customer."

Pilots Point the Way

Originators of "agility" point out that many of the elements, characteristics, or practices of agility already exist and simply need to be integrated into a state of practice. So, "Just Do It!" The U.S. Army's Tank-Automotive Command (TACOM), Tank-Automotive Research, Development and Engineering Center (TARDEC), and National Automotive Center (NAC), all located in Warren, MI, are taking actions to implement aspects of agility now. In those instances where the business case or technical scenario is unclear, or is a significant stretch, the preferred approach is to conduct pilot programs: "try before you buy." The principal focus of these pilots is at the subsystem, or spare/repair level. One of the best applications of agility is to solve the difficult, unusual supply issues, including sole-source/single-source items, low-density items which we would prefer not to have provision for, line stoppers, and out-of-stock condition items, to name a few.

No Free Lunch

Transition into a new state of practice is difficult. It is time consuming and requires many resources. The Army has a running start at agility. It has been funding deployment-type programs under its Flexible Computer-Integrated Manufacturing Program (FCIM). This program is managed out of the Industrial Engineering Activity located at Rock Island Arsenal, IL, by Steve McGlone. The initial focus of the Army FCIM programs has been on "organic" facilities and operations, namely the arsenals and depots. With many successes under its belt, and the ground swell for agility growing, the Army FCIM Program Office indicates it is increasingly interested in supporting initiatives in the private sector as well.

NAC Spearheads Technology

The National Automotive Center was established at the Detroit Arsenal to foster closer collaboration between TARDEC, TACOM, the Army, DOD and the automotive industry. Collaboration on agile manufacturing initiatives is an exceptionally timely opportunity. The NAC, under its 1993 Broad Agency Announcement, awarded three efforts in advanced manufacturing development: one in electronic data interchange/electronic commerce (EDI/EC), another in rapid-partnering for virtual company formation, and lastly, one in robotics for flexible assembly.

EDI/EC. Electronic enterprise integration is probably one of the most fundamental characteristics of an agile enterprise. In

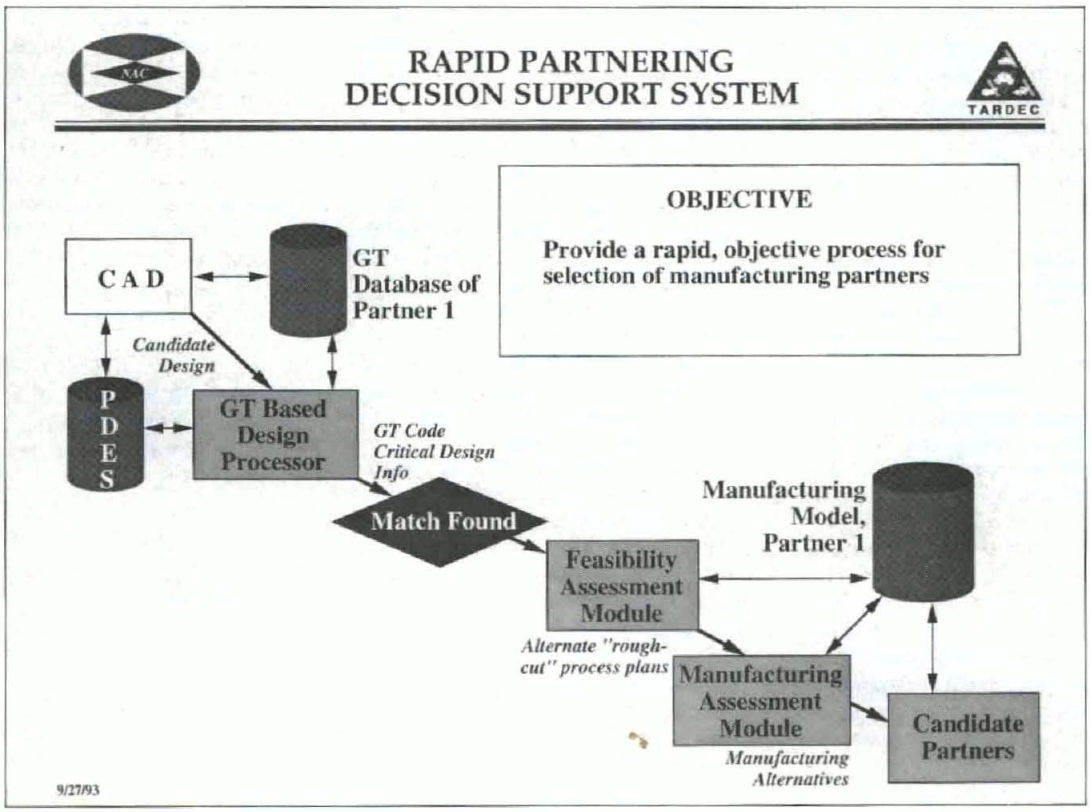


Figure 2.

pursuit of that goal, TACOM is moving forward with EDI/EC. The approach to adoption of EDI within the DOD community will not likely differ significantly from that experienced in the commercial/private sector. A recent editorial in *EDI World* indicated that adoption occurs in phases. (See Figure 1.) TACOM is in the early phase of activity.

Both prime contractors for the Abrams Tank and the Bradley Fighting Vehicle systems have successfully accomplished drawings and technical data interchanges between the PEO and TACOM tech data managers. The TACOM Acquisition Center's Automation Division has established an electronic bulletin board for procurement announcements and is working toward a fully electronic technical data package and request for proposal, on demand. Working in conjunction with spare/repair parts item managers, the Acquisition Center has also begun a pilot program in direct vendor delivery to the field for the HMMWV tire. All of these initiatives focus on the prime or first tier supplier.

Following the automotive industry's lead, the NAC has taken a further step in studying an EDI/EC pilot development for a full supplier chain of a spare/repair part. The Industrial Technology Institute in Ann Arbor, MI, is very active with the automotive and furniture industries in Michigan and was selected to assist TARDEC and the NAC in developing this pilot. It will focus on mechanical assemblies, which have at least a three- or four-tier supplier chain, and will be a "build-to-print" type of mechanical assembly requiring computer numerically controlled (CNC) machining or turning. The initial intent is to gain experience with our "traditional" vendor base. The longer range goal is to be electronically compatible with the commercial industrial base. Doing so will facilitate meeting future field-support requirements, on-demand, from a broad industrial base.

Virtual Companies. One of the visions of agility is that small- and medium-sized manufacturers will have to rapidly collaborate among multiple sources to meet a market place demand. Virtual companies with very specific, high skills will be formed rapidly, and just as rapidly dissolved after meeting the specific need. The NAC is working with the University of Maryland's Institute for Systems Research for the continued development of a computer-aided design/computer-based decision support system for enabling rapid, objective selection of manufacturing partners. (See Figure 2.) The system is based on the emerging product data exchange standard called STEP. It will integrate group-technology data bases of manufacturing partners around the country, with manufacturing feasibility assessment modules, and partner-selection software modules. Based on lead-time, cost, and quality metrics, it will produce a recommended list of candidate partners.

Virtual companies with very specific, high skills will be formed rapidly, and just as rapidly dissolved after meeting the specific need.

This decision support system has been under development and focused on microwave systems. The NAC program will adapt and complete the system's development. TARDEC plans to seek Cooperative Research and Development Agreement partners from the automotive industry (as well as others) to expand its capability to the full range of assemblies in tank-automotive systems.

Flexible Assembly/Dual-Use

Nearly everyone today recognizes the political benefits of "dual-use" technologies. The extent to which the theme can be brought to fruition in any one of its many variations of interpretation remains to be seen. However, the extent to which current production/manufacturing systems for ground combat vehicles is single purpose, and "sole" use is cause for rallying the creativity and innovative genius in us all. For entirely different reasons and motivations, the automotive industry is keenly interested in flexibility of production facilities.

Despite our differences, the routes to flexibility via advanced automation technology are similar. Vehicular body sheet metal, and hard tooling for assembly are the "longer poles in the tent" for the Big Three. Programmable robots and positioning systems offer the potential to provide the degree of flexibility for rapid changeover sought by the auto industry. In fact, Nissan Motors employs its Intelligent Body Assembly System (IBAS) in production today for flexible body assembly. "Controller" technology for these systems is a critical technical hurdle. Literally "banks" of controllers are required to operate a complex system with as many as 70 to 150 axis or degrees of freedom, with a high degree of coordinated or group axis control. Day-to-day dependability and reliability is critical. Fault diagnosis and isolation is difficult, but essential at the cost of $5,000 per minute of down time on an auto assembly line.

Reprogramming of this large bank of controllers at model change-over is difficult and very time consuming. The NAC working with Trellis Software and Controls of Rochester Hills, MI, will demonstrate a novel and potentially revolutionary "controller" technology for "flexible robotics for assembly." The innovation lies in utilization of the relatively low-cost, high performance computing power commercially available today, integrated with open architecture, and advanced robotics motion control software. This allows a single controller to control multiple, distributed axis of robots or positioners for complex assembly operations.

The robust open architecture controllers allow for an unprecedented degree of "scalability" (extension in numbers of systems controlled) and modular integration of sensor systems as required for adaptive control. This program follows a successful DARPA SBIR award to Trellis for the development and demonstration of this innovative approach to open architecture control systems. Aerospace and automotive firms are participating in this program and are contributing hardware as well.

Time is of the Essence

While the future is hopeful, there is at the same time, high cause for change within DOD. Commercial industries seem to adapt to change far more readily, and on a broad scale. While the automotive industry adopted FCIM, lean and just-in-time practices, until most recently, we have been largely involved in the specialized mass production era. The ARPA/National Institute for Science and Technology/National Science Foundation Technology Reinvestment Project plan for congressional defense conversion appropriations is encouraging, but a literal "drop in the bucket" compared to the task ahead of the nation.

The NAC is continuing to place high emphasis on the promotion of agile manufacturing technologies, concepts, and philosophies. The work has just begun to broaden TARDEC and TACOM's dual-use utilization of the commercial automotive base as a major opportunity for ensuring a viable, responsive industrial base for the future.

JAMIE FLORENCE is assigned to TARDEC's National Automotive Center and is responsible for advanced manufacturing initiatives. Florence holds a B.S. degree in mechanical engineering from the University of Detroit, and an M.S. degree in aerospace structures from the Ohio State University.

By G. Dean Clubb
and John D. Grimm

INTEGRATED PRODUCT AND PROCESS DEVELOPMENT

An Industry View

Background

During the Gulf conflict, the U.S military clearly demonstrated technological superiority and fielded an outstanding array of weapon systems that are a tribute to the management and technical efforts of the U.S. military and industrial community. While the systems deployed were the best the world has ever seen, their development and production phases were, in many cases, not executed without considerable problems. It was not uncommon for even the most successful of programs to encounter schedule delays and cost overruns as the product development process was executed.

Transition into production was a particularly difficult phase largely because of the incompatibility of state-of-the-art designs with existing manufacturing processes. Many times the recognition of the mismatch between the weapon system design and the capability of the manufacturing processes was not realized until initial production. This resulted in numerous programs going back into producibility phases and manufacturing process developments before affordable weapon system production could be successfully executed within affordable cost bounds. In today's environment, this pattern cannot continue.

Weapon system design and development, starting with research and extending through production, must focus not only on product design and technology but also on the development of manufacturing processes that will allow successful production and deployment. This is the essence of integrated product and process development (IPPD) and establishes a new focus on design-for-manufacturability that must start when the weapon system concept is first developed.

Today, the military and industrial community faces the challenge of smaller DOD budgets that absolutely demand a balanced focus on technology and manufacturing process development. This point is becoming more apparent to DOD and industry. A new era of cooperation is necessary to meet expectations of the tax-paying citizens of the United States. World-class partnering between DOD and its supplier base is essential. A highly interdependent DOD/industry team that shares planning and risk responsibilities is essential in today's environment.

Progress has been made with top level policy but the impact on system implementers and designers has been minimal. Deployment of an integrated product and process approach to development within both the DOD and the industrial community offer a realistic opportunity to meet the challenges of the 1990s.

Definition and Rationale for IPPD

Integrated product and process development is a management concept that provides early insight into product performance, manufacturing process capability, quality, development time and associated risks.

According to the Defense Science Board's 1992 Summer Study, published in April 1993, the process can be defined as "a management process that integrates all activities from product concept through production and field support, using a multifunctional team, to simultaneously optimize the product and it's manufacturing process to meet cost and performance objectives." Emphasis is on understanding and developing the manufacturing process concurrent with product design. In the past, too many products have entered engineering and manufacturing development (EMD) and even production with little quantifiable evidence of their manufacturability.

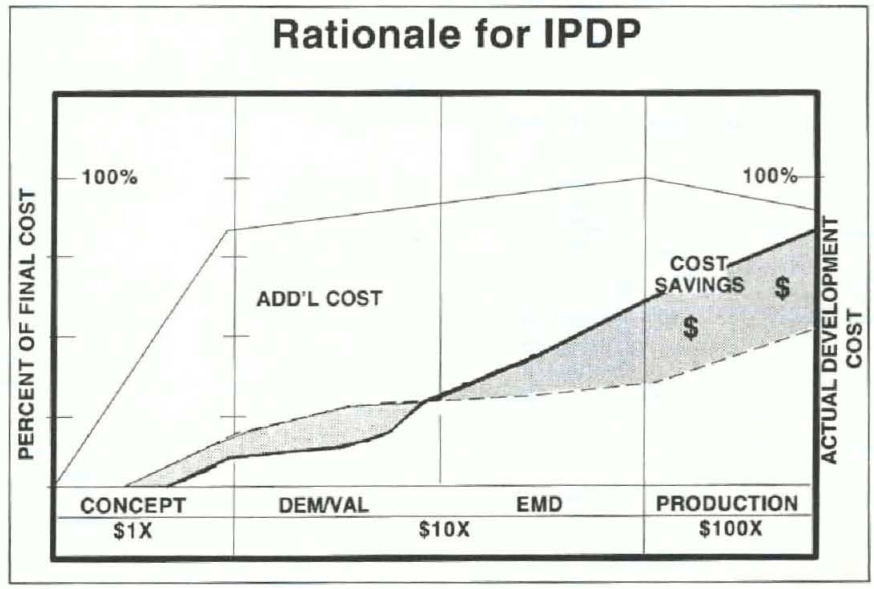


Figure 1.

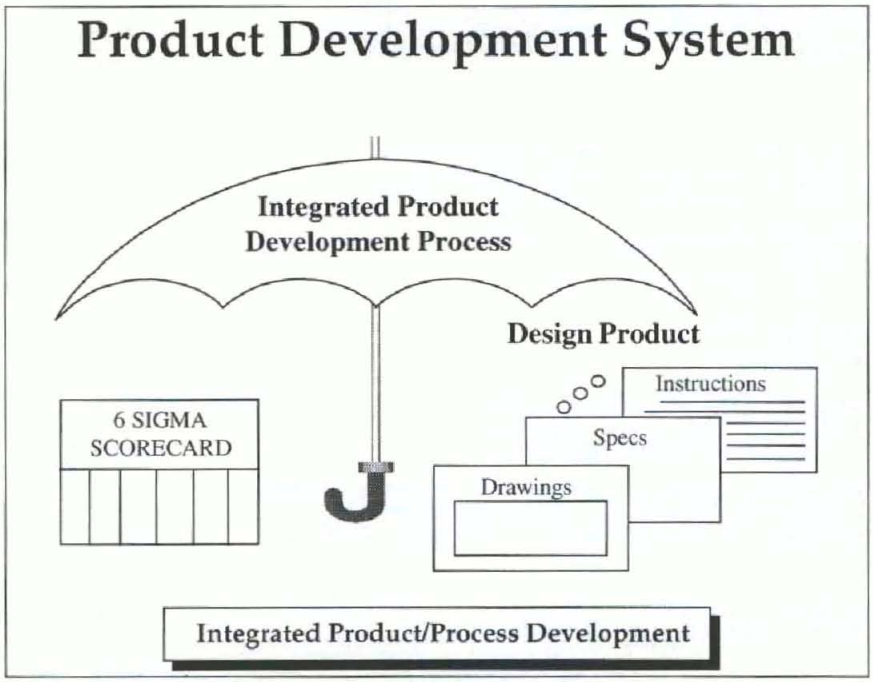


Figure 2.

The rationale for IPPD is based on reducing uncertainty early in the product development process when the costs per unit of time are relatively low and a smaller proportion of the product recurring cost is established.

Figure 1 illustrates three points. First, product development costs and cycle-time will be reduced if additional effort and resources are spent during the early stages of development to assure weapon system manufacturability. This is evident by comparing the shaded areas between the two cumulative expenditure curves. Second, the cost of change increases by an order of magnitude as a program progresses from concept development (pre-milestone I) to Dem/Val to EMD, and to Low Rate Initial Production (LRIP).

Finally, the greatest leverage for reducing recurring product costs occurs in the early stage of development, in fact, typically 80 percent of the recurring costs are determined prior to the end of concept development.

All of these factors argue for integrated product and process development that will in turn force early design maturity that will translate into performance, quality, cost, and schedule improvements.

IPPD Application Example

The fundamental question is how can the IPPD approach be implemented. At Texas Instruments, we have developed a family of integrated product development processes that provide the methodology to achieve integrated product and process development. (See Figure 2.)

Since 1992, more than 60 programs have incorporated the integrated product development (IPD) process in their planning and execution. The IPD process describes the product development steps (from concept definition through production and support) that would occur in a nominal program in the defense environment.

The process (See Figure 3.) embodies the principles defined in the *Systems Engineering Management Guide* published by the Defense Systems Management College. The process is documented by hierarchical flowcharts that identify all product development tasks, and corresponding task descriptors that define the aspects of each task. Entry and exit criteria are also identified placing equal emphasis on system design and manufacturability.

IPD Process Description. The sequence of tasks is contained in a flowchart hierarchy structure with three levels. Top level flowcharts show major program and customer activities and milestones. The intermediate level describes the functions performed and the lowest level identifies all tasks and their sequence for execution. The tasks are documented in a task descriptor dictionary with descriptive form as follows:

- *Inputs* describe the documents or data needed for processing the task.
- *Outputs* list the items produced by the task execution.
- *Narrative* gives a summarized prose description of the task.
- *Risks* list the possible consequences of not (or inadequately) completing the task.
- *Entry and Exit criteria* describes the conditions for task imitation and completion.

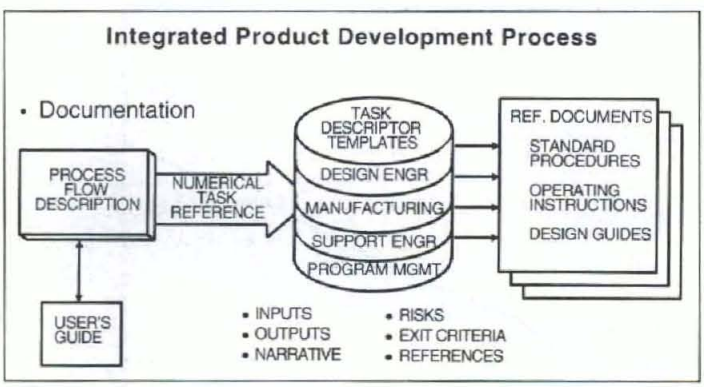


Figure 3.

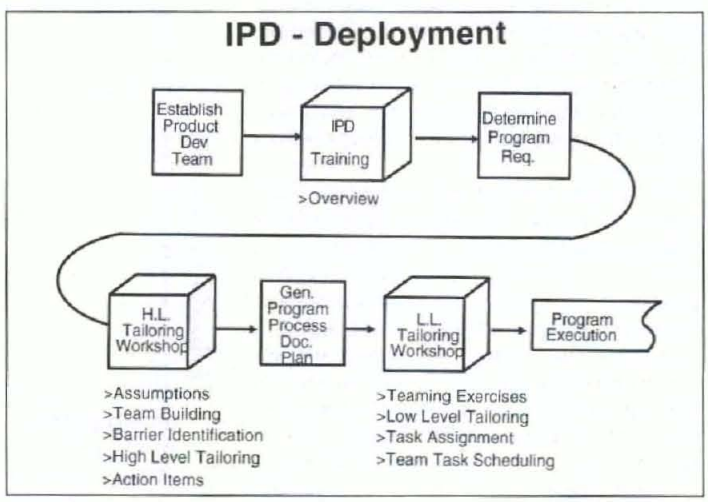


Figure 4.

• *References* are included to assist in defining sources that describe "how" to do this task.

IPD Process Deployment. The IPD process is the "nominal" product development process and must be tailored to the particular circumstance of each program. The deployment process is described in Figure 4. The first phase is a three-hour training course designed to acquaint program management and technical managers with the resource material and methodology. The second phase is a two-day facilitated workshop. Attendance includes program managers, technical managers, process experts, specialty engineering from all disciplines and customer and supplier representatives.

Workshop activities include a review of the overall program, brainstorming to assemble all program assumptions, barriers, risks, and proposed solutions and actions, and tailoring of the nominal IPD process to comprehend the specific needs of the program. The resulting product is a detailed program plan, but more importantly, a mutual understanding and consensus among the team members that execute the plan. Customer and supplier participation are very important to the success of this process. When all team members participate there is a unified commitment to program success.

The third deployment step is a detailed tailoring at the task descriptor level. This is accomplished by integrated product teams (IPTs) and results in detailed work statements and schedules that tie directly to the program work breakdown structure (WBS), integrated master plan (IMP) and integrated master schedule (IMS).

Process deployment is sustained throughout the life of the program by the IPD steering team that acts as the focal point for the IPTs, collects metrics for process improvement and evaluates product elements for reuse.

IPPD Implementation. Adherence to the tailored IPD process assures timely interaction of product development team members (design and manufacturing). This approach requires the concurrent development of process and product. A scorecard is developed that identifies the true manufacturability of the product considering predicted defect level of parts, manufacturing processes, design performance in meeting specified requirements, and software. (See Figure 5.)

A tabulated numerical manufacturability score is calculated that allows the integrated product development team to actively optimize weapon system manufacturability. This methodology is called design for six sigma and was originated by Motorola. The objective is to assure that the parts selected, the manufacturing processes, the design robustness and the system software have the inherent capability to perform at a defect level of 3.4 defects per million opportunities. This is truly a stretch goal considering that current military systems are produced with defect levels much higher than this objective. Adherence to this methodology forces active trades during the design phase with overall manufacturability being the driver. The following paragraphs describe the four scorecard categories.

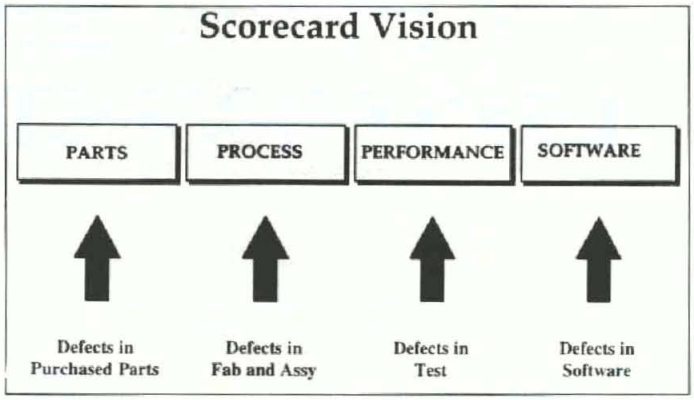


Figure 5.

Parts defects on receipt are predicted based on supplier data and in-house historical measurements. Defect data (parts per million) is provided electronically with other performance and physical information to the design engineer.

Process defects are dependent on manufacturing process capability. Defects are of two types; attribute and variable. Attribute refers to a go/no-go operation (auto component insert, solder defect). Variables data refers to the statistics resulting from a manufacturing process such as a machining process. The manufacturing operation produces a statistical distribution in relation to the process limits. Both of these data types are provided to the design engineer continuously during the design phase.

Performance sigma predictions are determined through simulation of functional performance over the statistical range of variability in supplier part parameters. The goal is a design which is robust to variation.

It is important to consider all resulting defect data concurrently to minimize the overall system defects. Tradeoffs are made in relation to the key process characteristics and product cost. Minimizing the number of unique parts and processes is a key objective. This must be accomplished with a system level perspective. Each element of the score card has a specific work sheet that defines the methodology for analysis and captures the design analysis results. The totality of the work sheets and summary score card give a factual basis to predict defects for the manufacturing operation prior to committing to a final design approach.

Summary

The dramatic changes in our environment call for dramatic responses from both industry and the government. The development and adoption of the IPPD approach places a balanced emphasis on technology and manufacturability. By using the structured integrated product development process in conjunction with six sigma methodologies, we can and should expect products to smoothly transition from development to production phases in less time and at a lower overall cost. We at Texas Instruments believe that implementation of this methodology is vital in today's environment if we are to continue to provide soldiers, sailors, marines and airmen weapon systems that are technically superior and affordable.

G. DEAN CLUBB is the deputy to the president of the Defense Systems and Electronics Group of Texas Instruments, Incorporated and the executive director for the Javelin program. He joined Texas Instruments in 1968 and has participated as a design engineer, project engineer or program manager on numerous programs. Clubb holds a B.S.M.E./AE degree from the University of Missouri.

JOHN D. GRIMM is director of systems engineering for the Defense Systems and Electronics Group of Texas Instruments, Incorporated. He joined Texas Instrumments in 1968 and has over 25 years experience in systems engineering in the areas of radar systems, signal processing, digital processing subsystems, and related technology development. Grimm holds a B.S. degree in electrical engineering from Louisiana Tech University and an M.S. degree in electrical engineering from Louisiana State University.

LEAN PRODUCTION

By James A. Ray

In these times of reduced defense budgets, a normal interpretation of the phrase "lean production" would be to consider it a status of current defense production activities. The terminology of "lean production," however, was coined by a Massachusetts Institute of Technology researcher during his efforts involved in supporting The International Motor Vehicle Program for a consortium of global motor vehicle manufacturers. Although this study was associated with the motor vehicle industry, the findings and concepts could be applied to all major industries, including those in the defense business. To understand why this concept may apply to all industries, as well as the Army, we should look at the background of the concept, the findings of this study, and how they are being applied.

From the MIT study, lean production was used to describe the efforts that had been pioneered by the Japanese in many of their industries. They had initiated "lean" methods in an effort to use less of everything, compared to normal mass production. The lean producer combines the advantages of small batch craft shops and mass production while avoiding the high costs of craft and the rigidity of mass production. As such, lean production employs teams of multi-skilled workers at all levels of the organization and uses highly flexible, increasingly automated machines to produce small batches of products at the same or less cost of mass production.

Why did the Japanese develop these methods when the United States has been considered the world leader in the motor vehicle business? One reason may be related to Japanese culture, which has fostered natural teaming as a primary goal. Another reason may be related to Japan's need to rebuild its industrial base following World War II, thus allowing the country to start anew. One certainty is Japan's ability to improve on existing ideas. The United States provided many of those ideas and concepts that resulted in lean production.

A major contributor in rebuilding Japanese industry was an American, W. Edwards Deming, who began working with their country in the 1950s. Although his concepts were taught in the United States, interest in his work was not taken seriously until after the Japanese had achieved numerous successes. Japan honored him by establishing the Deming Prize, which recognizes leading Japanese firms. In the United States, a similar award has been initiated entitled, The Malcolm Baldridge National Quality Award.

Although Deming was just one of the catalysts to change, he was well aware of the need for similar change in the United States. In his book, *Out of the Crisis,* he indicated his goal to transform the style of American management to allow the United States to compete in the global marketplace. He is now recognized as one of the leading experts in revitalizing U.S. companies to improve their overall competitive position. Many of his basic philosophies are the cornerstones of lean production.

Deming's efforts were only a part of the overall transformation in Japan. The Japanese had many innovations based on improvements to known production methods, quality procedures, design principles, management techniques, etc. Much of this is attributed to "Kaizen." Kaizen means gradual, unending improvement, doing "little things" better; setting—and achieving—ever higher standards. This process can be envisioned with the simple step by step procedure depicted in Figure 1.

Lean production is the result of many individual efforts associated with the Kaizen philosophy. Many successes keyed to lean production are described in the book, *Kaizen.* These include such areas as total quality control, just in time inventory, team based activities, process/system improvements, supplier relationships, cross-functional management, customer satisfaction, automation/robotics, empowerment of employees, flexible manufacturing, etc. Again, many of these principles were rooted in the United States and improved on and implemented in Japan. For example, the continuous improvement cycle was documented by Walter Shewhart in 1931, and the basic principles for total quality control came from J.M. Juran and Armand Feigenbaum.

The history of continuous improvement

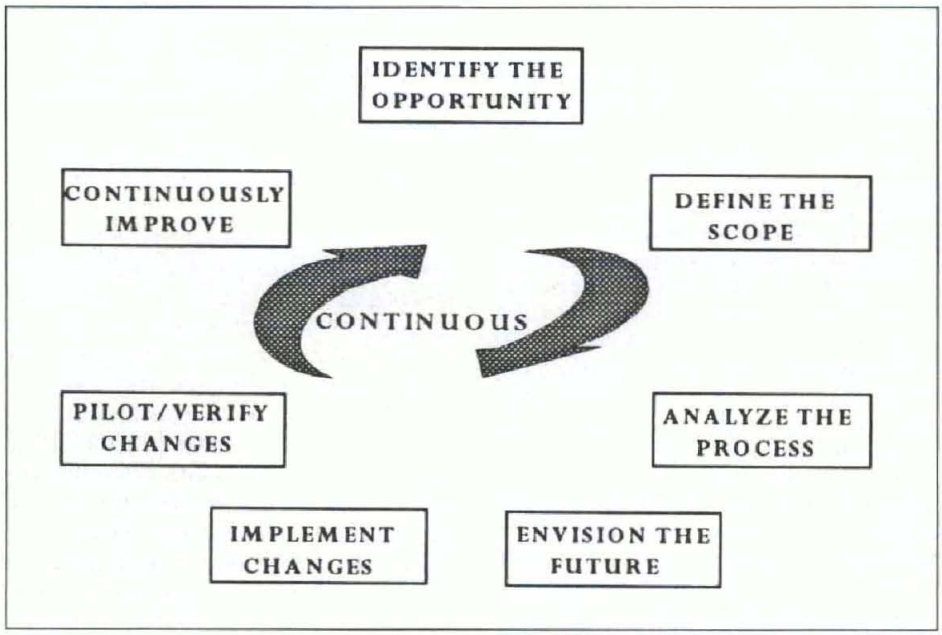


Figure 1.
Continuous Improvement Model.

	United States	Japan
Gross Assembly Hours Per Car	40.7	18.0
Assembly Defects Per 100 Cars	130	45
Assembly Space Per Car	8.1	4.8
Average Inventories of Parts	2 weeks	2 hours
Average Engineering Hours Per New Car *(in millions)*	3.1	1.7
Average Development Time Per New Car *(in months)*	60.4	46.2
Number of Employees in Development Project Team	903	485
Supplier Share of Engineering	14%	51%
Die Development Time *(in months)*	25.0	13.8
Prototype Lead Time *(in months)*	12.4	6.2
Return to Normal Quality After New Model *(in months)*	11	1.4

Figure 2.
Differences in automobile manufacturing in 1986.

methodology is significant because most of the concepts developed in Japan that led to lean production occurred over a 40 year period. This continuous change resulted in dramatic differences as documented in the MIT study. The MIT study documented significant advantages in Japanese methods in comparing a leading mass production facility in the United States with a leading lean production facility in Japan. Figure 2 summarizes the differences in automobile manufacturing in 1986.

Obviously, with these dramatic differences, dominance in the global marketplace shifted considerably away from the United States. This development prompted U.S. industry to initiate major changes. One company which has made dramatic changes to compete in a market overwhelmingly dominated by the Japanese is Harley-Davidson. Its rise from near oblivion to a major market player is described in the book, *Well Made in America*. Its success, although on a much smaller scale, compares to the Japanese. Harley Davidson implemented major principles such as continuous improvement, team based work force, quality leader, efficient manufacturing, process management, just in time inventory, statistical process control, employee involvement, customer focus, market share leader strategy, product differentiation for market niche, dealer and supplier partnership, continuous employee training, and a reorganization to reduce overhead and indirect costs.

Bear in mind that Harley-Davidson is only one company embracing the required changes in order to compete. A vast amount of literature has been published addressing lessons learned, the technologies, the theories, and the implementation of the many principles associated with the overall subject area of lean production reflecting many other companies' successes. These include best sellers in business books, academic papers and academic textbooks key to the revitalization in techniques and procedures.

With such a broad approach to the subject, how can any of this be applied to the Army? Hopefully, this particular issue of *Army RD&A Bulletin*—which is devoted to the subject of acquisition reform—will provide answers.

Concurrent engineering, a systematic approach to the integrated, concurrent design of products and their related processes, is another area where DOD has taken initiatives to energize developers to consider all aspects of the product life cycle during the design process. In fact, a concurrent engineering government/industry/academia consortium has been established to develop technologies to enhance interdisciplinary teams along with many other DOD studies, workshops, articles, and implementation documents (MIL-STD-499B draft) associated with concurrent engineering.

Lean production as a total program is also being addressed by DOD. In a related effort, a Lean Aircraft Initiative Program is underway using MIT in the same manner used previously for the International Motor Vehicle Program. This initiative involves research in five major areas: product development, fabrication and assembly, supplier relationships, organization and human resources, and policy and external environment.

Each of these areas is directed at specific research projects. The goal is to determine the best practices in industry and apply them in a pilot program for current and future acquisition efforts. For example, under product development, there are two current projects: integrated product and process development (IPPD) and process flow modeling and analysis.

Under the IPPD effort, models, practices and metrics are designed to identify and define alternative product development models, characterize current product development practices, define metrics for the measurement of best lean practices, and conduct a survey-based benchmarking and analysis of current product development activities. They will serve as guideposts which industry and government together can strive to achieve in the medium term (next five to 10 years). Finally, this project will explore and characterize implementation strategies for achieving these target best practices. Each of the other areas has similar ongoing detailed efforts.

Conclusion

Lean production is thus not only an effort that industry must consider in its overall strategy to remain competitive, but an effort that must be fostered and implemented within the DOD. Only by staying abreast of evolving technologies, processes, and procedures can the Army maintain its ability to field and sustain quality materiel within constrained resources.

JAMES A. RAY is deputy director of engineering, U.S. Army Aviation and Troop Command in St. Louis, MO. He holds a B.S. in mechanical engineering from the University of Tennessee, an M.S. in mechanical engineering from the University of Missouri-Rolla, and is completing work on an EMBA from Washington University.

ARMY HOLDS ACQUISITION CAREER MANAGEMENT WORKSHOP

Nearly 200 members of the Army Acquisition Corps (AAC) and acquisition workforce attended an Army Acquisition Career Management Workshop Sept. 15–17, 1993, in Herndon, VA. Both military and civilian members of the corps and the workforce attended the workshop, which was sponsored by LTG William H. Forster, director of acquisition career management, Office of the Assistant Secretary of the Army (Research, Development and Acquisition) (OASARDA). The purpose of the workshop was to inform and encourage the attendees as they begin the career development process.

COL Richard A. Grube, deputy director of acquisition career management (now director of AAC policy), OASARDA, welcomed the attendees. He said, "The Army today is going through a difficult environment, but we want to make sure that you leave this conference with a very comfortable feeling that you've made the proper decision, and that your potential will be realized and there are great opportunities for success." Grube stressed the need for civilians and military to work together to build a common acquisition corps with relationships that transcend status. He also presented four predominant themes for the workshop—Vision for the Future, Professional Development, Education and Training, and Career Management.

George E. Dausman, acting assistant secretary of the Army (research, development and acquisition), gave the keynote address on the "Future of the Workforce." "I see the creation of a professional world-class acquisition workforce. That is acquisition reform. Smart people are going to make any system work better." Dausman voiced two of his concerns about the future of the workforce. He stated that there are no restraints on civilians rising to the top in the acquisition business, but there are restrictions for military members. Military members must be promoted to general officer before they can become a program executive officer (PEO), and currently, few of these promotions are occurring. Secondly, Dausman expressed concern that educational opportunities might suffer as a result of budget pressures. He called on the Army leadership to ensure this does not happen.

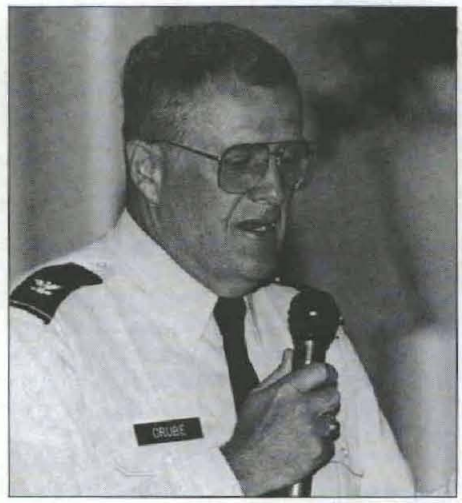
MG Dewitt T. Irby, PEO-Aviation, spoke on leadership roles in acquisition. He discussed the nine leadership principles addressed in the Army's field manual. These are: communication, professional ethics, use of automation, planning, decision making, supervision, teaching and counselling, team development, and technical proficiency. Irby stressed the importance of leadership, continuous improvements and managed change. He said, "Change is happening every day, and if you're not managing it, it's going to manage you."

LTG William H. Forster, director of acquisition career management, OASARDA, was the conference dinner speaker.

BG David R. Gust, PEO-Communication Systems, discussed the challenges and rewards of the program management business in his presentation titled "So You Want to Be a PM." He described a PM as "the person who executes the program, the beginning step, and the bedrock of the organization." Gust addressed the tasks that drive the personnel in the PM office. These include: budget, oversight, briefing requirements, international commitments and audits. Gust also cited specific instances from his work experiences as a PM to illustrate the challenges and rewards of being a PM.

Colleen A. Preston, deputy under secretary of Defense (acquisition reform), addressed some of the changes expected in the acquisition reform process. She pointed out that the Defense Department has been operating "under an anomaly—producing the best systems in the world with a broken acquisition system." She stated, "We can not afford to continue operating with the existing system as we have in the past and there is no reason to do so." According to Preston, because of the radical change in the global threat, we need an acquisition system that is responsive to flexible requirements and operates on a rapid and timely basis. She concluded by stating, "The bottom line is that there is a belief that the DOD acquisition system has changed beyond its ability to adjust or to evolve. It is no longer enough to improve the process. We need to reengineer it as a result of changes that have occurred during the last couple of years. This should be viewed as a challenge."

Dr. James S. McMichael, director, acquisition education, training and career development in the Office of the Under Secretary of Defense (Acquisition), spoke on the implementation of the Defense Acquisition



COL Richard A. Grube, deputy director of acquisition career management (now director of AAC policy), OASARDA, welcomed attendees to the conference.

Colleen A. Preston, deputy under secretary of Defense (acquisition reform), spoke on acquisition reform issues.

Workforce Improvement Act (DAWIA). McMichael noted that the number of Army waivers granted for Army Acquisition Corps certification was high in comparison to the other services. He called for less disparity among the services in this area. He emphasized the need to get the word out and communicate with the workforce. "The biggest challenge is communication . . . We need to do all we can to communicate especially with the workforce on what we're doing, and what affects them and how to deal with the new system," said McMichael.

Jay C. Rifenbary of Rifenbary Training and Development, gave a motivational presentation based on his book, *No Excuse—A Philosophy for Success.* He stressed self-responsibility on the job, adding that time and energy is wasted by making excuses, placing blame, and whining about what could have, should have, or would have been. Rifenbary also presented three ways to improve self-esteem: do the right thing; be committed to excellence; and follow the Golden Rule—treat others as you want to be treated.

Professor David V. Lamm of the Naval Postgraduate School, Monterey, CA, spoke on education initiatives provided by the Naval Postgraduate School. He described the school's mission as one of providing advanced professional studies at the graduate level for military officers and Defense officials from all services and from other nations. Lamm also defined the student population, noting that of the 1,905 students currently enrolled, 14 percent are Army officers. This number, he said, will increase as the system acquisition management and program management programs are expanded.

Military and civilian conferees then attended separate seminars where they were encouraged to ask questions and communicate ideas concerning AAC career management. Dr. Janet L.S. Brown, chief, Civilian AAC Management Office, led the civilian AAC career management workshop, and LTC Richard O. Bailer, director, Military AAC Management Office, led the military AAC career management workshop.

Director of Acquisition Career Management LTG William H. Forster was the conference dinner speaker. He encouraged AAC members to seek graduate degrees by attending one of the Army's new graduate programs at the Naval Postgraduate School, or the University of Texas at Austin. He recommends these schools for Acquisition Corps members in search of challenging, fast-track education opportunities.

LTG Forster also identified four dangers to our national security—regional dangers, nuclear dangers, economic dangers, and dangers to democracy such as the reversal of reforms in Eastern Europe. "These will set the stage and the standards by which most acquisition systems and most changes to the military departments are measured in the near-term."

LTG Forster also discussed the Army's modernization mission and the plans to carry out this mission in a period of reduced resources. He identified the following five modernization capabilities that the U.S. must preserve in order to succeed: project the force and sustain combat power; protect the force; win the battlefield information war; execute precision strikes; and dominate maneuver.

In voicing his perception of the DOD's Bottom-Up Review, LTG Forster stated, "There is no significant military strategy change. We still have to be sized and equipped to handle two major regional contingencies nearly simultaneously." "Readiness is clearly the number one mark within OSD," he added. He also stressed the importance of maintaining the industrial base noting, "It is clear that the industrial base is very important, and we want to consider industrial base implications in every decision that is made."

In closing, LTG Forster encouraged members of the AAC to be risk takers. "It's time to be bold, imaginative, inquisitive and do it right the first time," he said.

Brooks Barthalow, acting chief, Acquisition Management Office in the Office of the Deputy Chief of Staff for Acquisition, Headquarters, U.S. Army Materiel Command (AMC), was the first formal speaker on the second day of the conference. He spoke on Shaping AMC and the future. Barthalow noted that AMC is a significant part of the Army's acquisition community with nearly 30 percent of the military acquisition corps positions being within AMC—that's over half of the AMC officer distribution plan for military officers. According to Barthalow, the civilian side is even more significant. Approximately one third of AMC's civilian workforce is in the AAC workforce.

George T. Singley III, deputy assistant secretary of the Army (research and technology), OASARDA, and the Army's chief scientist, spoke on "Harnessing Technology for the Future." Singley addressed the newest threat currently being emphasized—economic dangers. "The main point is that in the short term, our security depends on military strength. However, in the long term, we can not have military security if we don't have economic security." Singley also stressed that protecting the science and technology program is key to our defense strategy. Said Singley: "We need to protect the technology base. Simply put, the technology base is our future. It provides a lot of the smart buyer expertise that feeds many of the PMs and many programs."

Anthony M. Valletta, Army vice director of information systems for command, control, communications and computers, spoke on the role of information systems in major acquisition programs. He said that information systems—computer hardware and software, communications and electronics—affects how people get paid, do personnel tasks, do requirements, engineering, development support, simulation and modeling, etc. According to Valletta, information technology is the enabler for the Army's future.

Maurice R. Donnelly, director of plans, programs and resources, Office of the Deputy Assistant Secretary of the Army (Plans, Programs and Policy), presented information concerning the Army's acquisition budget. Donnelly noted that one doesn't have to be a rocket scientist to realize that the Army and DOD are going to be impacted by some of the changes planned for the government, including the vice-president's re-inventing government initiatives.

Dr. James Edgar, assistant deputy director, Acquisition Career Management, OASARDA, spoke on the complexities of AAC certification procedures. Certification, he said, is intended as a major part of the implementation of DAWIA. Edgar views certification as a management process to assure that individuals occupying acquisition positions meet the qualification requirements or standards that are established for those positions in those career fields at those career levels. Edgar advised civilian attendees to make sure they know their career field and position category, and to make sure they assess their ability to be certified. Military members are already certified.

Gerald E. Keightly, executive director, Defense Acquisition University (DAU), gave a presentation on DAU's role in providing training and education opportunities for AAC members. The DAU is a consortium comprised of 16 schools which provide training in the 12 AAC career fields. Keightly stated that there is now an established senior acquisition course equivalent to senior-level professional military education. Keightly also announced the availability of DAU's 1994 catalogue.

Dr. Jerry Davis, director of The Center for Professional Development at The

George T. Singley III, deputy assistant secretary of the Army (research and technology), OASARDA, and the Army's chief scientist, emphasized the need to protect the technology base.

University of Texas at Austin spoke about professional development initiatives available to AAC members. Davis listed the various services his organization offers to the AAC. These include: education and training workshops, senior service college fellows programs, executive M.B.A. and M.S. programs, degree program coordination, cooperative programs, international exchange programs, professional development support and custom design programs. Davis concluded by stating that The Center for Professional Development and Training was established to support the acquisition corps.

A presentation on business ethics was given by retired LTG George Sammett Jr., who is now vice-president for ethics at Martin Marietta. According to Sammett, "Ethics is not just concern about lying, cheating or stealing. You'll find that the most important part is treating people fairly, and if you do that, most of your problems go away." He also pointed out that higher grades call for greater ethics awareness.

Dr. Reuben R. McDaniel Jr., professor of management at The University of Texas at Austin, gave a presentation titled, "How to Successfully Manage the Workforce: Emerging Themes for the 1990s and Beyond." He gave several predictions for the workforce in the 1990s. Some of these predictions are:

- Workers who only do a good job will be expendable;
- Workers at all levels will have to be taught what other people in the organization are doing so that they can help each other more effectively and efficiently;
- Much of the workforce will be externalized in the form of temporary workers and independent contractors; and
- The quality of connections between workers will be more important than the quality of each individual worker.

In his presentation, Daniel M. Clawson, chief, AAC Management Office in the U.S. Total Army Personnel Command (PERSCOM), provided tips for career planning, stressing the need for AAC members to be their own career managers. "You need to know what it is you want, you need to keep current, and you need to know yourself," said Clawson.

COL George J. Savitske, director, Acquisition and Industrial Base Policy, OASARDA, spoke about the acquisition force structure. He briefed the attendees on the mission and functions of the Acquisition Force Structure Division, provided a historical perspective on how the acquisition force structure has evolved over the years, and discussed the current status of the program management office structure. Savitske stressed the need for better force structure planning for the future PM and PEO structure.

LaVerne Jones, chief, Acquisition Education and Training Office, OASARDA, spoke on the various education programs available to AAC members. These include the senior service college fellowship, long-term training, part-time schooling, tuition assistance, and executive seminars. Executive seminars include training at schools such as the Wharton School, the Brookings Institute, Duke University, Harvard Senior Fellowship Program, OPM Executive Seminar Centers, The University of Texas at Austin, George Washington University, University of Chicago, University of Michigan, and University of Virginia. Jones also presented some initiatives planned for the corps, including training with industry, congressional fellowships, short- and long-term developmental assignments, acquisition intern program for DAU scholarship graduates, and an international exchange program.

LaVerne Jones, chief, Acquisition Education and Training Office, OASARDA, presented information on various education programs available to AAC members.

The final presentation of the day was a briefing by COL Stephen L. Thacher on the training opportunities offered at the Industrial College of the Armed Forces (ICAF), where he serves as a professor of acquisition. Thacher's presentation focused on the senior acquisition course which is now offered at ICAF.

The concluding day of the conference featured an acquisition career panel of experts answering attendees' questions on a host of acquisition corps issues. The panel, which was chaired by LTG Forster, was composed of: Ernie Willcher, attorney advisor in the Army's Office of the General Counsel; Daniel M. Clawson, chief, AAC Management Office, PERSCOM; COL Richard A. Grube, deputy director, Acquisition Career Management, OASARDA; Brooks Barthalow, acting chief, Acquisition Management Office, Office of the Deputy Chief of Staff for Acquisition, HQ AMC; LaVerne Jones, chief, Acquisition Education and Training Office, OASARDA; COL Michael Jorgenson, acting director of contracting, OASARDA; and Dr. James Edgar, assistant deputy director, Acquisition Career Management. Topics addressed by the panel included: dual-tracking, tuition reimbursements for second advanced degrees, overseas career opportunities, career advisors, identification of critical acquisition positions, certification, "greening," career tracking for civilian PMs and deputy PMs, protection during RIF procedures; training quotas; and narrowing the gap between military AAC members and their primary branches.

Following the panel, Dr. John A. Daley, professor of communications, The University of Texas at Austin, spoke about communication effectiveness. According to Dr. Daley, the keys to effective communication include: managing expectations; paying rapid attention to people; being reliable, consistent, and dependable; and being aware of what your message means to others.

LTG Forster concluded the conference by emphasizing the need for AAC members to think and act like a body, to work in concert and to focus on common objectives. He stressed that although the AAC is 30,000 strong, it is not too big for members to be treated as individuals. In closing, he appealed to the attendees to continue being who they are because it has resulted in them being successful. He also called on them to go where the action is, to take the tough jobs, to get out front, and to stand up and be counted.

ARMY NAMES 1993 R&D ACHIEVEMENT AWARD WINNERS

Forty individual Army scientists and engineers and two scientific teams have been selected to receive Department of the Army R&D Achievement Awards for 1993. This award is given in recognition of outstanding achievements in research and development that have improved the capabilities of the U.S. Army and contributed to the nation's welfare during calendar year 1993.

The awards, presented in the form of individual wall plaques, will honor 31 personnel employed at activities of the U.S. Army Materiel Command; six employees of the Corps of Engineers; and three employees of the U.S. Army Medical Research and Development Command. Additionally, two plaques will be presented to two scientific teams of the U.S. Army Materiel Command.

U.S. ARMY MATERIEL COMMAND

U.S. Army Armament Research, Development and Engineering Center (ARDEC)

Dr. Pai-Lien Lu, Jonathan Shin and Sam Moy, of the Energetics and Warheads Division, ARDEC, Picatinny Arsenal, NJ, will be recognized for their innovative research in developing a scientific basis explaining the mechanisms controlling the behavior of a gun propellant bed upon a shaped charge jet impact. Their efforts led to the successful development of a novel, low cost, small scale test evaluation technology to assess new insensitive propellants.

The team of Alfredo Alza, Anthony Baroni, Paul Bresnowitz, Lydia Chang, Daniel Crowley, Jeffery Fornoff, Altaf Khan, George Khowong, Henry Lee, Paul Little, Daniel Pierson, Daniel Ramer, Jacob Struck, Robert Van Zee, and John Wolek of the Armament Engineering Directorate, ARDEC, Picatinny Arsenal, will be honored for development of the SADARM Image Processing System. This unique and innovative measurement system advanced the state-of-the-art of Army remote optical instrumentation by an order of magnitude, and leads the way toward the implementation of advanced image processing-based systems to support future smart munitions.

U.S. Army Edgewood Research, Development and Engineering Center (ERDEC)

Dr. Burt V. Bronk, research physical scientist, U.S. Army Edgewood Research, Development and Engineering Center, will be honored for his outstanding technical efforts in enhancing the Army's capabilities to characterize and manipulate single aerosol particles consisting of microorganisms. The methodologies resulting from these efforts contribute significantly to the development of advanced techniques for the detection of biological threat materials in the field as well as to the improvement of tests of devices already under development.

U.S. Army Missile Command Research, Development and Engineering Center

Michael C. Schexnayder, supervisory general engineer, will be honored for his exceptional leadership in the advancement of hypersonic missile technology. He has led the development of the most weight efficient small diameter composite case rocket motor ever developed in the U.S., development of a unique control actuator system, development of a sophisticated simulation, demonstrated overmatch lethality, and development of a millimeter guidance system and an orientation package for virtual launch. This 50 millimeter diameter missile reaches hypersonic velocities in a little over one-third of a second and maintains lethality to 10 kilometers.

U.S. Army Aviation and Troop Command Aeroflightdynamics Directorate

John C. Wilson, research engineer, and Henry L. Kelley, aerospace engineer, will be cited for bringing to fruition a helicopter yaw control enhancement concept, the tail boom strake. This accomplishment involved exacting basic aerodynamic research, design, testing, and engineering for use by the fielded and future helicopter fleet.

U.S. Army Natick Research, Development and Engineering Center

The Soldier Integrated Protective Ensemble (SIPE) team demonstrated exceptional professional performance and superb technical expertise in developing and sustaining a modular head-to-toe integrated fighting system for the dismounted infantry soldier. This unprecedented team effort resulted in the successful design of a soldier system which has improved combat effectiveness while providing balanced, multiple threat protection. This effort has demonstrated the merit of employing the systems approach to enhance soldiers' performance in individual and collective scenarios. This team's contribution has led the soldier into the 21st Century. The SIPE team, led by Carol Fitzgerald, also consisted of Patrick Snow, Cynthia Mooney, Daniel Fisher, Louis Olivera, Heidi Danziger, Cynthia Blackwell, George Schultheiss, James Wright, William Sanchez, Erik Hall, Almon Gillette, Michael Scanlon, Greg Cirincione, William Hanlon, Christopher Royal, Jeff Hofmann, Edward Reiss and Bruce Cadarette.

U.S. Army Tank-Automotive Command

Dr. Douglas W. Templeton, electronics engineer and Robert V. Goedert, research physicist are cited for development and

integration of laser protection technologies for unity vision equipment used in all ground combat vehicles. They are credited with efforts in the research, development and release to production of new type-classified laser hardened unity vision periscopes and vision blocks for use in all new and existing combat vehicles, providing positive and certain ocular protection to the personnel in those vehicles; the development of contingency filters for use on combat vehicles involved in Operation Desert Storm; and innovative research in laser damage characterization and development of novel techniques for broad-based laser protection. The completion of these efforts has resulted in enhanced survivability for combat vehicle crews operating in a laser-rich environment and a material increase in the warfignting capability of U.S. ground vehicles.

U.S. Army Communications-Electronics Command Research, Development and Engineering Center

John A. D'Agostino, Luke B. Scott, Tho Q. Duong, and Curtis M. Webb from the Night Vision and Electronic Sensors Directorate, will be commended for the development of the FLIR92 Thermal Imaging Systems Performance Model which has application for the analysis of current and advanced thermal imaging systems, including Javelin, Comanche, combat vehicle sights and manportable systems. The innovative approach towards the measurement methodology and modeling permits system noise to be fully characterized. The group's accomplishment marks a major milestone in assuring that the predictive performance models are in place to support major Army procurement decisions.

U.S. Army Research Laboratory, Signatures, Sensors, Signal and Information Directorate

Dr. Joseph Nemarich, physicist, will be commended for an experimental program to acquire and analyze generic target and clutter signatures for millimeter wave radars. He formulated the basic requirements for and design of the highly advanced instrumentation radar system needed for the measurements, and was the principal investigator for the measurements, the data analysis, and the generation of models from the data. These models will reduce requirements for expensive field testing of millimeter wave seekers such as the Multiple Launch Rocket System Terminally Guided Weapon (MLRS-TGW) and may lead to automatic target recognition techniques for millimeter wave seekers and target acquisition systems.

U.S. Army Research Laboratory, Electronics and Power Sources Directorate (EPSD)

Dr. Arthur Ballato, a research physical scientist, Owen P. Layden, John A. Kosinski and Edward R. Baidy, electronics engineers, will be cited for the development of a unique method of protecting integrated circuits from intense electromagnetic interference (EMI) and high power microwave (HPM) radiation. The technique incorporates a novel power transmission system which uses acoustic waves to transfer power through the walls of a totally enclosed container. Used in combination with fiber optic cables for data I/O, the new protection technique completely eliminates all possible conduction paths for both conventional EMI and HPM-EMI. The protection technique is compact, affordable, rugged and reliable, and has demonstrated protection levels considerably in excess of all known near, mid- and long-term requirements.

Dr. Michael Binder and Dr. Robert J. Mammone, research scientists, and William L. Wade, a research chemist, will be honored for their construction contribution to the state-of-the-art of high energy density capacitors. This innovative modification to conventional dielectrics has great utility in increasing energy storage capabilities and efficiency of military capacitors.

Muhammad Mizan, Dana Sturzebecher and Thomas Higgins, electronics engineers from EPSD, will be cited for their major contributions to low phase noise frequency sources. Additionally, they have taken the technology one step further and combined it with high power solid state transmitters for Army systems.

Dr. K.K. Choi and Monica Taysing-Lara, electronics engineers, and Wayne Chang, research physical scientist, will be recognized for development of a new hot-electron quantum-well detector. The new technology will provide high resolution thermal imaging capability at a relatively low cost. The new detector will significantly enhance future infrared surveillance technology.

Walter R. Buchwald, an electronics engineer, Dr. Stephen N. Schauer, a research chemist and Dr. Kenneth A. Jones, a supervisory engineer, will be recognized for establishing a new research program advancing device and design concepts in the InP/InGaAsP material system. Their contribution to novel concepts for optoelectronic integration and discreet optoelectronic device technology promises to make a significant impact on current tera-op processing schemes, ultra-wide-band communications, fiber optics, pulsed power and phased array radar.

U.S. ARMY CORPS OF ENGINEERS

U.S. Army Topographic Engineering Center

Dr. James E. Heath will be honored for his outstanding performance and extraordinary technical achievements while serving as a member of the Joint Precision Strike Demonstration Task Force and as technical director for the Joint Air/Land/Sea "First Light" demonstration.

U.S. Army Engineer Waterways Experiment Station

Dr. Norman W. Scheffner will be cited for his outstanding contribution to coastal engineering. He developed innovative technology to evaluate the fate of dredged material disposed in open water.

James E. McDonald will be recognized for development of a precast concrete stay-in-place forming system for rehabilitation of navigation lock walls.

Charles E. Carter and Robert T. Donaghe, civil engineering technicians and Dr. Victor H. Torrey III, research civil engineer, are being recognized for their development of a new quality control method for compaction of soils containing substantial amounts of gravel or rock fragments.

U.S. ARMY MEDICAL RESEARCH AND DEVELOPMENT COMMAND

Armed Forces Research Institute of Medical Sciences

LTC Bruce L. Innis, virologist, is being honored for his leadership of a landmark study to establish the efficacy of a newly developed vaccine against hepatitis A virus. Through his outstanding efforts, the hepatitis A vaccine was shown to be safe and effective.

U.S. Army Medical Research Institute of Infectious Diseases (MRIID)

Dr. Connie S. Schmaljohn, supervisory microbiologist, is being honored for her contribution to the diagnosis and prevention of a disease through her work on hemorrhagic fever with renal syndrome and the Hantaan virus that causes it.

Walter Reed Army Institute of Research

Dr. Roberta R. Owens, research chemist, is being cited for her development of a vaccine delivery system which has made possible the production of a safe and efficacious vaccine against sporozoite malaria.

EXPANDED ANALYTICAL SUPPORT TO THE ACQUISITION PROCESS

Greater Cooperation Will Promote Improved Systems

By Dr. Herbert W. Fallin,
COL William Huff III
and Dr. Henry L. Manuel

Introduction

The director for assessment and evaluation (DAE) in the Office of the Assistant Secretary of the Army for Research, Development and Acquisition (OSARDA) is endeavoring to further define and expand the roles of the Army's analytical and modeling communities to support the acquisition process. The enhancement of roles is especially timely because of the dramatic changes occurring in the world and the variety of missions the U.S. Army will face in the future.

DAE works closely with the deputy chief of staff for operations and plans (DCSOPS), assistant deputy for force development, in directing cost and operational effectiveness analyses (COEA) to support the decision making process. Many of the analyses conducted and directed by DAE revolve around the performance parameters of the weapon system. These include warhead penetration analysis, system survivability, and sensor acquisition performance. The objective of these analyses is to verify that the system is meeting the requirements for the soldier.

Because the world is changing rapidly in directions that make threats unpredictable, the U.S. Army must remain flexible in how it it uses its weapon systems. There are options available through some of our modernized weapon systems that could expand how and when these systems are used. These options come in the form of available technical upgrades and different operational uses.

Because the world is changing rapidly in directions that make threats unpredictable, the U.S. Army must remain flexible in how it uses its weapon systems.

DCSOPS and DAE must focus on expanding analytical support to fully understand the technical and operational capabilities offered by our weapon systems. Expanded analytical support also denotes defining new analytic tools as well as leveraging all available analytical sources to support acquisition decisions. One of the byproducts of this is to outline options to improve our current weapons systems given that new systems aren't likely to be developed. This process can only be advanced with the use of all available analytical resources from the Army Training and Doctrine Command (TRADOC) community, contractors and independent analysis houses like the Institute for Defense Analysis and Rand.

Distributed Interactive Simulation can be a powerful tool to explore technology options and evaluate the effectiveness of systems throughout the acquisition process.

Expanding Capabilities

As the Army conducts its supporting analyses, especially in the form of COEAs, it is bound by narrow constraints in how the system is used. These constraints are defined by the requirements which serve to define the weapon system and the warfighting doctrine which the system is designed to support. The Army has always done an admirable job in conducting these analyses to gain an honest appraisal of the operational effectiveness of the system. The question we must ask is what else is this system capable of, if the specific opportunity presents itself.

Certain constraints are necessary in performing these types of analyses. However, in many cases there are unique capabilities inherent in a weapon system that don't get played due to many factors. The most prevalent is the fidelity of the models used to conduct the analysis. Another limitation is the narrow role and mission in which the weapon system is used. The area is primarily the province of the combat developer and the joint staff. However, OSARDA can assist in this process by sponsoring analyses that completely explore a system's technical capabilities. This analysis would complement other analyses that are used in the milestone decision review process during the acquisition cycle.

Some of the capabilities that have been designed into our weapons systems or that have been discovered and explored in testing include all weather performance, enhanced countermeasure resistance, the ability to defeat targets other than those for which it was designed and much improved overall system accuracy. Through supplementary analysis, these capabilities can be highlighted to advance the acquisition process.

Through the process of expanding the limits where the capabilities of weapon systems are considered in modeling leads to new insights concerning the roles and missions for which a system is designed. This view is reasonable given that if a system is capable of executing a particular role or mission, this ability becomes another warfighting option for the battlefield commander. This assists the materiel developer in maintaining and advancing this capability if needed, or deleting the capability if system costs become a problem and alternate systems can accomplish the mission. Due to our current budgetary environment, we must conduct this type of analysis early and often in the acquisition process.

Through the concept of expanding the capabilities of our weapon systems, we will be able to explore high technology options that have been developed as potential product improvements or horizontal integration. There are numerous examples of high technology concepts that can be adapted into existing systems, if viable and cost effective.

Developing New Analytical Tools

Technology demonstrations are underway to explore distributive interactive simulations (DIS) as a tool to conduct cost and operational effectiveness type analyses (Anti-Armor Advance Technology Demonstration, or A2 ATD for short). DIS can be a powerful tool to explore technology options and evaluate the effectiveness of systems throughout the acquisition process.

The primary simulation tool used by the Army is the Battlefield Distributive Simulation-Developmental (BDS-D). BDS-D uses a man-in-the-loop and has been primarily used for training and to refine doctrine and tactics for heavy forces. BDS-D will conform to the DIS standard architecture. The A2 ATD will leverage the BDS-D initiative to provide the expanded evaluation and assessment capability the combat and materiel development community needs.

There are other simulation facilities within the other Services. The analytical process can be advanced if the simulations in the Army are integrated with those of the other Services. For instance, the Air Force has estimated a theater air command and control simulation facility at Kirtland Air Force Base. This facility is capable of simulating integrated advanced air defenses including Patriot and Hawk. A possible future development would link this center with BDS-D and an Army deep and simultaneous attack simulation to portray a complete joint warfare interactive simulation. The payoff from such a simulation would serve all Services in defining technology options and opportunities in future developments as well as furthering the doctrinal aspects for modern warfighting.

Maximizing Analytical Resources

There are several leveraging opportunities that the Army analytical community can take advantage of to expand its knowledge base and support the acquisition process. DAE monitors and makes use of analyses produced by the Institute for Defense Analyses, the RAND Corporation, other FFRDCs, as well as analyses produced by the other Services. Relevant analytical research by these groups as well as private companies can supplement and at times provide the key analytical support for acquisition. The criterion that must be used to provide a credible supplement to the Service analytical efforts is consistency in scenarios and basic data.

Conclusion

The entire defense analytical community will be called upon to work collectively to advance the nature of interactive simulations as a tool for the acquisition process. This will also require the cooperation of all the Services. Throughout this process it is important to maintain credibility by having accurate models and simulations and by using sound military principles and doctrine. The Office of the Director for Assessment and Evaluation is the lead element within OSARDA to promote this evolution. This office will be responsible for assuring that analytical tools are available, for fostering interagency and inter-Service cooperation, and for highlighting all capabilities within a weapon system and promoting accuracy in the modeling results.

DR. HERBERT W. FALLIN is the director for assessment and evaluation in the Office of the Assistant Secretary of the Army for Research, Development and Acquisition.

WILLIAM H. HUFF III is the chief of analysis for the director for assessment and evaluation.

DR. HENRY MANUEL is a technical liaison to the director for assessment and evaluation from the Army Materiel Command's Smart Weapons Management Office.

From Single Source to Competition...

PALADIN AND PET

By Carroll Gagnon, William R. Hertel, Rene Kiebler, and Cleve Peeke

Introduction

In late 1989 and early 1990, the product manager responsible for improving the Army's self-propelled howitzer faced a dilemma: the sole source development of a major complex product improvement needed to be completed to bring cost under control, but the nature of the project seemed to preclude competitive production. The answer that evolved was the Producibility Evaluation Task (PET).

Through the use of PET, the Paladin program was able to successfully cross the bridge from the drawbacks of a single-source development to the benefits of competitive full-scale production.

Background

In order to understand how PET evolved, and why it was successful, it helps to appreciate the complexity of the Paladin program. It is a major product improvement to the M109 Self Propelled Howitzer Weapon System, consisting of a new engine and other automotive improvements, a new turret, a modified armament system, the addition of an Automated Fire Control System, an on-board Prognostic Diagnostic Interface Unit, and miscellaneous other changes.

The process of building a Paladin (see Fig.1) requires a significant amount of coordination and schedule planning among many participating agencies. The existing chassis (M109A2/A3) is input to the Letterkenney Army Depot where it is stripped down and refurbished. A new engine, radiator, suspension system and other improvements are installed, supported by kits provided by and shipped from the contractor. The Watervliet Arsenal produces the M284 Cannon Assembly and the Gun Mount Ballistic Shield Conversion Kits, and Rock Island Arsenal produces the M182A1 Gun Mount.

The modified chassis (without turret), the Cannon Assembly, the Gun Mount, and the Ballistic Shield are then shipped to the turret and system integration and assembly contractor. There, the new turret is manufactured and integrated with the Government Furnished Equipment (GFE) plus the Automated Fire Control System and Prognostic Diagnostic Interface System from subcontractors (after break out, these units are also GFE).

A full scale development contract was competitively awarded in October 1985. Long lead item contracts were awarded sole source to the developing contractor in FY88 and FY89 in order to meet the first unit equipped date of June 1993.

Need for Competition

By late 1989, questions about the direction of the sole source development began to surface. The Paladin product manager directed that an affordability study be undertaken to review the existing acquisition strategy and provide recommended alternative procurement strategies to achieve the low rate production (LRP) date and the planned first unit equipped. This study concluded that, based on the sole source contractor's schedule, cost experience, and estimated data, the scheduled first unit equipped date could not be met and that the LRP statement of work (SOW) was not affordable without changes in strategy and contracting. Following this study, a series of competition and acquisition strategy analyses were undertaken to determine the effect of various strategies on schedule and unit cost. Table 1 lists some of the traditional alternative strategies.

Several factors made the selection of an alternative difficult. First of all, the incumbent contractor for the development effort enjoyed significant advantages in terms of program experience and technical understanding of the system. A second factor was the evolutionary reduction in total units to be procured. The original program was to be 1,700 units. This was variously reduced to 1,360 units, then to 1,138 units, and eventually to 824 units. As the total procurement declined, so did the chances for attracting potential competitors.

The analyses, however, pointed to the need for competition, both to control unit costs (especially given the reduction in quantity) and to assure contractor responsiveness to the government's requirements.

The Evolution to PET

The PET concept began to appear in early 1990 (see Table 2). A February 1990 paper recommended that competition be created by providing technical data packages and one of the prototype howitzers to credible interested sources. These sources would then submit proposals for a small education buy. An alternative approach was considered that would follow the same process, but would not include the production of any units. This "learning contract" would provide technical familiarity to competing contractors so that they could produce credible competing proposals. The contractors would effectively perform the same function as the pre-production engineering phase of a first time competitive contract common in small arms weapons procurements.

The alternative approach was attractive because it reduced substantially the up-front costs and time required, allowing competition for full-scale production to occur significantly earlier. Although this approach was seen as riskier than if the competitors had actually produced units, it had the added advantage of keeping the competitive pressure on the sole source contractor while avoiding the large-scale expenditures of the other approach.

By September of 1990, the government decided to execute the initial low-rate production contract with the sole-source development contractor, while at the same time examining all viable competitive options, including foreign systems and in-house government production.

The foreign system alternative was studied in depth, but discarded after determining that foreign developments either did not meet or exceeded requirements, and in all cases were much more expensive and fielding dates would be much later. The alternative for in-house production was eventually also rejected because the risks to the program were too great.

PET Plan Finalized

As the PET plan was being discussed, several of the major obstacles to competition (e.g., lowered total production, and potential competitors' lack of experience) were somewhat resolved. With the end of the cold war and the reduction of defense business, even a smaller procurement was attractive. Also, the government decided to restrict the competition to the few producers who could show recent experience in producing a tracked combat vehicle. This limited the number of competitors, but eased the education and experience problem.

The desired outcome was to have two or

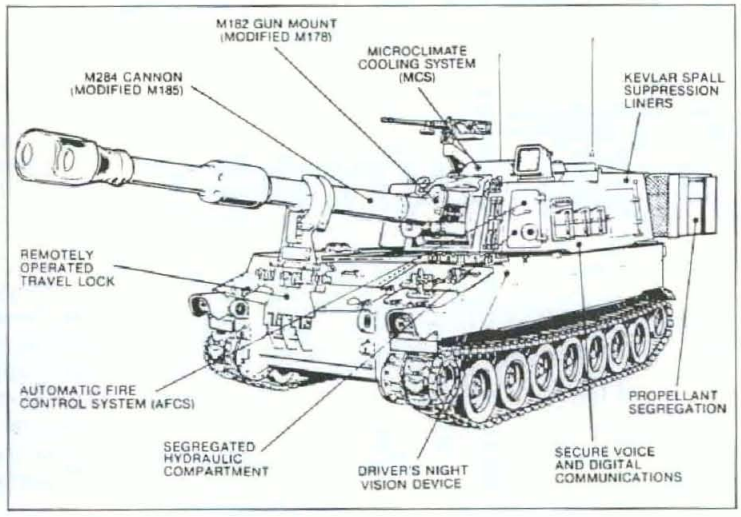


Figure 1. The Paladin is the M109A6 consisting of a 155mm Self-Propelled Howitzer. Integrated Logistics Support, and the Command, Control and Communications interface with the artillery fire support systems.

more qualified contractors capable of submitting a qualified proposal. Given that the potential contractors had successfully produced a tracked vehicle, the only question was what needed to be provided and when. Careful wargaming determined what the contractors needed; all efforts were then focused on providing the required inputs and to put the PET contract in place.

Prior to releasing the Request For Proposal for the PET, numerous senior Army leaders were briefed and at each meeting assistance was provided in fine tuning the concept. Finally, the Army acquisition executive and Army System Acquisition Review Council were briefed on the PET concept in March 1991 and a change in acquisition strategy was authorized. Forces were put in motion to achieve a December 1991 award to two or more PET contractors.

A market survey in the form of an industry day was held in August 1991 to familiarize industry with the Paladin program and inform industry of the PET effort. It was explained that the PET acquisition was being issued to enhance competition for the M109A6 Self-Propelled Howitzer full-scale production effort for FY93, providing an opportunity for competing contractors to gain some first-hand knowledge. The current contractor was excluded from participating in order to level the playing field for the PET competition.

In December 1991, the PET concept was implemented by awarding contracts to two respondents that were credible competitors. The contracts contained options, which were exercised by the government, requiring the contractors to subsequently respond to the full-scale production (FSP) RFP. That RFP (issued in July 1992) was then limited to the two PET contractors and the incumbent.

Key PET Tasks

The PET contract had been developed with two goals in mind: to allow the government to evaluate the contractor's manufacturing and integration capabilities; and to allow the contractors to become familiar with the government's manufacturing and integration requirements. To meet these goals, the PET statement of work was structured with the following key tasks:

• **Review of the Technical Data Package.** Each PET contractor evaluated the TDP for production given their own unique facilities and expertise. For example, each of the contractors in the Paladin PET effort has a unique welding capability. Each contractor submitted engineering change proposals for review by the government evaluation team, with the evaluation conducted outside of the normal Configuration Control Board (CCB) process. This was required because, after preliminary approval, these engineering change proposals were to become part of the contractor's unique proposal to the full-scale production RFP. Only after contract award would the formal engineering change proposals be processed through the CCB. The contractors were asked to carefully prioritize the many proposals under consideration to maximize the benefits which they could realize in the full-scale production proposal process. The contractors were required to certify to the producibility of the TDP as part of their full-scale production proposals.

• **Inspect/Disassemble/Inspect/Reassemble/Inspect.** The PET contractors were given a production vehicle, a specific set of reassembly spare parts (e.g. screws, nuts, washers, packings, seals, etc.), and a complete set of technical manuals. Upon receipt, the vehicle was tested to establish a performance baseline. After disassembly, inspection and reassembly using the GFE spares, the vehicle was retested according to the original test plan. This learning process went well beyond the typical paper study. In particular, the contractors were challenged by the various hydraulic cleanliness and alignment requirements which are somewhat unique to this vehicle application.

• **Manufacturing Plan.** The contractors were required to develop a manufacturing plan which documented the methods that they would use to manufacture and integrate the production of an M109A6. This plan was non-binding in nature and did not require formal government approval. It did, however, form the basis for the manufacturing plan required in the full-scale production proposal. It also provided the contractors with the opportunity to think through their manufacturing strategy well in advance of the RFP, allowing each contractor to seek out and evaluate various cost-saving facility agreements that other-

Table 1.
Typical Methods to Invoke Competition.

Negotiated Competition -- A second source is created through negotiation. When the second source has gained sufficient experience to be competitive with the original contractor, an all-or-nothing competitive buy-out award can be made. This procedure requires quantities sufficient to support split awards as well as a final award quantity sufficient to provide competitive impact.
Leader-Company Procurement -- This procedure provides assistance from the leader company to the follower company. Once the follower has passed first item tests, the progression to a buy-out can proceed.
Fusion-Fission -- Companies form teams for the R&D phase. Once the winning team is selected, the former partners become competitors for production contracts.
Licensing -- The developing contractor is paid for technical assistance (technology transfer) in two parts: a lump sum, plus a royalty for each item produced by the second source.
Educational Buys -- The Government awards a small quantity buy to a producer other than the original developer. This small award allows the second contractor to learn how to produce the item. Some form of technology transfer is required.

wise would have been seen as high risk by the government without sufficient documentation. This, in combination with the lessons learned through the other two tasks, proved to be a powerful combination in developing cost-saving strategies.

Fair and Equal Treatment

One of the overriding concerns of PET is the protection of information that could compromise competition while providing sufficient information to enable competition. Therefore, several actions were taken to prevent information crossover between contractors:

- The number of personnel involved in the PET team was kept to a minimum. There were a total of approximately six people who worked both PET contracts on a full-time basis. Other personnel were brought in only as needed and for specific issues.
- Technical personnel were briefed on the sensitivity of discussions and documentation provided by the contractors. Strict procedures were implemented which required all requests for technical information and responses to flow through the contracting officer's representative.
- The contractors were told to take great care to evaluate and mark all appropriate information as competition sensitive. In addition, all information received from the contractors was treated as competition sensitive even if it was not specifically marked as such.

PET's Success

The PET effort was successful both in terms of achieving its objective (building a bridge to competitive production) and in reducing the overall cost of full-scale production.

The signed multi-year production contract price was actually about six percent lower than the government's estimate. This represents a savings of approximately 35 percent when compared to the Paladin baseline cost estimate if adjustments for competition and multi-year funding are not included. It is difficult to assign an exact share of the savings to competition because other factors, such as multi-year funding, also had an effect on the final contract price. We estimate that a savings of about 25 percent can be attributed to PET and the resultant highly successful competitive source selection. (It is of interest to note that the incumbent did not win the competition.)

Conclusion

The conclusion based on this experience is that the PET approach, when properly managed, can legitimately introduce competition into a previously single source program and establish a level playing field for new competitors. In this case, the government's investment in the PET program actually yielded over a nine-fold return in the form of production contract savings.

Table 2.
Major PET Events.

December 1989	Affordability study cautions that the First Unit Equipped date will not be met and that changes in acquisition strategy are needed.
February 1990	Recommendation that competition be created by providing a Technical Data Package and a prototype howitzer to interested sources for disassembly, inspection and reassembly.
September 1990	Low-rate production by the sole source development contractor is begun, but viable competition options are still sought.
March 1991	Briefings for senior Army leaders explaining PET concept.
August 1991	Industry Day held to present PET to industry, and subsequent issue of PET RFP.
December 1991	PET contracts awarded to two qualified vendors.
July 1992	Full-scale production RFP issued to the two PET contractors and to the incumbent for FY93.
April 1993	Winning contractor selected for the full-scale production contract, and validation of the PET concept.

CARROLL GAGNON is the deputy product manager for Paladin. He is a member of the Army Acquisition Corps and holds a B.S. degree in mechanical engineering from the University of Maine.

WILLIAM R. HERTEL was the product manager for Paladin during the development period of the PET strategy. He has a B.S. degree in physical science from the University of Iowa, an M.S. degree in business administration from the University of North Colorado, and was the 1992 PM of the Year.

RENE KIEBLER is a production engineer for the Paladin product manager. A member of the Army Acquisition Corps, he has a B.S. degree in mechanical engineering from Rochester Institute of Technology and an M.S. degree in engineering management from the Florida Institute of Technology.

CLEVE PEEKE is an acquisition consultant for Camber Corp., working for the product manager, Paladin. He has a B.S.E. in industrial engineering from Arizona State University.

THE MILITARY TECHNICAL REVOLUTION

The Revolution in Conflict

By Dr. Daniel Goure'

Introduction

It is somewhat ironic that at a time when the greatest threat to world peace has vanished from the earth and the Cold War it spawned is over, that we should be witnessing a revolution in conflict. This revolution is the product of three interrelated phenomena. The first is the reorientation of U.S. and Western military strategies away from planning for a global war and towards the problems of regional security. Second is a revolution in military technologies, some of which were displayed in the recent Gulf War. Last, is the increasing importance of a host of "short-of-declared war" missions and roles for military forces.

The new international security environment is imposing new requirements on U.S. forces and planning and raising the demand for alternative defense capabilities. The United States is turning to a military strategy based on regional conflicts and contingencies. In the most stressful scenarios of future military conflicts, the United States will be required to project large conventional forces into a hostile environment to defeat a conventionally armed enemy, such as the Persian Gulf War. Yet, we will be required to do so as rapidly as in the past but with smaller forces, less forward presence, and a shrinking industrial base.

Even regional conflicts are likely to take on a very different cast due to, among other things, the global diffusion of technology, the creation of highly distributed, civilian information systems, and the revolution in manufacturing. These factors and others will fundamentally rewrite the equation of strategic power for the world in the 21st century.

There is growing promise for the U.S. to develop a range of new and innovative military capabilities. These could include non-lethal capabilities, new defensive weapons and technologies, and sensors and information systems for intelligence and arms control purposes. Some capabilities have existed for years, but were not deemed suitable or cost-effective in the era of Cold War planning. Others are entirely new and the product of revolutions in science and technology. Non-lethal systems, for example, have existed for many years in the rudimentary form of tear gas, water cannons, rubber bullets, and electric shock devices. A new generation of high-tech weapons applicable to the battlefield (and possible other uses) are now within the realm of the possible—some such weapons were used in the Persian Gulf War.

Security Environment

Additionally, in the new security environment U.S. forces will more often be involved in military operations very different from such large conventional conflicts. Humanitarian intervention, peacekeeping, and peacemaking operations are becoming a standard component of U.S. military activities. "Short-of-war environments" present prime operational environments for the employment of alternative capabilities, including non-lethal weapons. These environments are dominated by a concern to limit casualties, preemptively disarm combatants, and protect civilians.

U.S. allies, some of whom are only now beginning to become involved in out-of-area peacekeeping operations, might well be interested in non-lethal capabilities. Clearly, strategic innovation and alternative approaches are needed if the U.S. is to play the role of strategic coordinator in this world.

The emerging revolution in conflict also requires innovation in our intelligence gathering and assessments to match the new breadth of our security interests and concerns. The new challenges to intelligence include understanding the implications of parallel revolutionary forces on national security, developing a system of strategic warning indicators, and identifying untapped sources for intelligence information in these new areas of interest.

Historically, revolutions in military affairs have most often taken place within social and technological revolutions and reflect the interrelationship between developments in these various elements of society. The ramifications of past reformation, such as the industrial revolution, shaped national and international perceptions and norms of behavior. The social, political, economic, technological and cultural changes sweeping the world provide the context for a revolution in U.S. strategic thinking and military practices.

Within this context, a revolution in conflict will radically alter even the most basic notions of military power, deterrence, compellance, and warfare. It is possible that military power could no longer be solely based on measures of the destructive potential of military forces. Broader measures of military potential, superior information, and advantageous economic potential would have to be considered. Changes in information gathering capabilities, advanced manufacturing techniques, and artificial intelligence may radically alter the nature of warfare in the future, as well as change our definitions of what capabilities constitute the sinews of military strength.

Military-Technical Revolution

A military-technical revolution is generally defined as an order(s)-of-magnitude increase in the capability to wage wars and engage in combat resulting from a new synthesis of military hardware, doctrine and operational concepts, military organization, and command, control and communications. There have been several such revolutions in history, most notably the revolution in naval warfare in the Pacific with its emphasis on carrier operations and amphibious landings, and in Europe with the Blitzkrieg, the combination of tank-aircraft centered combat which dominated the Continent.

In the 1950s and 1960s a new revolution took place centered on nuclear weapons, jet aircraft, ballistic missiles and satellites. In each of these cases, technology married to new concepts of organization and employment created a revolution in military capabilities.

Many have touted the Persian Gulf War as a demonstration of an emerging revolution in warfare. Some contend that precision weapons and other advanced technologies evidence a decided break in the century-long trend of the increasing destructiveness of warfare. The extensive employment of innovative capabilities applied in new and daring ways may be the next phase of this trend. How might the future conflict environment likely evolve in response to development of a range of innovative

strategic and operational means of employing new types of weapons? These are just some of the issues that must be examined under the broad context of strategic innovation.

The most revolutionary change for the West in the arena of conflict is likely to be the requirements to control the scale and scope of military engagements. This is occurring at the same time that regional adversaries are growing more capable and are operating with fewer political constraints. In addition, the era of reliance on a strategy of overwhelming force is likely to end for a number of reasons:

• **Global Interdependence.** The rapid expansion of multi-national corporations and overseas investments will create a situation in which potential strategic targets are actually owned by U.S. businesses or those of our coalition members.

• **Casualty Concerns.** There is the need, particularly in the era of CNN real-time transmissions from the battlefield, to avoid collateral damage and unnecessary casualties.

• **Cost.** The cost of sending half a million troops to the Persian Gulf for almost a year will be beyond the resources available to the U.S. and its Allies, except in the most extreme circumstances.

• **Force Sizing Limits.** Neither the U.S. nor its allies are likely to dispose of forces of a magnitude sufficient to allow deployment massive overseas expeditionary forces. Downsizing of the military will mean, at a minimum, a scarcity of trained and highly skilled personnel.

• **Targeting Restrictions.** The need to avoid collateral damage, avoid lengthy post-conflict clean-ups and environmental insults, and limit fratricide and friendly fire casualties will restrict targeting options.

Regional adversaries will continue to be more quantity-oriented as compared to quality emphasis of the U.S. Armed Forces and those of our closest allies. If they have technological strengths they are likely to be only in selected areas such as air defense, mine warfare, shallow water submarine actions, and short-range ballistic missiles. What is more important, is that these nations have other strengths which make them potentially formidable adversaries for the U.S. These strengths include:

• More casualty tolerant than Western nations;

• Relatively insensitive to attacks on non-military infrastructure; and

• Possession of relatively few strategic targets, those whose destruction means a major disruption in their military operations.

As a result, the next military-technical revolution will be one which exploits emerging technologies to fit both the new mission areas and adversaries confronting U.S. Armed Forces, and the residual of the old missions. The military requirements for this new force should include the following capabilities:

• Global view, and tactical intelligence without long-term, hard-wired forward basing;

• Protection against advanced ballistic and aerodynamic threats;

• Ability to defeat hostile armor-heavy ground formations, rapidly without requiring deployment of equally large U.S. heavy formation;

• The ability to identify, track and target mobile and moveable strategic targets under a variety of scenarios and conditions;

• Suppression of Enemy Air Defenses (SEAD) capabilities against Western-class air defenses; and

• Lower logistics and combat support burden, allowing for reduced lift requirements and more rapid deployment of forces overseas.

These future military requirements lead to a set of capabilities of interest for the future. These proposed capabilities do not define the universe of those required by the Services in the performance of their functions. They are meant to suggest the types of capabilities which will be needed to meet the requirements imposed on the U.S. by new circumstances and challenges.

• Real-time, multi-spectral sensing, surveillance, guidance/targeting capabilities;

• High-performance, high-capacity information processing and communication systems;

• Advanced, computerized training aids/simulators;

• Controlled effects weapons (including non-lethal weapons);

• Electronic Counter Measures and Electronic Counter-Counter Measures;

• Stealth may have utility depending on application; and

• Area and mobility denial mechanisms include mines.

The general capabilities described above need to be placed into a systems context. In general, meeting the requirements for future decisive, high-technology, rapidly deployable, flexible and affordable forces means focusing on ways of delivering firepower remotely, possibly at long-ranges. It also means finding ways of reducing the unit equipment and stock-piles which need to accompany forces deploying forward. As a result, the revolution in future U.S. military forces will involve a number of systems which have the effects of reducing force "overhead" while simultaneously increasing firepower. Among the systems in question are:

• Cruise missiles, Unmanned Air Vehicles, and Unmanned Underwater Vehicles;

• Space-based real-time surveillance systems, including multi-spectral imaging, synthetic aperture radar and millimeter wave radar;

• Long-range, high-payload, air and sea platforms possibly derived from commercial barge and wide body transport aircraft;

• Rapidly deployable air and missile defenses capable of defeating long-range cruise and ballistic missiles;

• Submunition-equipped, rapid fire systems. Munitions can include Brilliant Anti-Tank Munition (BAT) and Skeet or Wide-Area Anti-Tank Munition (WAAM) type systems. High rates of fire would come from MLRS and tactical cruise missile type delivery means;

• Rapidly employable sea and land mines; and

• Ultra-fast air and sea-lift based on hypersonic air vehicles and wing-in-ground ships.

Conclusion

The U.S. military will have to grapple with the issues that surround the development and employment of innovative capabilities within the context of U.S. national military strategy. Besides technological advancement, the primary challenge to U.S. military forces will be developing the guiding policies and operational doctrine for a host of new and different missions as well as potentially revolutionary technical capabilities.

Information warfare systems, non-lethal technologies, and precision strike systems must be integrated into the force structure. Each weapon will undoubtedly possess unique operational characteristics and have specific tactical considerations for employment. In this era of fiscal austerity, the choice in the RDT&E and acquisition processes between competing weapons systems will likely entail difficult acquisition, force structure, and resource trade-offs. Additionally, the development of any capability must consider the likely development of countermeasures, both for friendly force protection and a weapon's continued effectiveness.

The U.S. requires a policy and strategy to promote and sustain strategic innovation at a time when the international environment is changing, new sources of instability are emerging, requirements imposed on military forces are expanding, and U.S. and Western military capabilities are shrinking. The U.S. needs to develop a national defense strategy with goals and expectations that promote strategic innovation in order to encourage the search for opportunities for technological, operational and organizational innovation, define criteria by which opportunities can be assessed, specify measures of effectiveness for such opportunities, and establish methods for operational test and evaluation.

DR. DANIEL GOURE' is the deputy director for Political-Military Studies at the Center for Strategic and International Studies in Washington, DC.

OMNIBUS CONTRACTING

By Jack R. Kulaga
and Joseph P. Brady

Introduction

The Army's Communications-Electronics Command (CECOM) has implemented a relatively new approach to service contracting, known as "Omnibus Contracting." The approach, quite simply, involves the consolidation of most of CECOM's approximately 125 service contracts. These service contracts range in effort and complexity—from industrial hygiene services to highly technical, integrated logistical support. Developed with the idea of meeting its mission in a more streamlined fashion, "Omnibus Contracting" is just one of the many new and innovative contracting processes CECOM initiated to help alleviate some of the problems associated with decreasing resources.

Omnibus provides a dynamic change to traditional service contracting methods. Unfortunately there exists the perception of fewer contracting opportunities and associated dollars, particularly for small and disadvantaged businesses. These perceptions are based mostly on the falsehood that a single contractor will independently perform the required contractual efforts. The fact is, as this article will later explain, that numerous opportunities exist for both small and large businesses. Through "teaming," prime contractors and subcontractors will form partnerships capable of providing customized technical and electronic support services.

Background

Putting the Omnibus concept into action demanded a significant amount of dedicated research and planning. Initially, CECOM assembled an Omnibus "tiger team" of personnel who were knowledgeable in the intricacies of service contracting, as well as the functional users' requirements. Once assembled, the team set out to complete a two-step approach to laying the groundwork necessary for an Omnibus reality.

First, over a period of several months, the team visited various military commands and government agencies involved with similar initiatives. By visiting the U.S. Army's Missile Command (MICOM), Air Force commands, National Aeronautics and Space Administration (NASA), Department of Transportation and Department of Energy, the team was able to identify potential Omnibus problem areas. The research surfaced areas of concern such as availability of administering personnel, level of acceptance and commitment to concept, identification and "phasing" of future requirements to existing service contracts, fairness to small business, and the belief that program managers need separate specialized contracts. Besides problem identification, the visits provided the team with "lessons learned"—invaluable information on Omnibus solutions and strategies.

Second, the team developed a two-phased data base. For ongoing contractual requirements, the team reviewed all of the existing 125 service contracts. Every statement of work (SOW) element on the current service contracts was entered into a data base. Individuals from each of the functional areas then reviewed and concurred as to the accuracy of the information placed in the Omnibus data base. Next, for the second phase, the data base was expanded to include planned or future service contracting requirements. Again, functional users reviewed the data input.

Upon identification of foreseeable problems and future service contract requirements, the Omnibus team was then prepared to formulate CECOM's own Omnibus concept.

Domains/Concept

To best implement the evolutionary Omnibus process, the Omnibus team divided the CECOM "universe" into three distinct domains: logistics and readiness; research, development and engineering; and business and information systems. Many varied functional areas comprise each one of the three domains. Each functional area, in turn, consists of a small range of one to three contracts. Overall, the three domains will reduce the number of service contracts from a previous 125 to 26. It is important to note that existing service contracts will not be canceled or terminated. These existing contracts, however, will not be extended (by way of option exercise) and instead will each "run their course."

The logistics and readiness domain consists of four functional areas. A total of eight service contracts in this domain will provide support for intelligence and electronic warfare systems, communication systems, command and control systems, and general logistical support (i.e., new equipment training). The research, development and engineering domain is comprised of 15 functional areas. A total of 15 contracts will provide support in such areas as fire support, night vision, hardware maintenance, training, field assistance, and engineering support for program managers and program executive officers. The business and information domain consists of three functional areas. Only three service contracts are necessary to provide support for areas of information systems, business analyses, and health physics/industrial hygiene.

Each Omnibus contract is structured with a basic one-year term and four, one-year options, thereby providing a potential five-year contractual effort for both small and large businesses. It is very unlikely that any one contractor will solely perform on a con-

tract. Instead, a more likely outcome is one single prime contractor who will have purview of the overall contractual effort, and will subcontract out the majority of the effort. Contractors and subcontractors possessing the specialized skills will likely continue to find themselves providing the more unique efforts in a subcontractor capacity.

Small Business

Small business received premium consideration as the Omnibus idea was developed. Maximizing small business participation in both restricted and unrestricted opportunities was of utmost importance to the Omnibus team. Early involvement of the Small Business Administration and Small and Disadvantaged Business Utilization Office (Department of the Army and CECOM SADBUO) provided the team with the input necessary to understand the needs of the small business community. The team also paid careful attention to the specific needs of the individual customer when identifying contracts as being either small business set-aside or 8A set-aside.

The Omnibus structure incentivizes large contractors to subcontract with small business and small disadvantaged business for those functional areas awarded on an unrestricted basis. Large contractors must propose and set aside a mandatory amount of work for small and small disadvantaged business. The proposed amounts will be a major consideration during the evaluation phase and will become an integral part of the Omnibus contract. The government's continuous evaluation of the prime contractor's efforts to meet its subcontracting plan further illustrates the Omnibus commitment towards small business.

Presently, CECOM has designated 11 of the 26 projected Omnibus contracts as small business set-asides. The business and information domain has two small business set-aside contracts and one 8A set-aside contract. The logistics and readiness domain consists of eight small business set-asides, and the research, development and engineering domain consists of one each small business set-aside and 8A set-aside, with the remaining 13 contracts designated as "unrestricted."

Stated differently, CECOM earmarked half of the Omnibus contracts and over 35 percent of the total projected Omnibus dollars for small and small disadvantaged businesses. Before Omnibus, approximately 25 percent of existing service contract dollars were for small and disadvantaged businesses. Therefore, although the total number of individual contracts decreased, the Omnibus team achieved an increase in the overall percentage of small business set-aside effort.

Status

Omnibus contracts will range in value from $2 million to $300 million, and are spread over a forecasted award timeline from September 1993 to May 1997. In conjunction with another -innovative contracting process called the Electronic Bulletin Board (EBB), Omnibus draft SOWs, solicitations and correspondences will be available electronically. The EBB allows industry to access Omnibus documents on an "around-the-clock," 24-hour basis.

The Omnibus structure incentivizes large contractors to subcontract with small business and small disadvantaged business for those functional areas awarded on an unrestricted basis.

The EBB provides a low cost method of streamlining the transfer of electronic communication data between the government and industry. Through industry's early involvement in the contractual process (i.e., draft requests for proposal), there is a reduction in proposal preparation time and enhanced clarity and quality in Omnibus solicitations.

An important factor to any process change is education. CECOM had thoughtfully presented useful Omnibus information to industry several times. On May 19, 1993, CECOM held its annual Advanced Planning Briefing for Industry (APBI) at Fort Monmouth, NJ, where Edward G. Elgart, director of CECOM's Command, Control, Communications and Intelligence Acquisition Center (C3IAC), formally presented the "Omnibus Functional Concept" as one of several APBI topics. The following month, on June 24, 1993, CECOM hosted an APBI entitled, "Omnibus Support Contracting at CECOM." That particular symposium was dedicated entirely to providing the business community CECOM's perspective of the Omnibus project. Each of the approximately 350 attendees was exposed to, among other topics, Omnibus domains and functional areas, small business impact, best value in Omnibus, and projected contracting opportunities.

Advantages

The advantages to Omnibus contracting are many and varied. Two advantages for industry particularly stand out. First, Omnibus allows for a streamlined service contracting process and standardization of contractual documents. A streamlined process provides many benefits often associated with standardization: uniformity, ease of recognition, fewer ambiguities, etc. Second, as previously stated, Omnibus provides for maximum involvement of small businesses. Opportunities abound for participation by small businesses in either a prime or subcontractor capacity. Constant monitoring by the SBA and SADBU offices assure small businesses that their interests will continue to be supported as Omnibus evolves.

Two important advantages also exist for the government. First, Omnibus allows industry to spread their overhead costs over a larger cost base. The larger cost base should result in lower overhead rates, which in turn, would bring savings to the government. Second, consolidation, should require less intensive management and overhead by the government in managing the contracts. A single, centralized Omnibus contracting team, for instance, fosters uniformity and efficiency.

Summary

CECOM remains committed to maintaining and sustaining an acquisition process that establishes affordable, understandable, and publicly supportable requirements, while providing the most efficient means of acquiring services to meet these requirements at the best value to the government. To this end, the efforts of the Omnibus team are essentially dual-focused. First, the team intends to continue to consolidate, where deemed necessary, and in doing so, continue to ensure that maximum opportunities exist for small businesses. And second, the team will continue to improve the process of contracting for services by using the lessons learned. It is only through such dedication and flexibility that CECOM intends to further enhance the Army's ability to meet its future needs.

CECOM remains available to industry and welcomes any discussions on Omnibus contracting. Readers having questions, comments or concerns regarding CECOM's Omnibus program are encouraged to write the Communications and Electronics Command, C3I Acquisition Center, Fort Monmouth, NJ 07703, ATTN: AMSEL-ACCB-D-BV.

JACK R. KULAGA is a procurement analyst for the Command, Control, Communications and Intelligence Acquisition Center, HQ CECOM. With more than 10 years of contracting experience, he holds an M.B.A degree from Monmouth College, NJ.

JOSEPH P. BRADY is the project leader and contracting officer for the CECOM Omnibus Project. He has more than 10 years of contracting experience and has an M.S.A. degree from Central Michigan University, MI.

COMBAT VEHICLE CREW HEAD-MOUNTED DISPLAYS

Next Generation Battlefield Communication and Information Management Systems for Armored Crewmen

By Henry Girolamo

Introduction

Next-generation miniature flat display technologies that will one day deliver visual information to soldiers are under development by many companies throughout America. These miniature displays will be used primarily for projection and head-mounted applications.

Two years ago, the Advanced Research Projects Agency (ARPA) published a high definition Systems Broad Agency Announcement (BAA) requesting proposals from companies with innovative display technologies. The goal was to develop, with industry, inexpensive, high-resolution displays to replace the current cathode ray tubes (CRT) used in almost all display systems.

The new displays would be developed in varying sizes to meet the majority of user requirements. Current displays, CRTs in particular, have many limitations such as expense, weight, and high voltage requirements that prevent them from being used in certain systems such as lightweight systems that could be worn on an individual's head.

ARPA indicated that they were seeking displays that would also have head-mounted applications. These displays would have high resolution, low weight, low power requirements, high brightness, good contrast, fast video refresh rates, low cost, and be easily manufactured.

SIPE

Over the past few years, the Army has shown interest in the potential benefits that these displays could have as part of an integrated information system. In 1988, the need to have a head-mounted, integrated battlefield communication and information management system was set forth in the Battlefield Development Plan by the U.S. Army Training and Doctrine Command (TRADOC), Fort Monroe, VA. In 1989, the Army began an Advanced Technology Demonstration—known as the Soldier Integrated Protective Ensemble (SIPE)—which validated the requirement.

The SIPE, which was successfully demonstrated at the U.S. Army Infantry School, Fort Benning, GA, in December 1992, includes a CRT-based integrated head-mounted display (HMD) system that provides full communication and information management capabilities. The system enhances performance in such areas as target recognition, weapon sighting, fire control and engagement, and reconnaissance. The man-portable computer (soldier's computer) governed the transmission of alphanumeric and graphical data, global positioning information, and assisted in decision making.

SIPE was the beginning of a new systematic approach to utilizing miniaturized electronics to enhance command, control, communication, lethality, and survivability on the battlefield. The next HMD system that will be developed for the dismounted soldier will employ newer, lightweight, high-resolution displays.

Dual-Use Technologies

The ARPA mission has historically been to focus new technologies on DOD applications. In later years, these technologies would enter the commercial markets for consumer applications. Under the new administration, however, the ARPA mission

is now emphasizing applications that meet dual-use criteria—DOD and commercial applications.

The ARPA High Definition (Display) Systems Program has provided the opportunity for the Army to leverage the research and development of these technologies. Interactions with ARPA have provided an opportunity to communicate the Army's need for high definition, small flat-panel display technologies that can be integrated into tactical military head-mounted displays (HMD).

A Joint Service Working Group (Army, Navy, Air Force and NASA) meeting was held at ARPA in the fall of 1991 to evaluate specific system and display requirements of joint service programs and to assess which display technologies would address their program goals and objectives. The objectives were to compare specific small display requirements and specific system requirements for commonality.

Combat Vehicle Crew Displays

In November 1991, ARPA established a $15 million HMD Program that involves the systems integration of miniature display technologies into a prototype HMD for combat vehicle crews (CVC). The U.S. Army Natick Research, Development and Engineering Center, along with many other Army agencies, and Honeywell Corporation, selected as the systems integrator, began the system development program in August 1992 to design a new head-mounted display. This HMD will incorporate two high- resolution, flat-panel display technologies, a graphics processor, computer interface, and a new optical configuration. The program, known as the Combat Vehicle Crew Head-Mounted Display (CVC HMD), will be demonstrated in the fall of FY94 as a fully functional brassboard HMD.

The flat-panel display technologies are being developed by Kopin Corporation, David Sarnoff Research Center, Planar Systems, and Standish Industries, a consortium working under a contract funded separately by ARPA.

The goals of the CVC HMD Program are specifically to demonstrate a next-generation, high definition, head-mounted display for tank and armored vehicle applications. This will be accomplished through the integration of emerging technologies (i.e. 1-inch monochrome active matrix electroluminescent (AMEL) and active matrix liquid crystal displays (AMLCD) with 1280 x 1040 pixel resolution, advanced optical configuration, and graphics and image processing) into a prototype helmet-independent binocular goggle with a 40-degree field of view.

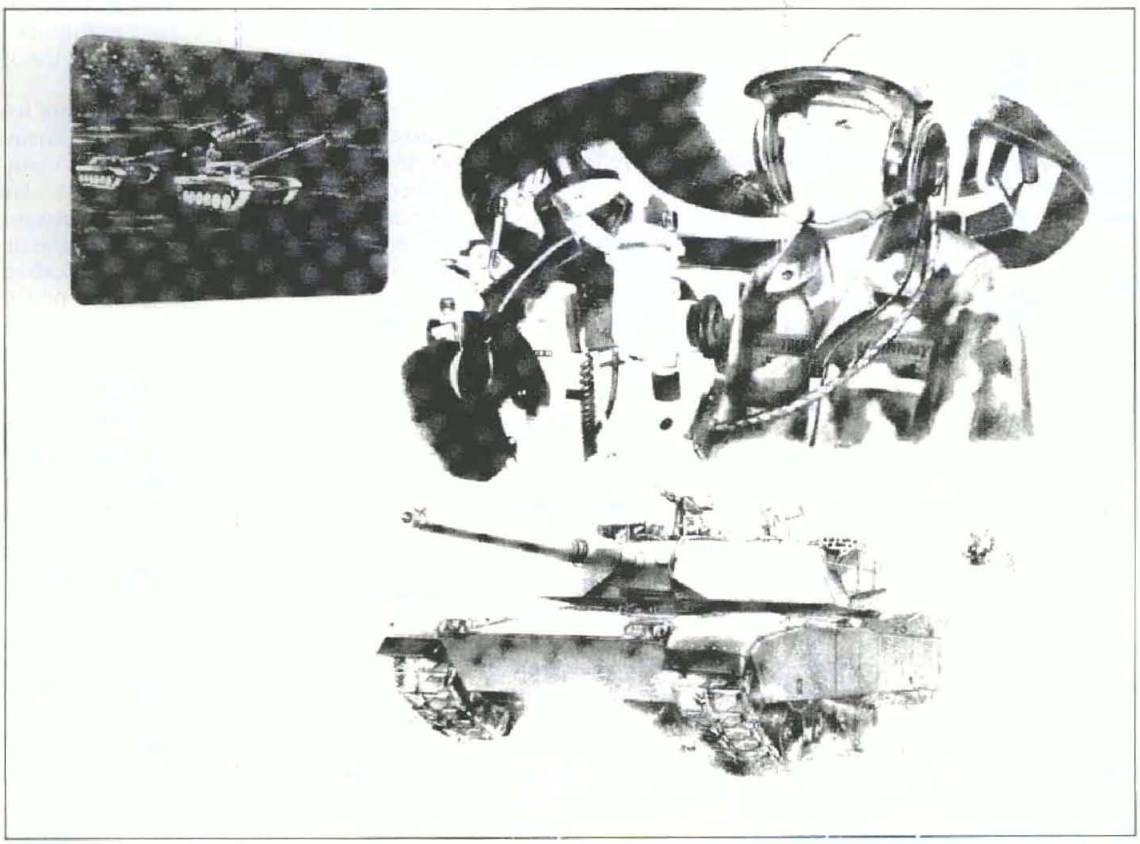
The binocular goggle was a configuration suggested by ARPA as having application to several users. However, the configuration of the system can be changed to meet precise user requirements. The binocular goggle will be developed in the frame of the sun, dust and wind goggles currently in use by the combat vehicle crewman.

The CVC HMD is expected to provide the tank commander with heads-up, eyes-out capability by displaying tactical information in a see-through HMD.

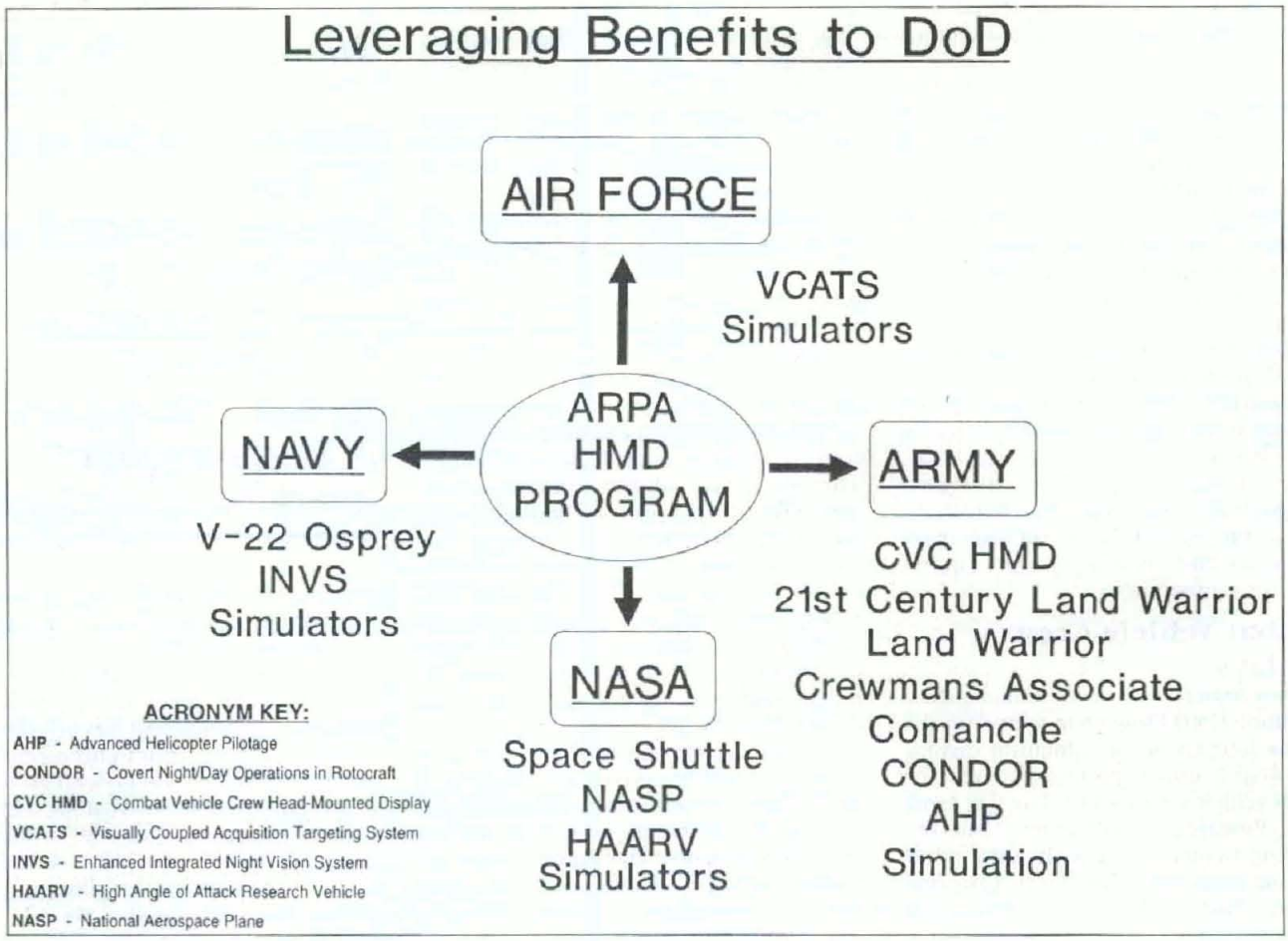
The Combat Vehicle Crew Head-Mounted Display is expected to provide the tank commander with heads-up, eyes-out capability by displaying tactical information in a see-through head-mounted display.

The program has been closely coordinated with the Directorate of Combat Developments at Fort Knox and was briefed to MG Thomas C. Foley prior to his recent retirement as commanding general of the U.S. Army Armor Center (USAARMC). MG Paul E. Funk, the current USAARMC commander was recently briefed on the CVC HMD Program. He recognized the potential performance enhancement that the CVC HMD would give the tank crew.

To take advantage of the ARPA-funded



The Combat Vehicle Crew Head-Mounted Display (CVC HMD)



research and development, and to take the program beyond the ARPA demonstration, MG Funk suggested a mounted crewman version of the Infantry School's program known as The Enhanced Integrated Soldier System (Land Warrior). He recommended a parallel approach to the Land Warrior Program to establish formal lines of communication, and to share information of common interest with regard to HMDs.

Display Issues and Human Factors

Beyond the technological challenge of integrating new display technology, the CVC HMD Program must consider the soldier's ability to perform tasks with the new equipment. Prior to a program being accepted, a proof-of-principal task must be completed. Issues such as display formatting, simulation with displayed information, and many human factors questions must be addressed. This can be done at the National Training Center with robust prototypes. It could be as late as FY95 when this effort is accomplished.

Another approach is to get the HMDs into the Simulation Laboratory at the Armor Center. A high caliber simulation effort at Fort Knox that explores display formatting and human factors issues would satisfy the proof-of-principal requirements. The displays would be based on the M1A2 simulators with the new (IVIS) as necessary, based on the study and mission scenario. M1A2 simulators with the new (IVIS) tactical displays are installed in the Fort Knox SIMNET facility. This is the most viable approach.

Present plans call for first-generation displays with 640 x 480 pixel resolution to be integrated into a preliminary prototype HMD system. This will provide the opportunity to begin the simulation study. It will also give engineers and system designers the chance to resolve potential challenges that may be encountered with integration of the new display technologies.

As the CVC HMD Program progresses through its second and final year, this technology demonstration of a next generation HMD system will provide evolutionary and revolutionary technology to enhance combat vehicle crew command, control, communications, lethality and survivability on the battlefield.

The CVC HMD Program met with considerable enthusiasm at the U.S. Army Armor Conference in May 1993 at Fort Knox. Generals and other officers, particularly tank commanders, showed special interest and overall support for the CVC HMD. They were impressed that the program is well coordinated with all relevant Army agencies. Notable credit has been given for having the foresight to begin the framework for a program focused on the Armor community so early in the R&D stages. Most felt strongly about it being a "force multiplier" capable of enhancing the performance of the armor crewman.

The CVC HMD program is not only focused on next-generation HMDs for Army combat vehicles, but it also supports many other DOD HMD programs. NASA, Air Force, Navy and Army aviators are currently developing HMDs that can accommodate the new displays, optics, computer interface and graphics processor being developed in the program.

HENRY GIROLAMO is employed as an operations research systems analyst in the Individual Protection Directorate's Systems Analysis Division at the U.S. Army Natick RD&E Center. He has a B.S. degree in business administration from the University of Massachusetts. Prior to joining Natick, he was employed for 16 years in the microelectronics and optics industry. He is currently the chairman of the ARPA Joint Services Working Group for Head-Mounted Displays and the CVC HMD program manager.

THE IMPORTANCE OF SOFTWARE SUPPORT TO ARMY READINESS

By COL James Piersall

Introduction

The future Army will be more dependant than ever on software controlled, high technology systems to accomplish its mission. As the Army shrinks the size of its fighting force, the remaining soldiers must acquire more capability. On the battlefield, software will control modern technology systems to provide the force multiplier the Army needs to field an effective, smaller force.

While software is widespread today, in the future it will be found everywhere, in weapon systems, command and control systems, communication systems, information collection and denial systems and with the individual soldier. The software embedded in these systems enhances the performance of the system and provides an additional capability of more rapid adaptation to new threats than could be achieved with an all hardware system. In order to remain effective, the software must be maintained throughout the life cycle of the system it controls.

The Army Materiel Command is responsible for life cycle software engineering (LCSE) on 357 systems. With no further growth in the number of systems supported, unlikely at best, the current software in these 357 systems (52 million lines of code) will cost the Army up to $35 billion over the life of these systems.

The Software Engineering Directorate (SED) at the Communications-Electronics Command's (CECOM) RD&E Center, Fort Monmouth, NJ, is the largest LCSE Center in the Army Materiel Command. It is responsible for LCSE on 227 mission-critical systems, supporting 55 customers. The center estimates that 30 percent of software costs are incurred during initial development and the other 70 percent occur during Post Deployment Software Support (PDSS), or about $24.5 billion based on the $35 billion estimate above. The magnitude of PDSS cost warrants serious attention.

Software Use

Why do we use software if it is so expensive? One reason is that our new technology requires software to control it. Using software to control the system instead of designing a hardware-only system reduces development cost and time prior to fielding and makes it easier for the Army to respond to changes in threat, doctrine, mission and interoperability needs in an effective manner.

While software appears to be expensive, it can usually be modified faster and at less cost than hardware, making it relatively inexpensive compared to hardware alternatives. The flexibility of the software control enhances a system's warfighting capability. An example is the PATRIOT system which was originally designed to engage only aircraft but, with a software enhancement, can also engage tactical ballistic missiles. That is a much more cost effective solution than fielding a second system to engage missiles.

Better Code

Now, it might be argued that we could take steps to eliminate these PDSS costs through better software management during the development phase of the system. Why not write the initial software better, exhaustively test it, then field it and forget it? After all, hardware may wear out or break but software doesn't! Let's look at these possibilities. Writing better code during development is a goal of every program manager, contractor and programmer, and we can certainly improve on what we do today. But how much can we improve? If the software isn't perfect then it still must be maintained. There are four major reasons why we cannot develop perfect code:

- user requirements always have a degree of uncertainty associated with them;
- requirements evolve and change during development;
- we can only test for the presence of errors but not for the absence of them; and
- the cost in both dollars and development time before deployment to "make it perfect" make this option unaffordable (Figure 1).

We can reduce the cost of PDSS but we cannot eliminate it because of user need for changes and the efficiency of the process that is used to accommodate that change. While we can improve the efficiency of the process, user needs based on threat, doctrine and interoperability will remain as the biggest cost driver.

While software appears to be expensive, it can usually be modified faster and at less cost than hardware, making it relatively inexpensive compared to hardware alternatives.

Testing

What about more testing? Thorough testing can demonstrate that the system will function properly under identified situations for intended uses of the system. However, once a system is fielded, operators will come up with creative ways to use the system better, ways the developer never thought of and did not try to test. One example of such user ingenuity occurred during Desert Shield/Desert Storm when some units brought STU-IIIs and FAX machines with them and expected to plug into the

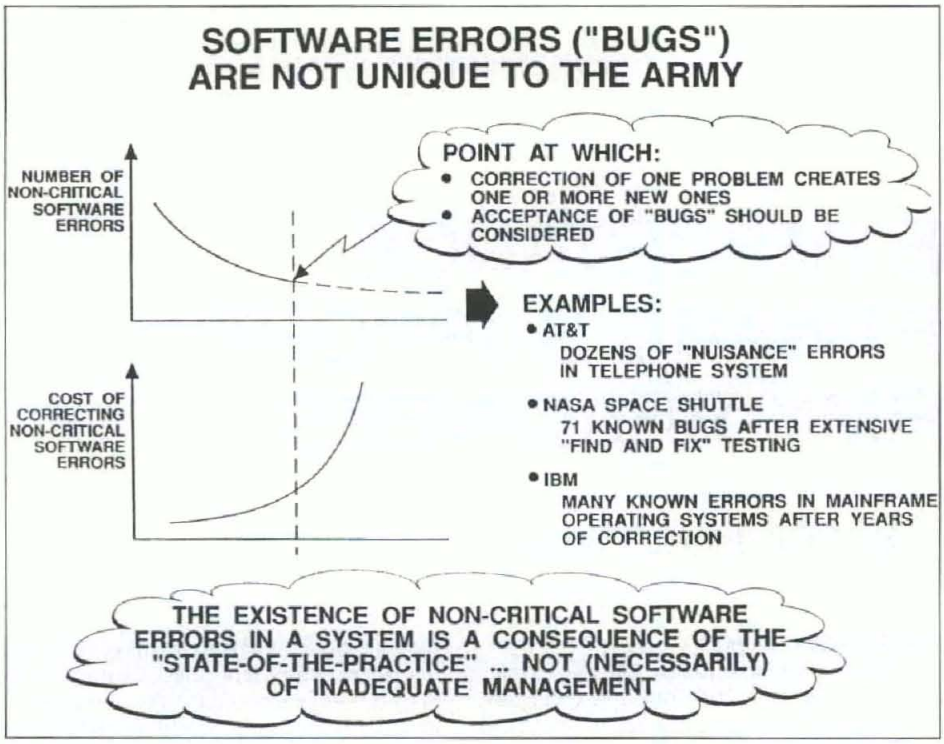


Figure 1.
Source: *Army Executives for Software*, CECOM.

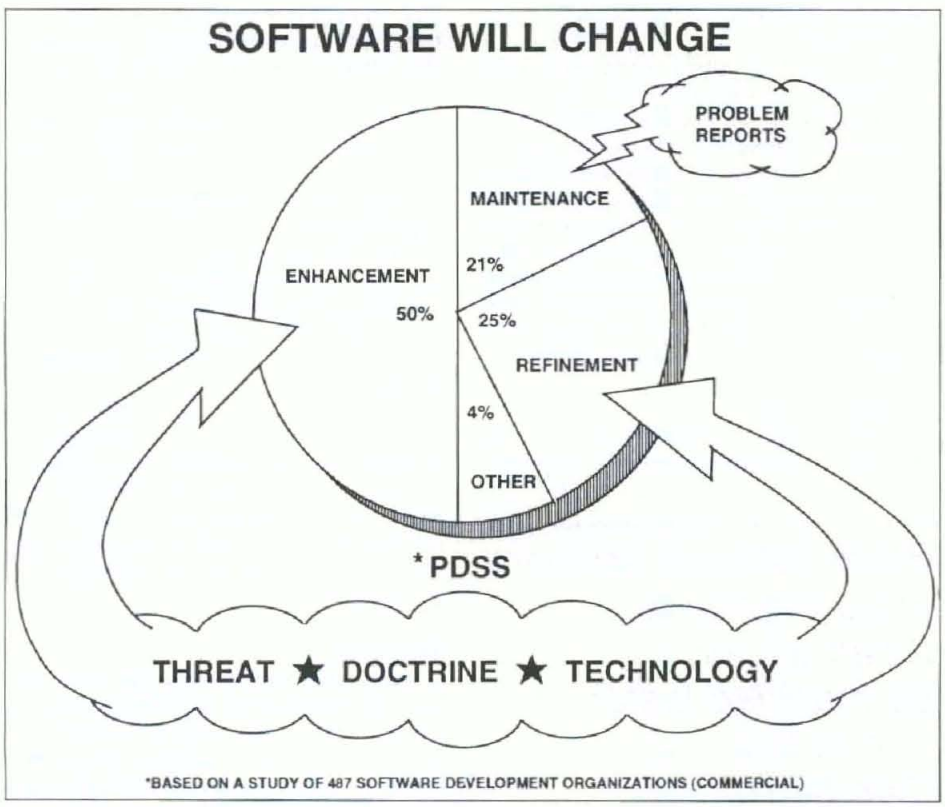


Figure 2

AN/TTC-39A circuit switch or the AN/TYC-39 message switch which were deployed during Desert Shield. STU-IIIs and FAXs were not in the doctrinal use of the switches, however the SED was able to modify the hardware and software so they could be used during Desert Storm.

Can exhaustive testing, i.e., testing all possibilities, solve this problem? For a simple system with 100 yes or no decisions there are 1.3 X 1,030 possible combinations of decisions. There are only 31.5 X 106 seconds in a year. If we were to test one billion decisions each second, it would take 4.1 X 1,013 centuries to run an exhaustive test. Clearly, for a system of any complexity, we must test smartly, not test every possibility.

A technique of user-based testing which runs typical profiles of users or random testing of possible scenerios is better than exhaustive testing. Another method being employed is to field and test an early prototype, build in more capability and field test again (build a little, test a little), so the system evolves with user input as the threat, doctrine and technology evolve.

Affordability

Even if we are able to develop well written code, can we afford to field the system and forget it? While software does not break or wear out like hardware, software degrades because the environment changes. New targets emerge which must be added to the system capability, new uses which were not envisioned at concept phase become critical requirements and new or modified systems are introduced into the battlefield and must be integrated into the total force structure.

Only about 20 percent of PDSS cost is spent to fix errors in delivered software; over 80 percent of the cost supports enhancements and refinements brought about by changes in threat, doctrine and technology (Figure 2). These actions are needed to enable the system to perform its originally intended mission.

System software, like hardware, must be continually upgraded to maintain system effectiveness. PDSS is the evolutionary development of system software required to bring system effectiveness back to its original level. Without the 80 percent of PDSS which supports enhancements and refinements, system effectiveness will deteriorate after deployment in response to the evolving change in threat, doctrine and technology. Each new release restores system effectiveness to the original or higher level (Figure 3).

The Future

What does the future look like? Army systems will become more complex and require more software control, adding to the amount of software that must be maintained. Systems will be kept longer and will be required to perform more functions so

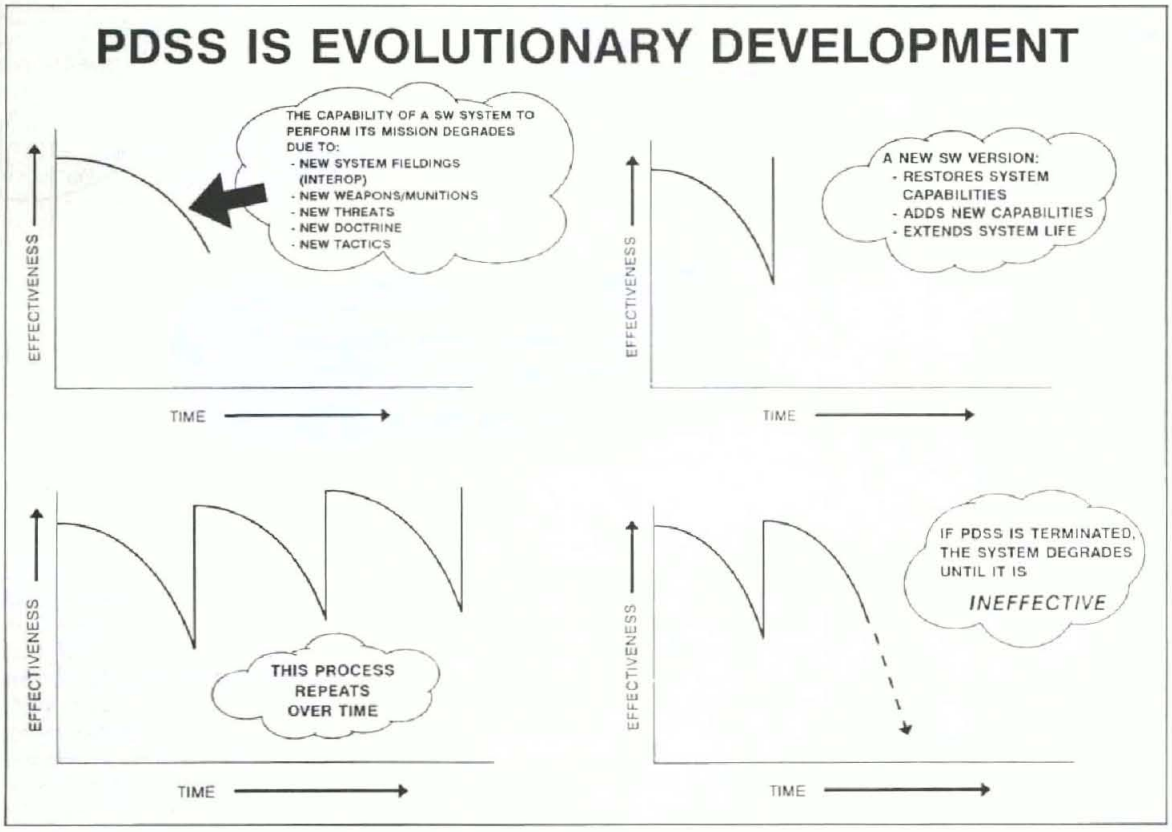


Figure 3.

they will need more PDSS to maintain their effectiveness. If a system and its software are useful, the software gets changed and survives beyond the life of the hardware platform. Systems withdrawn from active units may be reused by reserve and guard units and will need to be maintained. All indications are that the PDSS task will continue to grow in the foreseeable future (Figure 4).

Costs

What can we do about the costs? We must develop efficient, streamlined software development and maintenance processes. We must plan for the future and improve all the facets of life cycle software support. CECOM/SED and the Advanced Research Projects Agency have a joint Software Technology for Adaptable and Reliable Systems (STARS) Program to demonstrate benefits of a megaprogramming paradigm on the Improved Guardrail V systems software which is process driven, supports domain-specific software reuse and is supported by the software engineering environment. The level of maturity of a software process can be measured by

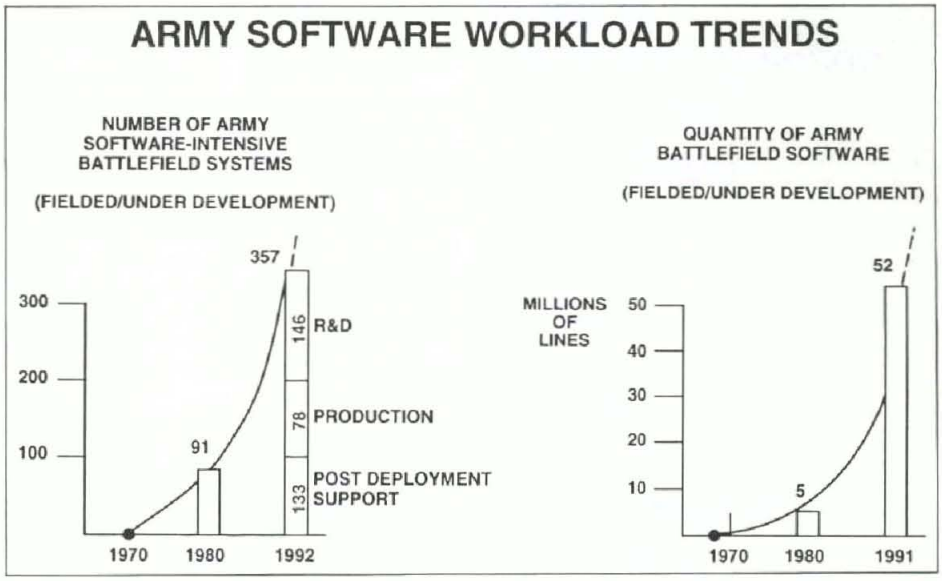


Figure 4.
Source: *Army Executives for Software*, CECOM.

the Assessment Criteria of the Software Engineering Institute, Carnegie Mellon University.

While PDSS implies action taken after a system is fielded, many cost saving steps must be taken early in the life cycle. Basic decisions affecting how software is maintained are made during concept and development phases. Easy access to the software and an inexpensive medium for distributing the enhancements can have a big effect on life cycle costs.

A well thought out concept of operations will allow for software to be written during the concept and development phases. Spare connectors, card slots and memory capacity will facilitate interoperability to new systems as they are fielded and integrated into the U.S. Army or other services, including Allied forces.

When a new version of software is ready for fielding, getting it installed in the system is not always easy. The SED Replication, Distribution Installation and Training (RDIT) Group is developing a program to standardize RDIT functions community-wide. This program will provide a corporate memory to avoid repeating costly mistakes in location of software, type of distribution and installation media, tracking of software versions and delta training to keep operators up to date.

Most of the software maintenance cost is spent defining, designing and testing the change; once this is done for a system, there is very little difference whether there is one unit or hundreds of units in the field.

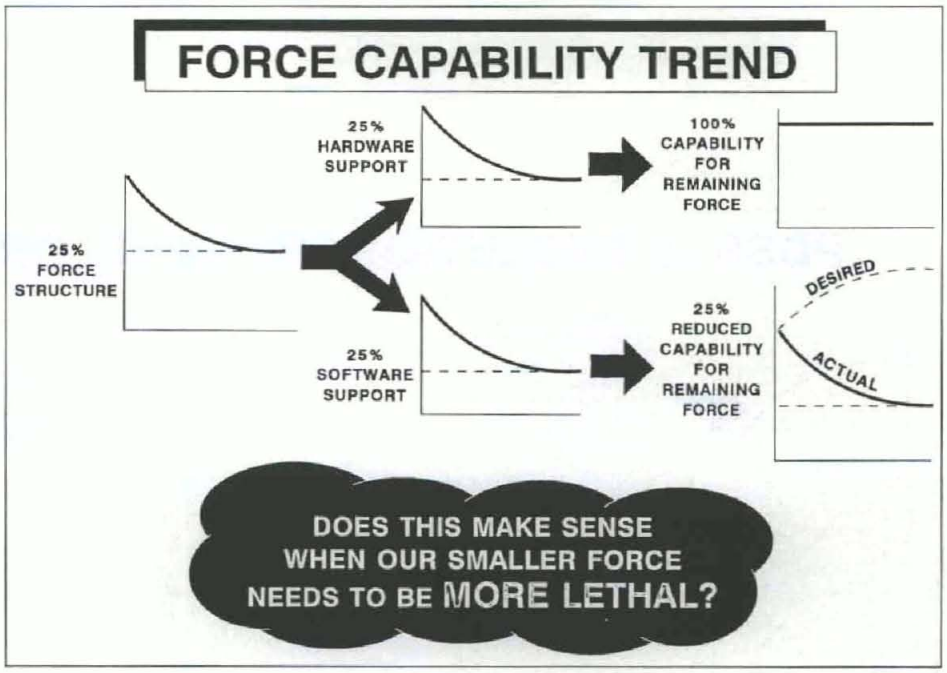


Figure 5.

Continued funding is vital. PDSS is labor intensive and both the Army and its contractors must plan their workforce tasking. Failure to provide stable funding causes projects to be delayed and critical trained personnel to be reassigned to other projects, having dire consequences if additional funding is added late in the fiscal year.

The costs of software maintenance are different from hardware maintenance. Hardware maintenance costs decrease as the number of supported units decreases since the need for spares, storage and installation teams decreases.

Most of the software maintenance cost is spent defining, designing and testing the change; once this is done for a system, there is very little difference whether there is one unit or hundreds of units in the field. The software cost will continue until the system is eliminated from the inventory. A reduction in force structure can be matched by a reduction in hardware support and still leave a capable force, but a similar reduction in software support will reduce rather than enhance the remaining force (Figure 5).

In addition to labor costs, the SED must have access to and maintain hardware systems on which to develop and test software modifications, system simulators and a worldwide communications network. Funding the up-front costs to develop a software process and the hardware infrastructure to support PDSS is likely to result in a cost avoidance in a few years.

What about the $35 billion cost to maintain current software over the system life? SED estimates that PDSS is approximately 4 percent of the yearly operations and support costs of a system and over the system life PDSS cost is less than 20 percent of the total acquisition cost. When this is spread over a system life of 20 years it is less than 1 percent per year; in FY92, $65.5 million was spent on PDSS for 56 CECOM systems with an acquisition cost of $7.13 billion. The acquisition cost to develop the system hardware and initial software is already spent (a sunk cost). PDSS protects this investment. Consider PDSS to be like the maintenance of roads: it involves not just filling potholes and repaving (correction of faults) but it also means removing hazards, adding lanes and building new roads to provide additional capability in response to changes in population, our use of transportation modes and the technology of the automobile itself.

COL JAMES PIERSALL is a reserve officer assigned to the Concurrent Engineering Division in the Office of the Deputy Chief of Staff for Research, Development and Engineering in the Army Materiel Command. He holds a bachelor's degree in engineering from Yale University and a master's degree in electrical engineering from the University of Maryland at College Park. In his civilian assignment, Piersall is a program manager of the Weapons Signals Management Team of the National Security Agency, Fort Meade, MD.

CONFEREES DISCUSS AAC PERSONNEL POLICIES

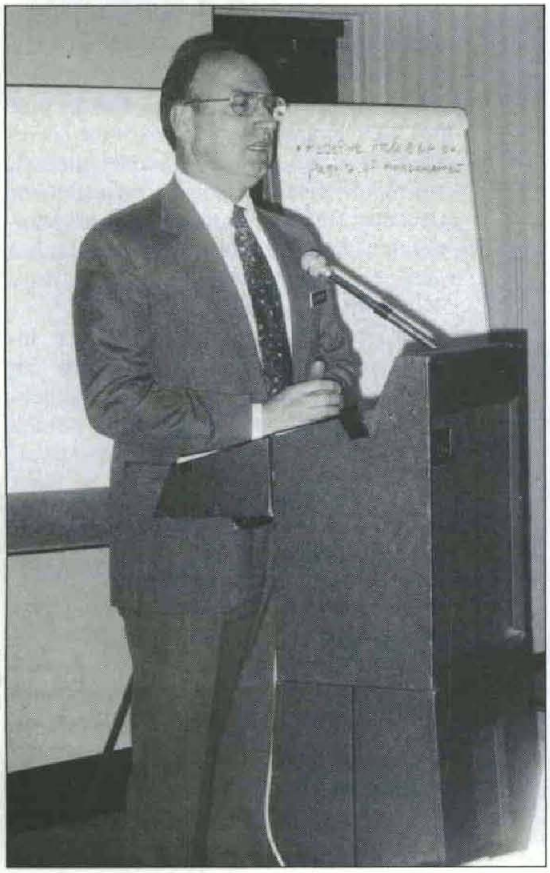
More than 100 conferees, including Department of the Army personnel classification and staffing specialists, and other personnel and functional specialists attended an Army Acquisition Corps (AAC) Civilian Personnel Acquisition Career Management workshop Nov. 8-10, 1993, in Fairfax, VA. Hosted by the director of acquisition career management and the director of officer personnel management, U.S. Total Army Personnel Command (PERSCOM), the three-day workshop was designed to allow grass-roots participation in shaping and streamlining the implementation of personnel policies applicable to civilian AAC members.

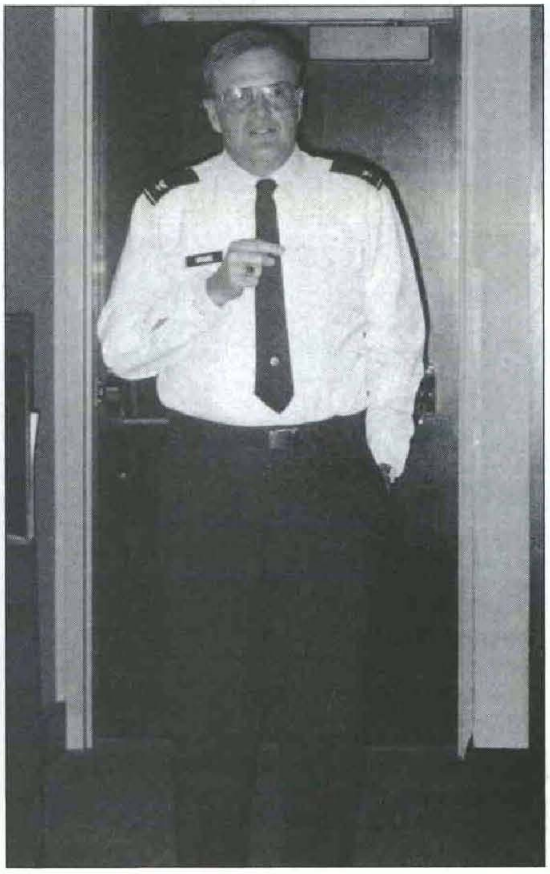
Daniel Clawson, chief of the Army Acquisition Corps Management Office, PERSCOM and Dr. Janet Brown, chief, Civilian Acquisition Management Branch (CAMB), PERSCOM, welcomed the attendees and outlined the objectives of the conference. Several other presentations and workshops followed.

Director of Officer Personnel Management, PERSCOM, BG Frederick G. Wong provided the keynote address on the grass roots approach to policy.

A discussion of the functional and civilian personnel office partnership—a team approach was given by George Jones, deputy chief of staff for personnel, Army Materiel Command (AMC), Brooks Bartholow, chief of the AMC Acquisition Corps Office and Robert E. Becker, chief of central programs, Civilian Personnel Management Directorate, PERSCOM.

COL Richard A. Grube, director of AAC policy, spoke on the status and vision of the AAC. Mike Patterson and Martha Stanley, both personnel management specialists from CAMB, described the Central Referral System. LTC Brin Tolliffe, project officer, Army Acquisition Workforce Management Information System (AAWMIS) Project Office, discussed the interface between AAWMIS and the Field Army Civilian Personnel System (ACPERS). LTG William H. Forster, military deputy to the assistant secretary of the Army (research, development and acquisition), was guest speaker for the dinner on the first day. His topic was modernization vision.

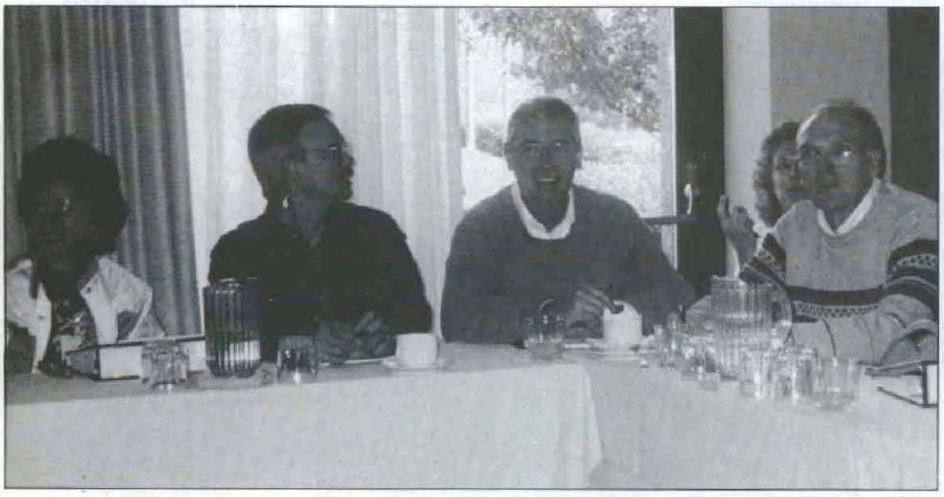




On the left is Daniel Clawson, chief of the Army Acquisition Corps Management Office. On the right is COL Richard A. Grube, director of Army Acquisition Corps policy.

Panelists addressed particularly challenging issues related to Army Acquisition Corps membership.

Chuck Caloia, personnel management specialist, Civilian Acquisition Management Branch, PERSCOM, discussed Army Acquisition Corps management.



Several workshops were convened during the conference.

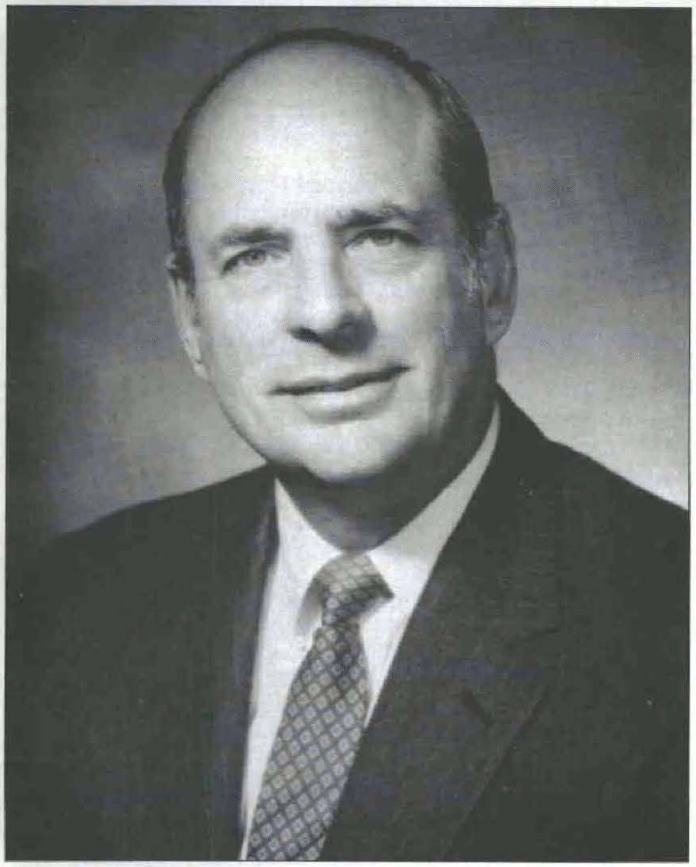
Day two included a panel discussion of issues particularly challenging to the attendees, such as mobility, rotation, sizing, relocation services and discontinued service. Panelists were COL Grube; Ernie Willcher, attorney advisor in the Army's Office of the General Counsel; Daniel Clawson; Lee Bevins, project manager for Army relocation services for employees; and Mark Ellicot and Mary Dakis, both personnel management specialists with the Field Operations Division of the Career Personnel Management Directorate, PERSCOM.

Following the panel, Cathie Kasch, program manager, staffing, Office of the Secretary of Defense (Personnel and Readiness), and Marge Luck, personnel management specialist, Defense Civilian Personnel Management Service, addressed assignment rights, reduction-in-force and the priority placement program.

The final day of the conference included the following presentations: an impromptu speech by Willcher on competitive levels; AAC membership, by Chuck Caloia, personnel management specialist, CAMB; strategies for the future by Janet Brown; and closing remarks by Grube and Clawson.

Several times throughout the conference, the attendees broke into smaller groups for workshops on the following topics: the Central Referral System, AAWMIS and ACPERS, reduction-in-force, and issues related to AAC membership. Following each workshop, group facilitators reported findings to conference participants.

Feedback provided by conference attendees will be used in planning a higher-level meeting slated for the spring of 1994.



Norman R. Augustine

NEEDED: PROCUREMENT "PERESTROIKA"

By Norman R. Augustine
Chairman and Chief Executive Officer
Martin Marietta Corporation

With the end of the Cold War, the nation has embarked on a path that will, over the next few years, scale back our defense posture even further, reducing the size of our Army to the point where it will be the ninth largest in the world. The budgetary reductions that have already taken place have had a substantial impact on the defense industry. The overall Department of Defense budget has been reduced by some 32 percent in real terms from the peak in the mid-1980s. But that part of the defense budget that underwrites equipping our military forces and has formed the underpinnings of the defense industry—the procurement budget—has been reduced by 64 percent . . . *so far.*

Current plans call for the defense budget to decline to 3.2 percent of GDP in 1998, half of what it was in the mid-'80s, and the lowest level since immediately prior to Pearl Harbor. Of course, these reductions are not news to readers of these pages. But there may not be wide understanding of the difficulties that the rapidly declining U.S. military procurement budgets are causing for the defense industrial base as well as for the military forces themselves.

Compounding the problem is the fact that the most recent round in the periodic efforts to "reform" the military procurement system—with the ill-advised "fixed price" contracts in the 1980s for risky research-and-development work—resulted in nearly $6 billion of losses in the defense industry during a recent four-year period. Too often, the winner of the competitive bidding process "won" only the right to lose money.

As a result of these factors, the financial health of the defense industry has deteriorated significantly. As a businessperson, I am concerned over the fact that aerospace companies, a prominent element of the defense industry, today sell at a 61 percent discount to the market average, based on price-to-earnings multiples.

As an American, I am even more concerned about the threat to national security represented by the dismantling of the U.S. military and the defense industrial base which supports it. I believe we are in the process of creating a "hollow industrial base," casting off many of the technological and manufacturing resources that enabled the U.S. to triumph in the Cold War and to do so with minimal casualties. My fear is that, once dissipated, this resource—which I have often referred to as the "fifth armed force"—will be impossible to reconstruct.

However, it is not my role here to argue whether we're cutting too much from defense. Given the realities of today's budget situation, we all have a responsibility to "get the most bang for the buck" from the limited funds still available—and that brings me to the issue of procurement reform.

I must acknowledge at this point that I am writing from the perspective of one who works for a company that derives a considerable share of its income from defense-related contracts. But I also spent a decade in five different assignments in the Pentagon under three different presidents during two different tours of duty. Having seen the procurement process from both sides, I can say with authority that somehow it works; after all, America's military hardware is sought by virtually every nation in the world. But it does not work nearly as well as it should. And in light of today's grim budget forecasts, it does not work anywhere near as well as it must.

A succession of commissions and study teams over the last several decades has attempted to make the system more efficient while delivering the quality products our armed forces need. Those efforts, it is generally agreed, have had less than satisfactory results overall. One outcome in the past few years has been the passage of a considerable body of laws and regulations that unfortunately

have become part of the problem rather than part of the solution. As one high-level officer recently noted, "The fact that military procurement provides steady work for more than 25,000 auditors is compelling evidence [that] the acquisition process... is badly broken."

What should be done? I believe the defense procurement process needs a number of distinct changes, including:

• *Halt turbulence in the acquisition process.* The principal cause of inefficiency in the acquisition process is not the infamous coffee pot, hammer or even toilet seat; it is the perpetual motion of requirements, people, schedules, funding, and the like. The time has come to appropriate funds by the *project,* not by the *year.* The current process is akin to going to a home builder and directing, "Build me a year's worth of house..." and then promising to return a year later with further instructions. What is needed is common agreement on implementing several needed reforms, including: making it more difficult to start new programs; giving very few people the authority to change a program once started; reducing the size of staff organizations in Congress, the Pentagon and industry; setting nominal "zero real growth" overall funding baselines for initial out-year planning; and establishing multi-year budgets for the Pentagon and its programs.

• *Dismantle the "military specifications" framework.* All defense contractors complain about the overwritten, overregulated set of standards that governs the purchase of even the most mundane pieces of equipment. But the problem extends to the entire procurement system, encompassing accounting standards, hiring and personnel practices, supplier relations, and so on. Making contractors the "pack horse" for an endless array of non-defense-related initiatives has saddled taxpayers with an enormous burden of excess costs and brought the system to the brink of breakdown. What is needed is to set goals for getting the job done, then give contractors the freedom to reach those goals in the most efficient, cost-effective manner possible. Contractors would be free to use "agile manufacturing" practices, taking advantage of economies of scale, evolving technological advances, and common production lines.

• *Embrace "best value" procurement.* The current "lowest bidder" approach (generally applied by procurement officials) of buying products for the Department of Defense ignores the basic criteria all of us as prudent shoppers use in our everyday lives. We often reject the lowest cost item in favor of products that feature better quality, offer more advanced technology, we've used successfully in the past, or represent a lower lifetime cost of ownership. If this were not true, Yugos would lead the U.S. automobile market and Mercedes Benzs would be non-existent. Acquisition officers should have the ability to make similar trade-offs in evaluating the array of bids for military business. They should have the authority to weigh past supplier performance, promise of greater quality, and overall long-term costs and not primarily initial bid prices.

• *Increase threshold for simplified acquisition.* Many initiatives already have proposed increasing the simplified acquisition threshold from $25,000 to $100,000. I endorse this change and I also support a permanent, government-wide increase in the TINA ("Truth in Negotiation Act") threshold to as least $500,000. Despite the suggestion in some quarters that such an increase would encourage malfeasance, actual experience in the private sector suggests that buyers handle contracts many times greater than these amounts entirely ethically. Knowing the professionalism and commitment of the vast majority of military procurement officers, I am confident this one change would greatly increase the efficiency of the procurement process.

• *Apply "TQM" principles to the procurement process.* Many private sector manufacturers have realized significant cost reductions and quality improvements by applying "total quality management" to their processes. At each step of the procurement process, senior Pentagon officials should ask themselves, "Why do we do that?" If sound reasons cannot be identified, the process should be changed to alter or eliminate questionable steps. For just one of many examples, we should encourage contractors to "build in" reliability and performance up front, rather than rely on sometimes-punitive warranties that come into play at end of the process. In other words, the "carrot" approach should replace the current "stick" approach.

• *Change rights and data policies.* The confiscatory mindset of current procurement policies regarding the use of proprietary technologies has had a chilling effect on joint industry-government projects, restricting the flow of technological advances to the military. While everyone agrees that industry should not profit at the government's expense, by the same token contractors should not suffer because of a desire to improve a military procurement project with their own proprietary processes. As with any contract, there should be more leeway for even-handed negotiation in the industry-government procurement process.

• *Decriminalize program risk.* It is one thing to personally profit from government program wrongdoing; it is another thing entirely to make a legitimate error in judgment in assessing the risk of a particular program. As long as America's military establishment seeks to lead the world in defense technologies, there will be stumbles and falls. The current laws and procedures are so punitive as to endanger technological innovation. No high-tech endeavor is without risk; the loss of space-craft and astronauts over the 30-year history of the space program is ample evidence of that. Yet we continue to send people and satellites into space because the rewards are so great. We must make the same acknowledgment of risk in military procurement as we do for space, building in reserves for uncertainties and unprogrammed events that occur during the R&D phase of major system procurements.

• *Finally, change the procurement culture.* As we all know, this is the most radical and difficult change of all, for it means turning upside-down the comfortableness of "business as usual." The suggestion that a procurement system should be driven by an entrepreneurial, goal-oriented process instead of today's risk-averse status quo is accepted by many; however, actually implementing such a wholesale change will be very difficult. And yet, private industry, responding to the demands of the marketplace, has been engaged in such changes for the better part of a decade. Even in civilian government, unprecedented changes are under way, as evidenced by Vice President Gore's National Performance Review. As part of the effort to change the procurement culture, we need to make sure that government policies are structured to assure that key decision-makers are thoroughly qualified; we need to pay our public servants competitive salaries, afford them the prestige they deserve, provide for their training and professional development, and grant them the latitude to manage and succeed.

The fact that program reform has been so elusive up to this point is an indication of how difficult progress can be. There is plenty of responsibility for the false starts of the past—by industry for its eternal promises of unrealistically low costs; the Department of Defense for its commonplace inability to steer a steady course; Congress for its micromanagement; the media for its unbalanced reporting on defense matters; and even the public for its illiteracy in defense issues. In short, some good old-fashioned management is needed: *setting realistic goals, putting capable people in charge, and letting them do their jobs.* That, in just 14 words, is what is needed to "fix" the acquisition process.

At a time when "Perestroika"—the Russian word for fundamental economic and political reform—is sweeping through the countries of the former Soviet Union, it is time to enact our own, much more limited, but still much needed, form of Perestroika. It is my firm conviction that we can, in fact, introduce reforms which will improve the procurement process and, by so doing, best serve our nation.

REINVENTING DEFENSE ACQUISITION

By George T. Singley III
Deputy Assistant Secretary
for Research and Technology
and Chief Scientist

Reinventing government... National Performance Review... Defense Acquisition Workforce Improvement Act... Goldwater-Nichols Act... Packard Commission... Grace Commission... Fly Before You Buy... Military Industrial Complex. Defense acquisition has certainly not suffered from a lack of critics, initiatives, studies or reform efforts over the years; however, we find ourselves today experiencing world-wide revolution in technology, business and geo-political alliances. The acquisition system that provided the world's best technology and most modern Army must be constantly improved if we are to retain the voters' trust and support to remain the world's lone military superpower.

Funding for Army research, development and acquisition (RDA) has declined more than 30 percent since the Berlin Wall came down and will soon be only one-third of the total Army RDA funding in 1985. Since Desert Storm, approximately 250,000 active military and 60,000 Army civilian positions have been eliminated. We are also experiencing the greatest change in the Defense industry since the end of World War II, almost a half century ago. The global geo-political, economic, military and technology changes and pace of change are unprecedented. As Professor Thurow of M.I.T. states in his recent book *Head to Head,* we emerged from World War II as one of two military superpowers but the lone economic superpower. Today we are the lone military superpower but are in competition with two other economic superpowers: European Economic Community and Japan. In their recent book *War and Antiwar,* Alvin and Heidi Toffler observe that we left the post-industrial revolution and entered the third wave, or knowledge-based, revolution three decades ago in this country. Economic and military success in this new world require: agility; flexibility; a superior, technologically literate work force; enlightened leadership; and a superior, modern infrastructure.

Defense acquisition must change soon if we are to shape our future and conserve our dwindling resources instead of becoming merely a student of the fundamental changes to our defense acquisition system. Our industrial partners are downsizing, diversifying and leaving the business to survive and honor their obligations to stockholders. Science and technology are advancing also at an unprecedented pace. Technologies such as microelectronics, telecommunications, materials, and biotechnology critical to our land warfare supremacy are turning over as often as two years. We can no longer expect the Cold War acquisition system—which was designed for new major weapon system development and is characterized by a 15-20 year cycle from concept to mass production to fielding—to meet tomorrow's requirement for lean production, continuous improvement via technology insertion, dual-use technology, and exploitation of commercial technologies, standards, procedures and products.

If implemented, the following list of actions by the Congress and Department of Defense will fundamentally change Defense acquisition to better serve the soldier, business and the taxpayer:

1. Become a "world-class customer," make acquisition affordable and reduce development cycle time by restoring trust and practicing risk management, rather than risk aversion.
2. Require the Integrated Product and Process Development (IPPD) approach to acquisition.
3. Benchmark and vigorously adopt best business practices, products, processes and standards while eliminating non-essential military standards.
4. Exploit advanced distributed simulation for higher quality, lower cost, more timely concepts, trade-offs, requirements, development, testing, training and mission rehearsal/planning.
5. Obtain better, more timely customer requirements by integrated decision teams comprised of the warfighter, technologist, acquirer and industry through Louisiana Maneuvers, TRADOC Battle Labs and Advanced Technology Demonstrations.
6. Reduce acquisition cycle time for most programs by adopting the two-step development process recommended by the 1993 Army Science Board Summer Study on Innovative Acquisition Strategies.
7. Procure price-based, best value vice lowest cost; thereby reducing cycle time, avoiding two separate (government and commercial) accounting systems and reducing final cost to the taxpayer.
8. Shift from a mass production assumption to lean, agile and flexible manufacturing commensurate with smaller production orders and the need for continuous improvement.
9. Streamline the Defense acquisition infrastructure; thereby allowing a commensurate industry infrastructure and overhead savings, improving the affordability and timeliness of defense weapon systems.
10. Accelerate laboratory and Research and Development Center quality and relevance improvements including: Project Reliance; focusing on core competencies; focusing on Army critical priorities and objectives stated in the Army Science and Technology Master Plan; and empowering management with the policies, practices, procedures and authorities enjoyed by the Department of Commerce's National Institute of Standards and Technology.

What Would You Like to See Done to Reform the Army's Acquisition Process?

Gary Tull
Deputy Chief of Staff for Acquisition
Headquarters, U.S. Army Materiel Command
Alexandria, VA

In this era of rapid change, "business as usual" and "school solutions" don't work. I'm convinced that each member of the acquisition community is a potential innovator. Open communication gives everyone the opportunity to make important and lasting contributions to the Army acquisition process.

Acquisition reform is replete with streamlining efforts, proposed changes and initiatives, but ironically, we still have not locked onto a vision or have an end state. I believe we generally know what needs to be done, but I'm not so sure that the total acquisition community has gotten the word. To succeed in our efforts, we need to cement in place firm cultural changes whereby process improvements are communicated at all levels.

In the past 18 months, the Army has spread this message through its Acquisition Improvement Seminars, known as "Roadshows." Through them our senior acquisition managers have conducted over 1,500 in-depth discussions and seminars with executives and mid-level managers emphasizing principles to streamline the process.

Some of the key initiatives we are trying to communicate are:

• **Increase Use of Non-military Specifications and Standards.** A Process Action Team (PAT) was established to reduce reliance on military specifications and standards. The PAT is focusing on six vital areas; training, automation, major system acquisition, sustainment, management and the processes supporting the development and revision of military specifications and standards. This effort is directed at understanding the objectives and requirements that drive the process, so that a viable solution that *isn't* dependent on military specifications and standards can be developed.

• **Best Value Contracting.** This concept assesses proposal differences *other than price* and is gaining widespread acceptance throughout the government. With the call for acquisition reform, Best Value Contracting offers an opportunity to get the best possible product for our money, while avoiding allegations of improper or highly subjective award decisions. Best Value Contracting is one of the featured topics of the Roadshow Series.

• **Functional Support Templating.** Provides program and functional managers a *decision making tool* in the face of diminishing resources. These templates cover 22 functional specialties dealing with engineering data and specifications, integrated logistics support and risk management. The templates offer a disciplined approach to identifying costs of functional requirements, possible alternatives and risks associated with each requirement. The templates emphasize the use of contractor flexibility and commercial practices to achieve functional requirements, while achieving cost and scheduling goals.

We need to convince everyone in our community that acquisition reform is everybody's concern. This is the time to seize the opportunity, when the realities of downsizing allow us to implement innovative approaches to modernization and readiness. Everyone involved with acquisition must feel empowered to seek out and implement improvements to our process.

Dr. Lawrence J. Korb
Senior Fellow, Foreign Policy Studies
Director, Center for Public Policy Education
The Brookings Institution
Washington, DC

The purpose of the acquisition process is to procure the weapons that support the national military strategy in the most cost effective manner. Over the past two decades, innumerable and well intentioned commissions and panels have focused on streamlining the process to make it more cost effective. From Fitzburgh to Carlucci to Packard, to the Defense Management Review to the National Performance Review, businessmen, politicians, and bureaucrats have told DOD how to buy more efficiently. But not much has really changed, nor are any significant changes likely to take place in the future, because the American government is not designed to be efficient. Our founding fathers did not trust government and did not design an apparatus that could operate efficiently. For them, efficiency ranked well below such other values as popular control, equity, and the rights of the minority. Moreover, even the marginal changes suggested by these groups and panels usually solve one problem by creating another. Packard's "fly before you buy" concept slowed down the weapons development process so much that it took nearly 20 years for the Army to get the M-1 tank. Similarly, buying off-the-shelf components to speed up the process gave us DIVAD.

But there are two things that can be done to improve the process. First, define more clearly our national military strategy. Second, carry out the acquisition process more honestly.

When a new administration takes office, it needs to spell out our national security policy through a series of presidential directives (PDs). Nine months after taking office, the Clinton administration has still not done that. For example, in late October 1993, PD-13, which defines our relationship with the U.N. and our role in preserving the borders of the republics of the former Soviet Union, still remains in the drafting stage. In fact, when a near final draft of this document was leaked to the press in the summer of 1993, it was repudiated by the President.

Political appointees, military officers, senior civilian servants, and defense industry executives routinely overestimate the capabilities of new weapon systems. When the program is delayed or experiences cost and performance problems, as any new system does, disillusionment sets in among the Congress and the American people. Would it not be better to point out the potential difficulties in advance and recognize that some programs are destined to fail? This tendency to exaggerate came close to derailing the Bradley, the Abrams, and the Apache, and did kill DIVAD!

Being clear about the role of force in the new world order, and being honest about the problems in the procurement process, will be more productive in the long run than setting up another study that tries to streamline the process.

SPEAKING OUT

MAJ Mark Brown
Chief, Army Acquisition Corps Policy
Office of the Deputy Chief of Staff for Personnel
The Pentagon

Clearly, acquisition reform is needed. This does not mean that DOD acquisition systems have not changed over the years. In fact, DOD acquisition systems have constantly been changing all along. The current resultant acquisition process takes too long, is too complicated, and is too expensive to field operationally significant numbers of quality high-tech equipment.

With that opinion stated, there are some very good things about our system that have evolved over time. Many current ways of doing business have resulted from lessons learned the hard way—for reasons we have probably long forgotten. Therefore, while pursuing acquisition reform, we must be careful not to "throw the baby out with the bath water."

After some brainstorming, the following ideas came to mind. I'm not sure if the following proposals would work, or are even smart ways of doing business, but I would like to see them studied for feasibility, costs, and if they make sense, implemented.

- All new legislation and regulation should incorporate "sunset provisions" mandating review and adjustment after a period of time, or that legislation or regulation would expire.
- The small purchase threshold will apparently be raised to $100,000 in the near future. Raise it as high as possible, perhaps to $250,000, so that simplified purchase procedures can be used as often as is prudent in the judgement of the contracting officer.
- Mandate "off the shelf" or modified non-developmental item procurement as the option of first choice. Set the approval level for exceptions to this policy very high, perhaps at the AAE or DAE level.
- Mandate the use of performance specifications with exceptions approved at the AAE level.
- Where performance specs are not adequate, use industry standard specifications, such as SAE or IEEE specifications, with exceptions approved at the AAE level.
- Oversight, audit, and inspection agencies should be consolidated and reduced with unique roles and responsibilities assigned to those remaining. Acquisition organizations spend too much of their time preparing for and responding to the many oversight, audit, and inspection organizations in existence today.
- Mandate a limit to the size and complexity of RFPs and Proposals—perhaps 25 standard-size pages or less, including annexes or appendices.
- Attempt to force those RFPs and proposals into a paperless, "electronic" system.
- Define standards for what constitutes a "frivolous protest" and levy stiff monetary fines for filing protests conforming to those standards.
- Investigate the consolidation of all Army testing, developmental and operational, into a single independent organization, reporting to the AAE, CG, TRADOC or the DCSOPS (focus on meeting the user's requirements).
- Investigate the consolidation of the various similar DOD and service commodity commands into consolidated functional organizations. For example, investigate the consolidation of NAVAIR, Aeronautical Systems Division (USAF), and the aviation piece of ATCOM into one Air Systems Command under the control of the Air Force or DOD. The Naval Sea Systems Command (NAVSEA), of course should be under the control of the Navy. A Land Systems Command similar to TACOM with portions of other AMC MSCs would be under the control of the Army. The Air Force's Electronics Systems Division (ESD), DISA and CECOM could be investigated for consolidation into an Electronic Systems Command.

Obviously the last two proposals would be the most controversial and the most difficult to implement. Those proposals would have to be investigated as part of a strategic reform plan. Numerous combinations could be examined for feasibility. Transitional costs and operational difficulties might offset any potential savings.

However, savings in staff overheads and infrastructure could be significant for some options. Potential pitfalls would be that individual service interests and requirements might be reduced to the lowest common denominator or worse, lost in the shuffle.

Clearly, there is tremendous potential for reform if we are willing to achieve it. Paradigms must be broken and the leadership at all levels must "think outside of the box" of past ways of doing business. We have no choice if maximum output is to be obtained from shrinking resources. The size and scope of most high pay-off reform is so large that significant reform needs to be conducted from a strategic basis, not within a year or two, or we are just nibbling around the margins. I believe there are few "quick fixes" and that acquisition reform must be conducted in a directed evolution format.

LeRoy Haugh
Vice-President of Procurement and Finance
Aerospace Industries Association
Washington, DC

Ever since my first appointment to a procurement policy-making position as the Navy Policy Member on the Armed Services Procurement Regulation (ASPR) Committee a generation ago, I have been an avid proponent of uniform policy and centralized management of the regulatory process. But I want to make clear that I do not advocate uniformity for its own sake, nor do I believe in regulations and procedures so rigid that they preclude the exercise of judgment by contracting officers and other acquisition officials who must apply those regulations. Avoiding either extreme of total chaos or mindless rigidity requires a disciplined system—one which can adapt readily to meet changing requirements in a dynamic acquisition process.

We have unfortunately witnessed both of these extremes in just the last dozen years. The dramatic increase in DOD spending in the early 80s was accompanied by what appeared to be—either by design or by accident—an abdication of OSD responsibility to manage the process. This led rapidly to virtually unchecked initiatives by all the military departments, such as the widespread use of fixed-price research and development contracts and the use of literally thousands of unapproved special clauses and contract provisions. With equal speed and unchecked enthusiasm, Congress also reacted to what it saw as abuses, by "micromanaging" the process through successively more burdensome legislative requirements. These in turn were often over-implemented by DOD and by the military departments, contributing further to the loss of flexibility and the onset of today's gridlock.

Against that backdrop, it is only fair to address acquisition reform broadly, and not just as it relates to the Army. The Army is of course a very important part of DOD, but reform in my judgment needs to start with Congress and OSD, and must be made across the board. Not too many years ago, I would have urged that the Army use more imagination and flexibility in its procurements

SPEAKING OUT

because, historically, Army procurement has been characterized by undue caution and unwillingness to do anything not specifically permitted by the regulations. Thus, the Army often failed to take advantage of the flexibility and room for judgment which the regulations may have permitted. However, that flexibility has all but disappeared for everyone with the increase in oversight by DCAA, the IG, GAO and Congress, and the accusation of "fraud" everytime an acquisition official makes a questionable judgment.

What is needed now is a major overhaul of the entire acquisition system, including statutes, regulations, policies, procedures, detailed "how to" specifications, etc., in short a cultural change. The time seems to be ripe for this effort, with Congress, the Executive Branch and the industry solidly supporting the concept of acquisition reform. With the defense budget shrinking, it behooves everyone to ensure that those dollars are well spent, and not wasted on non-value-added costs to comply with unnecessary controls. Congress must take the lead and make necessary statutory changes which, in turn, will set the stage for overhauling the regulations. The Army, for its part, should support both these efforts—first to streamline the statutory base, and then to eliminate any regulations which exceed statutory requirements or which are not necessary to a business-like buyer/seller relationship. If this much can be achieved, it will be a major breakthrough. But looking further down the road, it may prove to be the easier part. Effecting the cultural change needed to really put reform into practice and then keep the system from accumulating the same collection of barnacles again will require that: 1) contracting officials exercise the flexibility which the system offers, and be willing to make judgements and accept responsibility; and 2) Congress, DCAA, the IG and others responsible for oversight exercise discipline and avoid overreacting to every perceived shortcoming by costly legislative or regulatory micromanagement.

BOOKS

Government Printing Office Releases Publications

The following publications are available from the U.S. Government Printing Office:

Introduction to Defense Acquisition Management
Stock Number: 008-020-01297-1
ISBN 0-16-041725-2
Edition: 1993
Synopsis: This pamphlet was designed to be both a quick study guide to refresh the skilled and experienced acquisition management professional as well as an introduction to the world of systems acquisition management for the newcomer. It focuses on Department of Defense wide applications rather than on the details of how a specific weapons system program is managed.

A Brief History of the U.S. Army in World War II
Stock Number: 008-029-00245-1
Edition: 1992
Synopsis: World War II was the largest and most violent armed conflict in the history of mankind. However, the half century that now separates us from that conflict has exacted its toll on our collective knowledge. While World War II continues to absorb the interest of military scholars and historians, as well as its veterans, a generation of Americans has grown to maturity largely unaware of the political, social, and military implications of a war that, more than any other, united us as a people with a common purpose.

Lessons in Restructuring Defense Industry: The French Experience
Stock Number: 052-003-01286-3
ISBN 0-16-037940-7
Edition: 1992
Synopsis: Although the U.S. spends 10 times more on defense than does France, the two nations' defense industries share some basic similarities that make recent French experience in defense-industrial restructuring relevant for U.S. policymakers. In considering the lessons that might be learned from France, however, Americans should keep in mind the differences between the two nations. First, whereas the U.S. defense industry is mainly in private hands and the U.S. government emphasizes market mechanisms, nearly four-fifths of the French defense industry is controlled by the state and broadly managed by the government. Second, the French Parliament has much less power over defense decisions than does the U.S. Congress.

Disposal of Chemical Weapons - Alternative Technologies
Stock Number: 052-003-01287-1
ISBN 0-16-037951-2
Edition: 1992
Synopsis: The United States has pledged to destroy its entire stockpile of chemical weapons by the end of this decade. The U.S. Army has begun this process by building and testing a demonstration facility to disassemble and incinerate these weapons on Johnston Island, a small island in the mid-Pacific Ocean. After tests prove the concept, the Army plans to build similar facilities for the other chemical weapons now stored at each of eight sites in the continental United States.

Secretaries of War and Secretaries of the Army, By William Gardner Bell
Stock Number: 008-029-00249-3
ISBN 0-16-036191-5
Edition: 1992
Synopsis: The United States Army has evolved during more than two hundred years from the assorted volunteer elements of a weak confederation of colonies into the composite and balanced standing force of a leading world power. Its evolution has paralleled the social, economic, political, and geographical development of the nation. In the opening struggle for independence, the middle period of continental expansion, and the modern era of international operations, the Army has played a constant and substantive role in American history.

Military Careers
Stock Number: 008-000-00614-8
Edition: 1992
Synopsis: The Department of Defense recruits and trains approximately 200,000 enlisted members and officers each year, making it one of the largest employers in the U.S. *Military Careers* has been developed to help educators and youth learn about the many career opportunities the military has to offer. The book is a compendium of military occupational, training, and career information and is designed for use by students desiring to explore the military world of work.

Building Future Security
Stock Number: 052-003-01289-8
ISBN 0-16-037975-X
Edition: 1992
Synopsis: The collapse of the Soviet military threat holds out the prospect of a "peace dividend" in the form of a smaller and less costly defense establishment. But despite the end of the cold war, the United States still faces existing and emerging security threats, including the rise of regional powers, the proliferation of advanced conventional military technologies and weapons of mass destruction, and the possibility of a renewed global military threat in the distant future. The nation will therefore continue to need a robust defense technology and industrial base that can develop, produce, and support appropriate military systems in peacetime and respond to additional military requirements in crises or war.

AAC Highlights . . .

Pinckley Named Deputy For Acquisition Career Management

Dr. Bennie H. Pinckley, former project manager for the Ground Based Surveillance and Tracking System, has been named deputy director for acquisition career management in the Office of the Assistant Secretary of the Army for Research, Development and Acquisition.

A member of the SES since November 1988, Pinckley has more than 33 years of federal civilian service, including previous responsibilities as deputy program executive officer for Air Defense; acting deputy program executive officer, High/Medium Air Defense/Theater Missile Defense; and deputy project manager, Joint Theater Missile Defense Project Office.

Pinckley holds a doctorate in public administration from NOVA University and a bachelor's degree in electrical engineering from the University of Tennessee. In addition, he has completed courses at the Brookings Institute and the Defense Systems Management College.

Program Management Course Selectees

The director of Army acquisition career management has announced that the following civilian members of the Army Acquisition Corps were selected to attend the Program Management Course (PMC), Class 94-1, beginning Jan. 24, 1994. The class is scheduled for completion on June 10, 1994.

Eighty-one nominations were submitted for PMC 94-1; of these, 70 nominations were selected as primary candidates. The next PMC is scheduled to commence in July, 1994. Candidates who were not selected for Class 94-1 are eligible for reconsideration by the next PMC board, scheduled to convene in April, 1994.

NAME	ORGANIZATION
ARMBRUSTER, Vicky R.	PEO TACT MSL
GARCIA-BACO, Luis E.	HQ AMC
BENNER, John T.	PEO COMM
BEEZLEY, Thomas C.	MTMC
BOGGS, Nancy C.	ISC
BONKOSKY, Brian B.	TACOM
BROCK, Elizabeth K.	CECOM
BUHRKUHL, Robert L.	PEO AVN
BURNSTEEL, Harvey L.	HQ AMC
BUSHMAN, William	PEO STAMIS
CARLESON, James R.	ATCOM
CARMEN, James W.	PEO IEW
CAUDLE, James T.	PEO MSL DEF
COLVIN, Randy D.	MICOM
COLANGELO, Ronald D.	STRICOM
COTHRAU, Julian L.	MICOM
CRAWFORD, John F.	SSDC
DOPP, David J.	TACOM
DUMBACHER, John L.	SSDC
EDELEMAN, Richard E.	PEO COMM
FRADLEY, Dale R.	AAESA
FITZPATRICK, George J.	PEO COMM
GADDY, Sidney W.	PEO MSL DEF
GEBELE, William X.	PEO IEW
GLADD, David L.	TACOM
HARRISON, Darrell L.	PEO AVN
HARKINS, Randall B.	MICOM
HETTMAN, Michael J.	PEO IEW
HIGGINBOTHAM, Claude L.	PEO TACT MSL
HINDMAN, Dorothy L.	Cont Spt Agency
JACKSON, Chauncey D.	STRICOM
JEHAN, Henry I.	STRICOM
JOHNSON, Steven K.	PEO IEW
KEE, Gregory L.	RCAS
KRASNICKI, Dennis F.	TACOM
KOBLER, Virginia P.	PEO MSL DEF
KERRIGAN, Thomas G.	PEO CCS
KIEBLER, Rene	PEO ARM
KIRZOW, Paul J.	PEO COMM
LEE, Harvey K.	AMSAA
LORENZ, Robert C.	PEO AVN
MCKEON, Sharron G.	HQ AMC
MEIER, Cheryl L.	PEO AVN
MELVIN, Byron E.	HQ AMC
LOPEZ-MERCED, Jose	HQ AMC
MILLER, Billy S.	PEO AVN
NEIGHBORS, Robert H.	PEO TACT MSL
NGYUEN, Giao K.	PEO CCS
OLSON, Deborah A.	PEO AVN
ORF, Carolyn K.	PEO AVN
POLONSKY, Stanford I.	PEO STAMIS
PUTZUTTELLI, Charles	PEO COMM
QUINN, John C.	PEO IEW
RIVOMONTE, Joseph M.	MICOM
ROBERSON, William E.	PEO MSL DEF
RUBINS, Shirley C.	STRICOM
SHORT, Paul M.	ATCOM
SHUM, Julia H.	ARDEC
SKRILETTS, John L.	PEO COMM
SLATER, Griffith	HQ AMC
SMITH, Joan C.	PEO COMM
SUNDBERG, John C.	PEO TACT MSL
TIWARI, Subhash R.	SSDC
TREVEY, Betsy B.	PEO AVN
TUTTEN, Mark C.	STRICOM
YOUNG, Virginia D.	MICOM
WILSON, Gisele C.	SSDC
WOLF, Robert G.	STRICOM
VELEZ, Eduardo B.	CECOM
WYMER, Debra G.	PEO MSL DEF

DAU Partial Course Schedule

The following 1994 schedule of some Defense Acquisition University (DAU) courses was provided by the U.S. Army Logistics Management College. TBD indicates that the location is to be determined. For more information, contact Carolyn Jones at (804)765-4997 or DSN 539-4997.

CONTRACTING FUNDAMENTALS

1994 Dates	Class Location
Jan 18–Feb 11	USAF, Wright-Patterson AFB, OH
Feb 7–Mar 4	Fort Lee, VA
Feb 28–Mar 25	DOD, Philadelphia, PA
Mar 14–Apr 8	Fort Lee, VA
Apr 4–29	Army, TBD
Apr 18–May 13	Fort Lee, VA
May 9–Jun 3	Navy, TBD
May 23–Jun 17	Fort Lee, VA
Jul 11–Aug 5	Army, TBD
Jul 18–Aug 12	Fort Lee, VA
Aug 8–Sep 2	Philadelphia, PA

GOVERNMENT CONTRACT LAW

1994 Dates	Class Location
Jan 31–Feb 11	Army, TBD
Feb 28–Mar 11	Navy, Washington, DC
Mar 28–Apr 8	USAF, Hill AFB, UT
Apr 25–May 6	DOD, St. Louis, MO
May 16–27	Army, TBD
Jun 13–24	Navy, TBD
Jul 11–22	DOD, Linthicum, MD
Sep 12–23	DOD, Philadelphia, PA

INTERMEDIATE CONTRACTING

1994 Dates	Class Location
Jan 10–28	Fort Lee, VA
Jan 10–28	USAF, Davis Monthan AFB, AZ
Jan 10–28	DOD, Linthicum, MD
Jan 10–28	Army, TBD
Jan 10–28	Navy, Washington, DC
Jan 31–Feb 18	DOD, Boston, MA
Jan 31–Feb 18	Army, TBD
Jan 31–Feb 18	DOD, Philadelphia, PA
Feb 7–25	Fort Lee, VA
Feb 7–25	USAF, Ellsworth AFB, SD
Feb 28–Mar 18	Army, TBD
Feb 28–Mar 18	DOD, Philadelphia, PA
Feb 28–Mar 18	Army, TBD
Mar 7–25	Fort Lee, VA
Mar 7–25	DOD, Columbus, OH
Mar 21–Apr 8	DOD, St. Louis, MO
Mar 21–Apr 8	Army, TBD
Mar 21–Apr 8	DOD, Philadelphia, PA
Apr 4–22	Fort Lee, VA
Apr 4–22	Army, Rock Island, IL
Apr 11–29	Army, TBD
Apr 11–29	DOD, St. Louis, MO
Apr 11–29	Army, TBD
May 2–20	Fort Lee, VA
May 2–20	DOD, Boston, MA
May 2–20	DOD, Columbus, OH
May 2–20	DOD, Dayton, OH
May 2–20	Navy, Mechanicsburg, PA
Jun 6–24	Fort Lee, VA
Jun 6–24	USAF, Wright-Patterson AFB, OH
Jul 11–29	Fort Lee, VA
Aug 8–26	Fort Lee, VA
Aug 8–26	Navy, TBD
Sep 12–30	Fort Lee, VA

INTERMEDIATE CONTRACT PRICING

1994 Dates	Class Location
Feb 28–Mar 11	TBD
Apr 4–15	TBD
May 2–13	TBD
Jun 6–17	TBD
Jul 11–22	TBD
Aug 1–12	TBD
Sep 19–30	TBD

COST ACCOUNTING STANDARDS WORKSHOP

1994 Dates	Class Location
Jan 31–Feb 11	Fort Lee, VA
Feb 28–Mar 11	Fort Lee, VA
Mar 29–Apr 8	Navy, Alexandria, VA
Apr 25–May 6	Fort Lee, VA
May 16–27	Fort Lee, VA
Jun 21–Jul 1	USAF, Fort Lee, VA
Jul 25–Aug 5	Fort Lee, VA
Aug 9–19	DOD, Chicago, IL
Sep 19–30	Fort Lee, VA

AUTOMATED INFO SYSTEMS (AIS) CONTRACTING

1994 Dates	Class Location
Feb 1–16	Fort Lee, VA
Feb 23–Mar 4	Fort Lee, VA
Mar 14–25	Fort Lee, VA
Mar 28–Apr 8	DOD, Linthicum, MD
Apr 11–22	Fort Lee, VA
Apr 25–May 6	Army, N. Little Rock, AR
May 9–20	Fort Lee, VA
Jun 6–17	USAF, TBD
Jun 20–Jul 1	Fort Lee, VA
Jul 25–Aug 5	Fort Lee, VA
Aug 22–Sep 2	Fort Lee, VA
Sep 12–23	Fort Lee, VA

EXECUTIVE PRE-AWARD CONTRACTING

1994 Dates	Class Location
Jan 10–14	Fort Lee, VA
Jan 31–Feb 4	Fort Lee, VA
Feb 14–18	USAF, El Segundo, CA
Feb 14–18	USAF, Columbus, OH
Feb 28–Mar 4	Fort Lee, VA
Mar 28–Apr 1	Fort Lee, VA
Apr 18–22	Fort Lee, VA
May 9–13	Fort Lee, VA
May 23–27	USAF, El Segundo, CA
May 23–27	USAF, Philadelphia, PA
Jun 6–10	Fort Lee, VA
Jun 27–Jul 1	Fort Lee, VA
Jul 18–22	Fort Lee, VA
Aug 8–12	Fort Lee, VA
Aug 29–Sep 2	Fort Lee, VA
Sep 12–16	USAF, Columbus, OH
Sep 12–16	USAF, Chicago, IL

INTERMEDIATE ACQUISITION LOGISTICS

1994 Dates	Class Location
Feb 28–Mar 18	Fort Lee, VA
Apr 11–29	Fort Lee, VA
Jun 13–Jul 1	Fort Lee, VA

FUNDAMENTALS OF SYSTEMS ACQUISITION MANAGEMENT

1994 Dates	Class Location
Mar 7–11	TBD
Jun 20–24	TBD
Aug 22–26	TBD
Aug 29–Sep 2	TBD
Sep 26–30	TBD

PURCHASING FUNDAMENTALS

1994 Dates	Class Location
Jan 31–Feb 11	TBD
Jan 31–Feb 11	Army, TBD
Feb 28–Mar 11	Fort Lee, VA
Mar 14–25	Fort Lee, VA
Mar 14–25	USAF, Kelly AFB, TX
Apr 11–22	Fort Lee, VA
Apr 25–May 6	Fort Lee, VA
May 9–20	Fort Lee, VA
May 9–20	USAF, TBD

CAREER DEVELOPMENT UPDATE

1994 Dates	Class Location
Jun 6–17	DOD, Philadelphia, PA
Jul 11–22	TBD
Jul 25–Aug 5	Fort Lee, VA

INTERMEDIATE PURCHASING

1994 Dates	Class Location
Jan 31–Feb 9	Fort Lee, VA
Feb 1–10	Navy, TBD
Feb 14–24	Fort Lee, VA
Feb 14 -24	DOD, Philadelphia, PA
Mar 1–10	Army, St. Louis, MO
Mar 1–10	Navy, TBD
Mar 14–23	Fort Lee, VA
Mar 15–24	Army, TBD
Apr 11–20	Fort Lee, VA
Apr 26–May 5	Navy, Norfolk, VA
May 9–18	Fort Lee, VA
Jun 6–15	Fort Lee, VA
Jun 7–16	DOD, Columbus, OH
Jun 21–30	Army, TBD
Jun 21–30	Navy, TBD
Jul 11–20	Fort Lee, VA
Jul 12–21	Army, TBD
Jul 26–Aug 4	Navy, Norfolk, VA
Aug 8–17	Fort Lee, VA

INTERMEDIATE QUALITY ASSURANCE

1994 Dates	Class Location
Feb 7–11	Fort Lee, VA
May 2–6	Army, Warren, MI
May 23–27	Navy, Indianapolis, IN
Jun 27–Jul 1	USAF, Tinker AFB, OK
Sep 12–16	Navy, TBD

EXECUTIVE QUALITY ASSURANCE

1994 Dates	Class Location
Jan 10–13	Fort Lee, VA
Feb 14–17	Fort Lee, VA
Mar 15–18	Navy, Corona, CA
Mar 29–Apr 1	DOD, Philadelphia, PA
Apr 19–22	DOD, Boston, MA
Jun 13–16	Fort Lee, VA
Jul 11–14	Fort Lee, VA
Jul 26–29	DOD, El Segundo, CA
Aug 30–Sep 2	DOD, Philadelphia, PA
Sep 19–22	Fort Lee, VA

DEFENSE SPECIFICATION MANAGEMENT

1994 Dates	Class Location
Jan 24–Feb 4	Fort Lee, VA
Feb 28–Mar 11	TBD
Apr 4–15	TBD
May 9–20	TBD
Jul 18–29	Fort Lee, VA
Aug 15–26	TBD
Sep 19–30	TBD

SPECIFICATIONS IN DEFENSE ACQUISITION PROCESS

1994 Dates	Class Location
Jan 10–14	Fort Lee, VA
Jun 20–24	TBD

CONFERENCES

Army Science Conference Call For Exhibits

A call for exhibits at the 19th Army Science Conference, June 20-24, 1994 in Orlando, FL, has been issued by the sponsor, the deputy assistant secretary of the Army for research and technology.

Army Science Conference exhibits must be on display throughout the conference and demonstrate the latest science and technology in government laboratories and research, development and engineering centers.

The exhibits must display actual achievements of an agency and should reflect the theme of the Army Science Conference, "Assuring the Competitive Edge" for soldiers in the 21st century. Exhibits are restricted to government only and will be selected based on original and interactive capabilities. Best exhibit awards will be made during the conference.

To obtain exhibit applications and information, fax your complete mailing address, telephone number and fax number to Army Science Conference exhibits at (804)255-0056, or call Brenda Vaughan at (804)255-0409. Exhibit applications must be received no later than Jan. 15, 1994.

Upcoming Conferences

• The Object-Oriented Simulation Conference will be held Jan. 24–27, 1994 in Tempe, AZ. Sponsored by the Society for Computer Simulation, the seminar will feature discussions and presentations of research papers on all aspects of the application of object-oriented technology to simulation modeling and analysis. For additional information, write Charles Herring, U.S. Army Construction Engineering Research Laboratories, P.O. Box 9005, Champaign, IL, 61826-9005, or call (217) 352-6511.

• The Eleventh International Seminar on Primary and Secondary Battery Technology and Application will be held Feb. 28–March 3, 1994 in Deerfield Beach, FL. This seminar will be sponsored by Dr. S.P. Wolsky, Ansum Enterprises Inc. and Dr. N. Marincic, Battery Engineering Inc. The seminar will cover all important aspects of battery research, development, manufacturing and application with particular emphasis on new technologies and recent developments in the rechargeable battery field. For additional information, contact Dr. S.P. Wolsky, Ansum Enterprises Inc., 1900 Cocoanut Road, Boca Raton, FL 33432, or call (407) 391-3544.

• The Mechanical Failures Prevention Group will hold its 48th meeting in Wakefield, MA, on April 19-21, 1994. The U.S Army Research Laboratory, the Office of Naval Research, the Naval Surface Warfare Center, Naval Civil Engineering Laboratory and the Vibration Institute will sponsor the conference. In keeping with the goals of the White House Technology Reinvestment Project, this year's theme is "Advanced Materials and Process Technology for Mechanical Failure Prevention." For additional information contact Henry C. Pusey, 4193 Sudley Road, Haymarket, VA 22069-2420, (703) 754-2234.

AWARDS

O'Brien Chosen as ARL Fellow

Dr. T. Kevin O'Brien, senior research scientist with the Army Vehicles Structures Directorate, NASA Langley Research Center, has been named an Army Research Laboratory (ARL) fellow. The ARL fellowship was established last year to serve as a guiding advisory body to the ARL director. The fellowship is limited to the top two percent of ARL scientists and engineers.

O'Brien is internationally known for his work on delamination of composite materials and has authored more than 100 publications and presentations. He is currently involved in the durability and damage tolerance assessment of composite materials for military and commercial aircraft, rotorcraft, and ground vehicles.

Unit Maintenance Aerial Recovery Kit

Aerial aircraft recovery is not an easy or enviable task. This job is further complicated when military operations in a hostile environment are added to the equation. Couple a damaged helicopter in enemy territory with night operations in protective gear (cold weather or MOPPIV) with minimum manpower and this normally labor-intensive, difficult task becomes near impossible. Nevertheless, aircraft recovery in the rotary wing environment is a necessary duty and must be accomplished with a minimum of effort and as quickly as possible. Previously, the only means of recovering a downed helicopter was the Aerial Recovery Kit (ARK). The kit was functional; however, it was extremely heavy and difficult to install due to complicated sling arrangements and hardware. The need arose to develop a kit that was man-portable, riggable in 15 minutes or less, and was so simple that three men operating in degraded working conditions (night operations, protective gear) could accomplish the recovery task with a minimum of effort and a high degree of safety.

The Aviation Applied Technology Directorate (AATD), U.S. Army Aviation and Troop Command (ATCOM), at Fort Eustis, VA, was tasked to develop a kit meeting these requirements for all of the Army's rotary wing aircraft in the current inventory (AH-64, AH-64 Longbow, and all series UH-1, UH-60, AH-1, and OH-58).

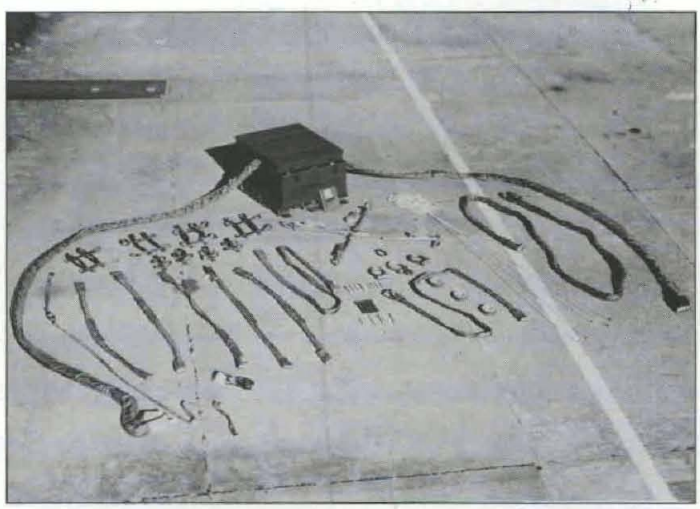
AATD is a research and development organization that functions as a materiel developer for the Army aviation community.

Efforts to develop such a kit began in 1985. Many concepts were pursued before a useable kit utilizing the aircraft rotor head as the primary lifting point was developed.

The culmination of concepts, revisions and improvements took place during Desert Shield/Desert Storm when the Interim UMARK (IUMARK) became reality with 64 kits being sent to Saudi Arabia. Based on feedback from the user community, the kits enjoyed great success during Desert Storm (see accompanying photo).

After Desert Storm, action was initiated to further improve UMARK. These improvements were greater weight savings, increased ease of use, and higher versatility with fewer components. In addition, a spreader bar assembly was included to facilitate recovery of the OH-58D and Longbow Apache. This effort, referred to as the Advanced UMARK, has resulted in a contractual agreement with Kaman Aerospace.

The prototype UMARK design is approximately 140 pounds lighter than the old design (IUMARK), utilizes a common spreader bar for both the OH-58D and Longbow Apache, and is much easier to use since it requires no tools for installation. This seemingly phenomenal weight savings comes from application of a new fiber known as Spectra. Spectra is a polyethylene fiber that exhibits great tensile strength while being half the weight of similar strength rated polyester slings. Spectra is virtually impervious to chemical and mold/mildew attack. Strength or rate of stretch does not degrade or change when wet and is unaffected by sunlight unlike most sling material. The absence of bulk and weight allows for a lightweight modularized kit that consists of three polyethylene ruggedized cases that are two-man transportable.



One of 64 Interim Unit Maintenance Aerial Recovery Kits sent to Desert Storm.

The arrangement of the contents of the boxes is such that if the aircraft to be recovered is not an OH-58D or Longbow Apache, then the box containing the spreader bar assembly for the mast-mounted sight or radar can be left behind. What remains are two boxes, one weighing approximately 95 pounds and the other 92 pounds.

The box containing the spreader bar assembly and associated slings and hardware weighs approximately 141 pounds. (These weights include the container weight.) Using the UH-60 or CH-47, the advanced UMARK is designed to recover both lightly and heavily damaged aircraft, aircraft in which the transmission/rotor-head area is not intact. These aircraft include the CH-47 from which the blades and necessary equipment are removed to reduce gross weight.

The program is currently in the final design approval stage and four prototype kits will be delivered for test and evaluation in April of 1994.

The preceding article was written by John M. Maglieri, an aerospace engineer with the Reliability, Maintainability and Mission Technology Division in the Aviation Applied Technology Directorate, U.S. Army Aviation and Troop Command, Fort Eustis, VA.

RD&A NEWS BRIEFS

Advanced Power System For Army's Ground Based Radar

A system designed to provide electrical power for the ground-based radar (GBR) is now being developed by the Power Generation Division of the Belvoir RD&E Center Logistics Equipment Directorate (LED).

"We are pursuing this technology demonstration program for the GBR project manager. Our aim is to develop an advanced tactical power system that will optimize the theater missile defense capability of the GBR," said H. Scott Coombe, leader of the GBR project.

According to LED officials, the GBR is being designed to enhance the Army's missile defense capability. It should be able to detect and track incoming missiles and then guide interceptors to destroy these targets at ranges exceeding the Patriot system.

"Our prototypes will include generator sets, mobility platforms and power transfer capability. These will be diesel and turbine based that will provide a megawatt of continuous, tactical quality power, with the processing capability to supply the necessary power to operate the radar and auxiliary loads," added Coombe.

Thomas Childers, assistant GBR project leader, said, "We will be incorporating electromagnetic pulse and interference hardening; infrared, acoustic, visual and electromagnetic signature suppression; and NBC decontamination capabilities. Our product will fit aboard present Air Force fixed-wing cargo airplanes with roll-on/roll-off capabilities."

"We have completed the conceptual design phase and we're currently preparing detailed designs, performing component testing and pursuing long-lead component acquisition," said Coombe. "We should be ready to produce demonstrators in October 1995 to support a milestone II decision in fiscal year 1997," concluded Coombe.

TARDEC Program Cuts Vehicle Test Costs

The U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), Warren, MI, expects to save the Army millions of dollars annually through a program aimed at reducing the cost of testing vehicles and components.

Since 1989, expenditures on Army vehicle testing have averaged $13.5 million annually. Most of the testing (over 80 percent) is performed at the Army's Test & Evaluation Command facility, with the remainder taking place at independent contractor sites.

The traditional procedure for monitoring the quality of vehicles and components is to test them periodically at Army test sites to make sure that they meet military specification requirements. Though this approach is effective, it sometimes results in testing that is unnecessary because of a repeatedly good past performance record of a vehicle system for a given contractor.

The new program began in September 1992 in an attempt to test smarter as a result of cutbacks in defense expenditures. MG Joseph Raffiani Jr., commander of the U.S. Army Tank-Automotive Command, supported the idea and asked TARDEC's Product Assurance Directorate to coordinate efforts to lower testing costs for combat and tactical vehicles.

The aim of the TARDEC program is to get everyone who is directly or indirectly involved in testing vehicles and related components to work toward reducing test costs wherever possible without risk to the soldier in the field. These cost-reduction efforts would be tracked and reported on periodically to access trends.

Product Assurance Directorate's Barry C. Carter, who heads the program said, "The program encompasses not just the testing itself but any procedures that would be involved indirectly with the testing. In other words, if there are areas related to testing, say, in the office environment, where we can improve our productivity to reduce testing costs, we also factor that into the savings."

According to Carter, the most significant cost savings result from reducing the number of required tests. "The way we determine what tests to eliminate is to look at records of past tests and the performance of the items tested. And if a contractor is found to have a good track record in providing highly reliable vehicles or components, then we can eliminate some of the testing called for in the vehicle specification—as much as 50 percent in some cases," he explained.

Carter added that the savings are substantial. He noted, for example, that cutting the number of follow-on production tests for the Bradley Fighting vehicles from three to two per year has resulted in an annual savings of $250,000. Moreover, he said a cutback in tests of 25mm ammunition used in Bradleys is saving an additional $165,000 per year.

Carter said also playing an increasingly important role in reducing test costs is a growing emphasis in the use of laboratory and computer simulation. He said the advantage to such tests is that they eliminate the need for drivers, support test personnel and equipment that contribute to costly overhead associated with conventional field tests. He noted, for instance, that in computer simulation, the practicality of a system is determined before any hardware is ever fabricated.

Carter added that efforts are underway to reduce the cost of prototype testing that is part of the process to develop new vehicles. Noting that it is not uncommon during the developmental process to test up to five prototypes simultaneously to quickly obtain as much reliability data as possible, Carter asserted that abandonment of this practice could reduce testing costs significantly. "It makes a lot more sense to do more shakedown testing of a few prototypes and iron out the serious bugs rather than test five of them—all having the same bugs—and end up wasting money. It's the kind of smart testing that we are going to be required to do more of in the future as our money situation gets tighter," he said.

Army, University of Maryland Study Turbine Engine Stall

The Institute for Systems Research at the University of Maryland at College Park and the Army Research Laboratory have signed a cooperative research and development agreement (CRADA) to carry out a joint project in the development of active stall controllers for axial/centrifugal flow compressors in jet aircraft turbines. However, the research is applicable to all turbine engines.

This research program will combine controller development and testing by the Army's Vehicle Propulsion Directorate (VPD) at Lewis Research Center with modeling and analysis at the Institute for Systems Research.

The CRADA was signed under the provisions of the Technology Transfer Act of 1986 through which federal laboratories make developments accessible to private industry. The legislation promotes the utilization of federally-funded technology developments to improve U.S. economic, environmental, and social well-being.

Karl Owen, VPD researcher, said, "This agreement demonstrates the synergy that's possible because of the Technology Transfer Act. While we had assembled a formidable team from industry, academia, and the government to address the flow physics of stall, participation of the Institute for Systems Research adds to our confidence that we will succeed in actively suppressing stall and surge. The Institute's theoretical work in the aspects of non-linear control of axial and centrifugal flow compressors brings a new and complementary approach to this research."

University of Maryland Researcher Ray Adomaitis said, "This is quite an exciting time in stall analysis and control. The theory of flow instability inception in these machines and experimental work on stall and surge suppression have matured to a point where the implementation of this technology appears to be a realistic goal."

The Institute of Systems Research is one of 18 National Science Foundation engineering research centers chartered to increase the global competitiveness of U.S. industry. It is a joint effort of the University of Maryland at College Park and Harvard University to conduct fundamental research in integrated systems design for the control and optimization of complex engineering systems.

Armored Security Vehicle To Enhance MP Survivability

The U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), with the assistance of several Tank-Automotive Command directorates, has successfully transitioned the Armored Security Vehicle (ASV) to the PEO— Combat Support. The ASV program recently reached Milestone I and II decisions (engineering and manufacturing phase) and is entirely funded for use by the U.S. Army Military Police Corps.

The ASV will be funded in fiscal years 1994-96 with research and development allocations. The program will continue to be funded through production resources in fiscal years 1996–99.

MAJ Thomas Vaught, former weapon systems manager, said, "TARDEC's Emerging Systems Division in the Advanced Systems, Concepts, and Planning Directorate has actually 'emerged a system.' They've gotten it from concept to Milestones I and II. These people have successfully fulfilled a mission, although most of the work was not funded.

"This work has resulted in a funded program that will significantly increase the survivability of the MPs. This system also dramatically increases their lethality. It will broaden response options and enlarge the overall value and presence of the Military Police," Vaught continued.

Vaught said that the Military Police have become the Army's force of choice, as they provide military presence without actually deploying a combat force. The MP's presence eliminates the international tensions traditionally associated with employing combat units.

The MPs represent four percent of the Army's force and were deployed 52 times in the last 12 years. They comprised eight percent of the force in Operation Desert Storm, 16 percent in Panama, and 30 percent in Somalia. Although the number of MPs deployed may seem insignificant, their contributions were of immeasurable value, as they provided law and order, security and handled enemy-prisoner-of-war issues.

The ASV will carry a three-member security team: a gunner, driver and team leader. It will also provide room for an extra passenger and stowage space for up to 100 rounds of ammunition.

The vehicle's main gun, an Mk-19, will be turret-mounted. This turret will provide ballistic protection capable of shielding the crew against small-arms fire and include an infrared nighttime target- acquisition system. The gun is easily dismounted from the turret for specialized missions.

The ASV will replace the M1026 High-Mobility Multipurpose Wheeled Vehicle. The M1026 lacks ballistic protection and night capabilities for target identification with its main weapon.

"The MPs have accounted for many of the Army's casualties in recent years. This is because their vehicles are not adequately equipped to withstand the low-intensity conflicts that are associated with the MPs defensive and protective roles," said Vaught.

The Military Police School, headquartered at Fort McClellan, AL, developed the operational and organizational plan for the ASV. TARDEC assisted by formulating a vehicle concept using the plan as a guideline. The ASV's Operational Requirements Documents (ORD) were approved in March 1992. The requirements outline that the ASV be a wheeled vehicle with a flat-run tire capability possessing 7.62mm armor piercing ammunition protection for crew, weapon station and ammunition storage; it must have overhead protection (60mm mortar burst within 10m); and provide protection from anti-personnel mines.

The ORD also states that the ASV be survivable from nuclear/biological/chemical contamination and operable in Mission-Oriented Protective Posture level 4. In addition, it must be roll-on/roll-off transportable by a C-130 aircraft, and accomodate a payload of 4,360 lbs.

The Army is slated to purchase 95 ASVs. The U.S. Air Force may order up to 300 vehicles for use by their airfield construction and explosive ordnance disposal personnel.

The preceding article was written by Rae Higgins, a publicist with the U.S. Army Tank-Automotive Research, Development and Engineering Center Marketing Office.

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