Description of document:	Three Army Science Board (ASB) Reports, 1988-1998 (See following page for report titles)
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Army Science Board (ASB) Reports included

DEPARTMENT OF THE ARMY
OFFICE OF THE ADMINISTRATIVE ASSISTANT TO THE SECRETARY OF THE ARMY
9301 CHAPEK ROAD
FORT BELVOIR VA 22060-5527

April 30, 2020

SAAA-LS

This letter responds to your Freedom of Information Act (FOIA) request dated January 28, 2020. The U.S. Army Freedom of Information Act Division, Records Management Declassification Agency (RMDA), referred your request to this office. You are seeking records pertaining to your enclosed FOIA request. Your request was assigned our office tracking number FA-20-0061.

Under the FOIA, a government agency is required to make a good faith effort to conduct a search for responsive records. Our office requested a records search from the Office of the Deputy Under Secretary of the Army (DUSA). We are releasing (232) pages that are in response to your FOIA request. However, responsive records pertaining to 1990- Army Research and Development Accomplishments 1940-1990 (letter report) failed to yield responsive records. We have determined this search was reasonable.

Exemption 6 of the FOIA 5 U.S.C. § 552(b)(6)

Exemption (b)(6) of the FOIA protects from mandatory disclosure "personnel and medical files the disclosure of which would constitute a clearly unwarranted invasion of privacy." 5 U.S.C. § 552(b)(6) (2011). To qualify for protection under Exemption (b)(6), records must meet two criteria: (1) they must be "personnel and medical files and similar files," (2) the disclosure of which "would constitute a clearly unwarranted invasion of personal privacy." Id.; United States Dep't of State v. Washington Post Co., 456 U.S. 595, 599-603 (1982). The first prong is met if the information "appl[ies] to a particular individual" and is "personal" in nature. New York Times Co. v. NASA, 852 F.2d 602, 606 (D.C. Cir. 1988). The second prong requires courts to strike a "balance between the protection of an individual's right to privacy and the preservation of the public's right to government information." United States Dep't of State v. Washington Post Co., 456 U.S. 595, 599 (1982). The "public interest" in the analysis is limited to the "core purpose" for which Congress enacted the FOIA: to "shed . . . light on an agency's performance of its statutory duties." United States Dep't of Justice v. Reporters Comm. for Freedom of the Press, 489 U.S. 749, 773 (1989).

We are withholding names and contact information for all Army personnel (e.g., e-mail addresses, direct-line telephone numbers) and third-party information under Exemption 6. 5 U.S.C. § 552(b)(6). See Judicial Watch, Inc. v. United States, No. 03-1160, 2004 WL 26736, at *4 (4th Cir. Jan. 6, 2004). Under the Exemption (b)(6) balancing test, the Supreme Court held in a similar case that disclosure of employee addresses "would not appreciably further the citizens' right to be informed about what their Government is up to and, indeed, would reveal little or

nothing about the employing agencies or their activities." United States Dep't of Defense v. Fed. Labor Relations Auth., 510 U.S. 487 (1994). The same is true here. Disclosure of the names, contact and personal information of government employees would contribute little to the public's understanding of government activities. By contrast, such disclosure would constitute a "non-trivial" and "not insubstantial" invasion of government employees' privacy interests. Id. at 500, 501.

For any further assistance and to discuss any aspect of your request, you have the right to contact the Army FOIA Public Liaison Officer, Alecia Bolling, by email at usarmy.belvoir.hqda-oaa-ahs.mbx.rmda-foia-public-liaison@mail.mil or by phone at (571) 515-0306. Additionally, you may contact the Office of Government Information Services (OGIS) at the national Archives and Records Administration (NARA) to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: NARA-OGIS, 8601 Adelphi Road-OGIS, College Park, MD 20740-6001, email at ogis@nara.gov, telephone number (202) 741-5770 toll free at (877) 684-6448 or by facsimile at (202) 741-5769.

This partial denial has been made on behalf of the Administrative Assistant to the Secretary of the Army, who has designated that this office act as the Initial Denial Authority for records maintained by the Office of the Secretary of the Army and its serviced activities. You have the right to file an administrative appeal with the Office of the Army General Counsel within ninety (90) calendar days. See 32 C.F.R. § 518.17(c). Their mailing address is:

Department of the Army
Office of the General Counsel
104 Army Pentagon, Room 2E724
Washington, D.C. 20310

If you have any questions regarding this letter or the information furnished, please contact this office at (703) 614-5871 or email at usarmy.belvoir.hqda-oaa-rpa.mbx.oaa-cals-mailbox-foia@mail.mil. In all correspondence please refer to FOIA number FA-20-0061.

Sincerely,

Paul V. DeAgostino
Senior Counsel

Enclosure(s) - 232 pages

(4)

DEPARTMENT OF THE ARMY
ASSISTANT SECRETARY OF THE ARMY
RESEARCH, DEVELOPMENT AND ACQUISITION
WASHINGTON, D. C. 20310-0103

ARMY SCIENCE BOARD

FINAL REPORT OF THE AD HOC SUBGROUP

ON

THE IMPACT OF COMPETITION IN CONTRACTING ON RESEARCH AND DEVELOPMENT

DECEMBER 1988

This report is a product of the Army Science Board. The Board is an independent, objective advisory group to the Secretary of the Army and the Army Chief of Staff. Statements, opinions, recommendations, and/or conclusions contained in this report are those of the Ad Hoc Subgroup on "The Impact of Competition in Contracting on Research and Development," and do not necessarily represent the official position of the U. S. Army or the Department of Defense.

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7. AUTHOR(s) (b) (6) [redacted]		8. CONTRACT OR GRANT NUMBER(s)
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Competition in Contracting	Industrial Mobilization
Competitive procurements	Unsolicited Proposals
Competitive procedures	Independent Research and Development (IR&D)
Technology Base	Bid and Proposal (B&P)
Statutory Exemptions	Competition Advocates

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In September 1987, the Army Science Board Ad Hoc Study Group was appointed to assess the impact of known and likely changes in statutory and regulatory guidelines in the Contract of Acquisition of research and development. The study group held four (4) fact-finding sessions and provided recommendations based on the panel assessment of the information gathered.

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COMMITTEE REPORT

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*NOTE: The session minutes and submissions to the study group, listed on page ii, are on file and available for review at the Army Science Board's Executive Secretary's Office in the Pentagon. Washington D.C.

SUBMISSIONS TO THE AD HOC STUDY GROUP

1. Multi-Association (AIA, EIA & NSIA) dated 21 Jul 88
   Topic: IR&D/B&P Costs

2. Environmental Research Institute of Michigan dated 12 Jan 88
   Topic: Effects of Competition

3. Southwest Research Institute dated 25 Jan 88
   Topic: Competition Advocacy Program Effect on Not-For-Profit Research Institutes

4. The Charles Stark Draper Laboratory, Inc. dated 11 Feb 88
   Topic: Impact of CICA on Draper

5. Perceptronics dated 2 Mar 88 Topic: Views on Competition Issues

6. SRI International dated 23 Mar 88 Topic: Views on the Effects of CICA on Nonprofit Research Organizations

7. Stanford University dated 23 Mar 88 Topic: Concerns about Regulations and Policies Related to the Funding of Research

8. AEL Industries, Inc. dated 23 Mar 88 -- Topic: Perspective of Small Business

9. George Washington University dated 31 Mar 88 Topic: Competition in Contracting from the University Perspective

10. Electronic Industries Association dated 15 Apr 88
    Topic: Comments on Terms of Reference and Panel Questions

11. Paper dated 20 Jun 88 submitted by [redacted], Subject: Considerations and Issues Involved With Competitive R&D Contracting

12. Summary transcript of an interview with [redacted] by [redacted] on 24 Mar 88.

DEPARTMENT OF THE ARMY

ARMY SCIENCE BOARD

REPORT OF THE AD HOC STUDY GROUP ON THE IMPACT OF COMPETITION IN CONTRACTING ON RESEARCH AND DEVELOPMENT

Study Group REPORT

The three-year old Competition in Contracting implementing structure has adopted a narrow view of its mission and is pursuing an overly restrictive interpretation of the 1984 Competition in Contracting Law as it relates to research and development. The Study Group is concerned with the resulting erosion of long-term technology base efforts and the concurrent threat to innovation. The Study Group endorses immediate action aimed at reestablishing the special importance and nature of research and development in procurement procedures both directly and as it is intrinsically coupled with certain repeated production buys.

A large competition advocate organizational structure appears to address primarily statistical goals which measure the number of procurements which are subject to competition and the number of dollars spent pursuant to competitive procurements. This structure fosters an atmosphere which discourages the use of statutory exemptions reflecting Congress' intention that other than formal competitive procedures be used in certain circumstances. The Study Group believes that the competition advocate structure has failed to recognize and encourage use of those nuances in the Congressional mandate. This failure to address the Congressional direction reflected in statutory exemptions poses a serious threat to the national defense technology base.

Both production capability and clearly perceived commitment to technology base efforts are necessary to support continuing industrial mobilization resources. It takes three to five years to build a technology team, which the stroke of a pen can destroy. In industry, the production base ultimately supports many significant research and development efforts via acceptable Independent Research and Development overhead rates, direct investment in technology, and investment in the capital facilities and equipment needed as part of a technological capability. Competition for the production of advanced technology systems can lead to destruction of specialized engineering capabilities necessary for mobilization.

In particular, current law (10 U.S.C., Section 2304(c)) directs that the head of an agency may use procedures other than competitive procedures "... when ... it is necessary to award the contract to a particular source or sources in order ... to maintain a ... supplier available for furnishing ... services in case of a national emergency or to achieve industrial mobilization, ..." This exemption applys to maintaining critical research, development and engineering teams intact. The exemption is not, however, interpreted as applying to research and development capabilities but rather to production capabilities only. Maintenance of critical masses of focused researchers addressing specific technology base issues should be supported by the exemption.

The head of an agency may use procedures other than full and open competition when it is necessary to award the contract to a particular source or sources in order to establish or maintain an essential engineering, research, or development capability to be provided by an educational or other non-profit institution or a federally-funded research and development center. This section has been misinterpreted to substitute the notion of uniqueness for the notion of essentiality.

The head of an agency may use procedures other than full and open competition only when the property or services needed by the agency are available from only one responsible source or only from a limited number of responsible sources and no other type of property or services will satisfy the needs of the agency, ((c)(1)). For the purpose of applying this section, section (d)(1)(A) as amended in 1987, provides "... in the case of a contract for the property or services to be awarded on the basis of acceptance of an unsolicited research proposal, the property or services shall be considered to be available from only one source if the source has submitted an unsolicited research proposal that demonstrates a concept (i) that is unique and demonstrates a unique capability of the source to provide the service; and (ii) the substance of which is not otherwise available to the United States, and does not resemble the substance of a pending competitive procurement."

Notwithstanding 1987 legislation interpreted (Army Office of General Counsel Memorandum, May 10, 1988, attached) to the contrary, the notion of a unique and innovative concept has been confused by requiring that a unique ability to perform be demonstrated before an unsolicited proposal can be funded. This restrictive interpretation of the law coupled with a widespread

and genuine fear in the research and development community concerning the commercial security of unique and innovative concepts set forth in the unsolicited proposal format has led to a precipitous drop in the number of meritorious unsolicited proposals being submitted. There is an impression that ideas submitted in unsolicited proposal sometimes show up in subsequent Broad Agency Announcements. The Study Group believes that unsolicited proposals are an important way to develop and assure the viability of the national technology base. Broad Agency Announcements are not broad enough and can result in significant delays. These announcements are viewed as restrictive, not expansive. No provision is made for truly new concepts (except for those improperly founded in unsolicited submissions) as the government must undertake the impossible task of anticipating research areas and results. With shrinking real budgets, the problem is exacerbated.

Finally, statistics, while inadequate at present because of the short time period since implementation of the 1984 Act (in April, 1985) and reporting delays, seem to confirm a widespread belief in industry that increased bid and proposal costs required to prepare competitive proposals are eroding the independent research and development budgets. Because the amount which can be spent on proposals plus the amount which can be spent on independent research is capped, the resulting increased emphasis on proposal preparation leads to reduced commitment to self-directed research and development. This problem is compounded in that there are no offsetting administrative savings for industry associated with competitive procurements. Where price competition is used, contract audits might, for example, evaluate only performance criteria.

Recommendations

1. The perception that the burden of justification for contract actions using other than competitive procedures for research, development, and engineering is too onerous should be minimized. The long-term positive results achievable by maintaining important research capabilities should be addressed. (See Assistant Secretary of Defense memorandum dated September 23, 1987, copy attached). In particular, guidance on (1) maintaining critical research, development and engineering teams intact, (2) establishing and maintaining a variety of essential capabilities in the not-for-profit sector, and (3) more fully supporting proffers of unique and innovative concepts should be promulgated.

2. Consideration should be given to exempting research and development (6.1, 6.2, 6.3a) from the competition review process.

3. Procedures should be implemented to encourage unsolicited proposals which demonstrate unique and innovative concepts regardless of whether or not the proposer is the only possible performer of the proposed research. Unique and innovative concepts submitted as part of unsolicited proposals should be protected and individuals who reveal, distribute or publish unique and innovative aspects should be reprimanded. Training and supervisory attention should be focused on protecting unsolicited proposal and sole sources proprietary data.

4. The Acquisition Authority should submit written findings concerning the impact of competition on research and development in conjunction with each annual Competition Advocate's Report to Congress. Data should be included to measure both government initiated and contractor initiated research, development and engineering.

5. A case study based review of Independent Research and Development <u>versus</u> Bid and Proposal expenditures should be conducted and consideration should be given to determining long-term consequences to the nation's technology base caused by requiring competition for every production buy.

6. Consideration should be given to contract formats which minimize audit requirements where competitive procurement practices are followed.

7. Consideration should be given to the long term need for separate Competition Advocates now that the basic concepts of the new competition in contracting programs have been implemented.

DEPARTMENT OF THE ARMY
OFFICE OF THE GENERAL COUNSEL
WASHINGTON, DC 20310 0104

10 May 1988

MEMORANDUM FOR THE CHAIRMAN, ARMY SCIENCE BOARD COMPETITION SUBGROUP

SUBJECT: Interpretation of Amendment to Section 2304(d)(1)(A) of Title 10

You have inquired whether 10 U.S.C. Section 2304(d)(1)(A), as amended by Section 923(b) & (d)(2) of Public Law 99-500, allows the award of sole-source contracts to research and development contractors on the basis of unsolicited proposals in circumstances where such contractors cannot demonstrate a "unique capability" to perform the planned research. Our opinion is that the Competition in Contracting Act allows such awards, notwithstanding the absence of demonstrated unique capability, when the contractor's proposal demonstrates a unique and innovative concept. This, of course, assumes that acceptance of an unsolicited proposal is otherwise authorized.

We draw our conclusion from the plain meaning of the words used by Congress in Public Law 99-500. Whereas the predecessor language in Section 2304(d)(1)(A) provided for awards on the basis of unsolicited proposals where the contractor's proposal demonstrated a "unique and innovative concept," the revised language allows for awards where the proposal demonstrates a concept "that is unique and innovative or, in the case of a service, for which the source demonstrates a unique capability . . . to provide the service . . . ." 10 U.S.C. 2304(d)(1)(A)(i) (emphasis added). To us, it appears that Congress' plain intention was to allow for a sole-source award on the basis of an unsolicited proposal when the contractor can demonstrate a proprietary concept that is unique and innovative but, for some reason, cannot demonstrate a unique ability to perform.

The implementating regulations contained in the FAR are consistent with the above interpretation in that they simply reiterate the statutory passages. See Proposed FAR 6.302-1(a)(2)(i) (approved for publication 26 April 1988).

We would be happy to discuss this matter further if you desire.

[redacted]
Assistant to the General Counsel

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, DC 20310-0103

3 SEP 1987

[redacted]
Chair
Army Science Board
Penn Central Federal Systems Company
1800 Diagonal Road, Suite 500
Alexandria, VA 22314-2840

Dear [redacted]:

In my letter of March 3, 1987 to [redacted], I asked [redacted] to appoint an Army Science Board Panel of five or six members to serve as an ad hoc "Competition in Contracting" study group. [redacted], the chairperson of that study group met with [redacted], the HQDA Senior Advisor and [redacted], the HQDA Staff Assistant, in late June.

It became clear at that meeting that the terms of reference in the March 3 letter were too broad for an effective six-month study effort.

In order to allow optimization of ASB efforts within a reasonable timeframe and to assure meaningful and practical results of long term benefit to the Army, I have decided to focus on the following revised objectives and terms of reference.

The broad objectives of the study group should be limited to:

a. Assessment of the impact of known and likely changes in statutory and regulatory guidelines related to competition, in the context of acquisition of research and development.

b. Recommending, where appropriate, changes in research and development acquisition guidelines, regulations or practices to achieve broad Army objectives.

The terms of reference for the study shall include, but not necessarily be limited to, the following:

a. Objective assessment of the impact of the increased emphasis on competition on contractor

ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-8000

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SEP 23 1987

MEMORANDUM FOR THE ASSISTANT SECRETARY OF THE ARMY (RD&A)
ASSISTANT SECRETARY OF THE NAVY (S&L)
ASSISTANT SECRETARY OF THE AIR FORCE (RD&L)
DIRECTORS OF DEFENSE AGENCIES

SUBJECT: Procurement Process for Nonprofit Organizations

The Department of Defense and educational institutions have a long history of cooperation in research and engineering to aid the fulfillment of the Department's mission. The Department by itself or together with the Nation's educational institutions has established nonprofit organizations and Federally Funded Research and Development Centers (FFRDCs) to provide essential capability in research, engineering and development. Contracts for research, engineering or development with these organizations establish or maintain such needed capabilities.

The Competition in Contracting Act of 1984 granted an exception to the full and open competition requirements of the Act when the Department contracts with educational institutions, FFRDCs or nonprofit organizations in order to establish or maintain essential research, engineering or development capability (10 U.S. Code 2304c(3)).

We are aware that this authority is being utilized to support the essential research, engineering or development capabilities provided by educational institutions and FFRDCs. However, use of this authority to support the capabilities of other nonprofit organizations has been sparse and, as a result, we may not be accomplishing the objective of maintaining these valuable research resources. The perception that the burden of justification for such contract actions is too onerous should be minimized by the long term positive results gained from maintaining such research capabilities.

Contractual access to such organizations should be facilitated consistent with the intent and requirements of the Competition in Contracting Act of 1984 when it is in the interest of the government to do so.

[redacted]

Assistant Secretary of Defense
(Production & Logistics)

independent research and development (IR&D) and the mix of the IR&D and bid and proposal (B&P) cost pool (e.g., the potential decrease in innovation, and potential change in allocation of business resources due to competition).

b. Objective assessment of the unsolicited proposal, "broad agency announcement," and Small Business Innovation Research Program techniques, as contrasted with the "normal" individually defined and solicited R&D competition process, from the perspectives of large and small businesses, universities and not-for-profit institutions, to include a review of pre-CICA vs. post-CICA practices (industry and Government); treatment of proprietary data and other intellectual property; evaluation/selection/rejection of proposals; and quality of products.

c. Objective assessment of the future status and viability of not-for-profit organizations, to include Federally Funded Research and Development Centers, as competitive entities in the post-CICA context considering use of the current CICA exceptions to full and open competition (especially 10 U.S.C. 2304(c)(3) (FAR 6.302(a)(2)(ii)).

I will continue as the sponsor for this study. The Senior Advisor will be [redacted], Competition Advocate General, OASA(RDA). [redacted], Acting Deputy Assistant Secretary for Procurement will serve as the cognizant principal Deputy. The HQDA Staff Assistant will be [redacted], SARD

The study panel should be tasked as described above and should complete its work by 31 March 1988.

It is not anticipated that it will be necessary to go into "particular matters" as defined by Section 208, Title 18, United States Code.

Sincerely,

[redacted]

Assistant Secretary of the Army
(Research, Development and Acquisition)

1 September 1987

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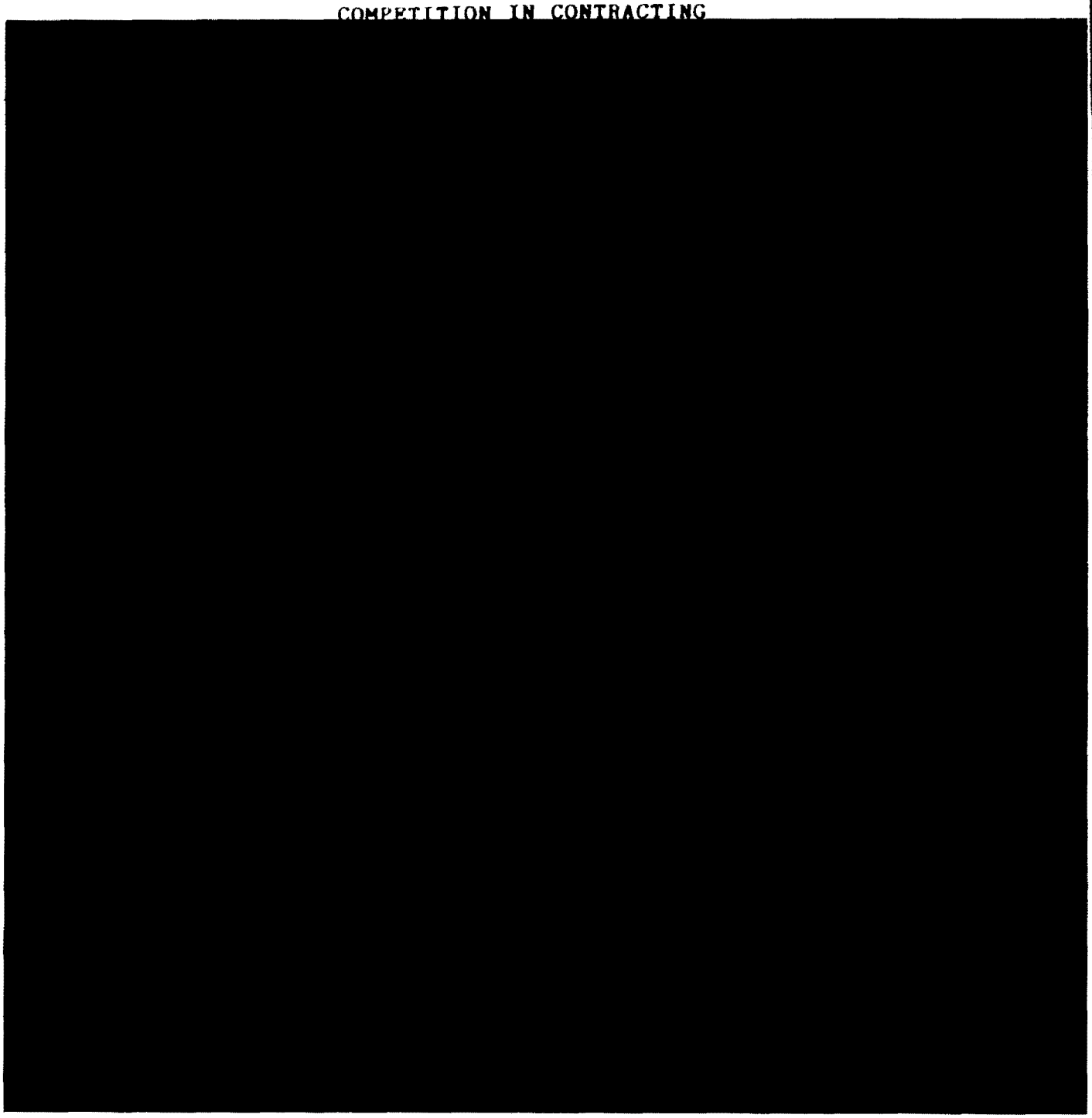
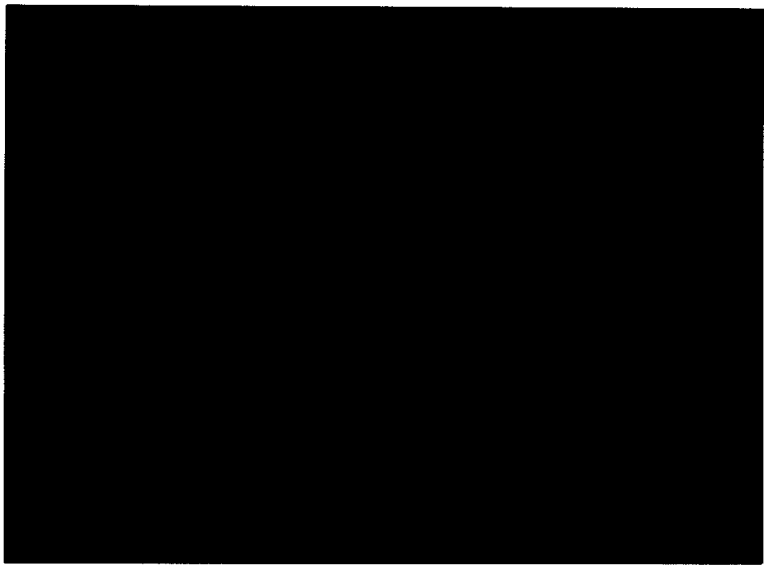
ON
COMPETITION IN CONTRACTING



APPENDIX B



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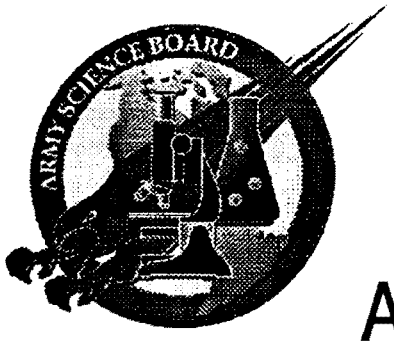

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ARMY SCIENCE BOARD

1995 SUMMER STUDY

FINAL REPORT

"THE TRANSITION OF TECHNOLOGY FROM THE TECHNOLOGY BASE TO THE CUSTOMER"

June 1997

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13. ABSTRACT (*Maximum 200 words*)

This study was tasked to review the Army's existing technology transition (T2) process, examine the T2 processes of industry and other government agencies, and recommend improvements to the Army's requirements process which could reduce "cycle time," costs, and risk.

The Panel's fact-finding mission uncovered several areas of concern: 1) although there is an abundance of useful technology, the Army lacks a coherent process that sorts the most promising technologies from the marginal performers; 2) the requirements process is largely insensitive to the many technological opportunities available, and often focuses on a "point solution" to a perceived problem; 3) the Army's Total Obligation Authority (TOA) has declined precipitously over the past decade, and now severely limits the ability to develop and field needed modern systems; 4) the current acquisition process results in expensive programs that are doomed to field obsolete equipment due to the length of the development cycle; 5) program turbulence resulting from technology revolutions such as digitization causes turbulence in the Army's overall acquisition program; 6) T2 successes usually result from a management structure that is outside the normal course of events.

The Panel has made several recommendations for a reengineered Army T2 process: 1) following industry's successful example, the Army should establish an Integrated Product Development Team (IPDT) consisting of representatives of all of the major stakeholders for every important program--this team would oversee a system from concept through fielding to life cycle maintenance; 2) industry's example of a two-step T2 process should be adopted as a three-step acquisition process by the Department of Defense (DoD) (currently a five-step process is in place); 3) Military Worth Metrics (MWMs) should be utilized to discipline the technology selection process; 4) virtual prototyping should be employed to produce definitive programs at Milestone II, eliminating the need for expensive full-development models; 5) a continuous design process for items in procurement and in the field, coupled with a flexible manufacturing facility, should be employed to allow insertion of new technology into systems and reduce development costs; 6) the acquisition process should be synchronized with the building of the Program Objective Memorandum (POM) to support one annual review and decision point (during the Army Systems Acquisition Review Council [ASARC] process).

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FINAL REPORT

"THE TRANSITION OF TECHNOLOGY FROM THE TECHNOLOGY BASE TO THE CUSTOMER"

JUNE 1997

AUTHOR'S NOTE

The Co-Chairs of this Study were fortunate to be given an exciting challenge to address. The need to improve our approach to the acquisition of modern technology has never been more important, and the continuing decline in Army resources will keep this problem before the leadership for years to come.

The team assembled for this task included many of the best and brightest from the Army Science Board, with representation from all critical communities. It was an honor to associate with these individuals.

The results speak for themselves. A series of recommendations are offered that would reshape Army acquisition into a much more efficient process—with the ability to maximize current technology in the hands of the warfighters within a very constrained budget.

While we recognize that implementing these recommendations will be a challenge for the Army leadership, we firmly believe the benefits far outweigh the pain.

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EXECUTIVE SUMMARY

With the end of the Cold War, the press predicted a peace dividend, based on the reduced need to maintain U.S. military forces. Since that time, the Army has found its forces spread around the world in numbers and locations unheard of during the Cold War. This radical change in both mission and available resources has created many challenges. This Study reflects the frustration of the Army's technology base community with its inability to move promising technology from the laboratory to the field. Upon examination, this is the direct result of the paucity of funding for new programs. There are/will be few new programs within available budgets; thus, the Army must be very selective in terms of those programs which it moves into development.

The technology base problem is but a subset of the overall acquisition dilemma. Once the Study Team came to this realization, it focused it efforts on improving the overall process. This begins with the statement of requirements, includes the evaluation of the relative worth of a program, and finally explores the incorporation of modern design and manufacturing tools into a reengineered process to equip the future Army.

The Study is broken into four major sections:

- A review of the Army's current technology transfer (T2) process;
- An examination of the processes employed by successful high-tech industries;
- A synthesis of lessons learned into a reengineered approach to the acquisition of Army systems; and finally
- A series of recommendations to implement the proposed process.

CURRENT ARMY PROCESS

The Panel's fact finding into the current Army T2 process is summarized below.

- There is more technology available than the Army can ever utilize. Fundamental problems include identification of the most promising technologies and incorporation of as many commercial products as practicable to minimize development costs.
- The world has a very robust arms market, with quality weapons offered by former Soviet bloc nations as a means of earning hard currency. Further, many European nations are offering high-performance missiles and quality electronics, particularly night vision equipment, which find their way into product improvements of existing systems or onto new weapons platforms.
- The Army has no orderly method of selecting and husbanding weapons from concept to fielding. With the many systems needed to equip a modern land force, it becomes critical that a force-wide evaluation be conducted to identify the most important capabilities—and

the greatest vulnerabilities. Branch parochialism has resulted in a force resembling a union of fiefdoms rather than an integrated whole.

- The Army, by its very nature, must be methodical in the training of its personnel. This very structured approach to combat makes it difficult for the organization to rapidly embrace new, revolutionary concepts. To minimize this inherent inertia, new tools are needed to allow the Army to experiment with new ideas—without the major investment necessary to field a new, untried capability.

- The advent of the Battle Laboratories and their partnership with the science and technology (S&T) community has afforded a remarkable learning opportunity. It has led to a much better understanding of the available technology on the part of the Training and Doctrine Command (TRADOC) and a greatly improved understanding of the Army's operational problems by laboratory personnel.

- Examination of the Army Science and Technology Master Plan (ASTMP) reveals that many of the programs expending resources are hopelessly out-classed and out-spent in the commercial sector. Many of the high-tech developments which were initiated by the military, including high-density semi-conductors, have been totally usurped by the civilian economy. Modest investments by the Army are unlikely to impact the future development of these technologies.

INDUSTRY REVIEW

In the see-saw battle for supremacy in the global economy, the world has seen the U.S. dominate during and after WWII, only to fall behind the war's "losers" as the Germans and Japanese became the major forces in the 1980s. Since that time, much of U.S. industry has reinvented the way in which it does business, to the point that this nation again leads the world in many or most areas. This reinvention of commercial industry has yet to trickle down to the Department of Defense (DoD), but four areas of reinvention offer great promise to the Army:

- Team Development—Industry has recognized that it is very inefficient to hand the development of a product from one constituent group to another. Today it organizes Integrated Product Development Teams (IPDTs), which develop the concept for new/ improved products, define the parameters of that product (the requirements), develop the product, and manufacture and maintain the end item. The engineers on IPDTs ensure that the marketers do not oversell the realm of the possible; the manufacturing personnel ensure that the product can be produced economically in quantity; the field support personnel watch for both inherent reliability and for designs which can be serviced in the field; and so on. It is a team approach that leads to the development of today's quality products.

- Two-Step Development Process—In the course of system development, industry has learned that it is necessary to have a go/no-go decision prior to production, at which time *all* unknowns must be resolved. Commercial products do not enter engineering development with critical technologies still "a few months off." This two-step process is designed to ensure that all high-risk areas are identified early in the process, and that they

are fully addressed prior to a production decision. Very few products are seen today that are not mature when they are offered in the marketplace.

- Computer-Aided Design (CAD) and Analysis—The dramatic increase in computer power over the past decade has afforded the opportunity to build high-fidelity models of very complex systems. The development of the Boeing 777 has illustrated the power of this approach. This design was carried from concept to a finished aircraft with no need for "hand-built" prototypes. It afforded the capability to sell an aircraft complete with training simulators, and supported early certification for transoceanic flight, with minimal flight test hours.

- Integrated Design and Manufacturing—The computer-based design of the 777 and many other commercial products allows the vendor to continuously modify and improve the design by incorporating new and/or improved technology. This capability to maintain a "state-of-the-art" design, coupled with a flexible manufacturing facility, lets the vendor evolve his product to increase its reliability, improve its capability, and/or reduce its manufacturing costs. Flexible manufacturing affords better, cheaper, high-performance products, as evidenced by many modern products (computers, laser printers, airplanes, etc.).

A REENGINEERED APPROACH TO SYSTEMS ACQUISITION

The Panel's review of the Army's T2 process as contrasted with contemporary industry practice led to the conclusion that a new way of doing business is in order. Reengineering the Army process is complex. It involves changes to every step, and to be truly effective requires that each element of the process be changed in concert with the whole. The recommended approach includes:

- Establishing an IPDT for every important program. The synergy available from a team representing all of the stakeholders has demonstrated its power both in industry and government. By conducting product development under the watchful eye of an IPDT, the intellectual starts and stops can be avoided, as well as the periodic reinvention of the endpoint.

- Adopting industry's two-step process, thereby establishing a firm decision point which reviews the entire program. There must be no "to-be-determined's" (TBDs) when the program transitions into production engineering. Too often, programs have moved through the Army Systems Acquisition Review Council (ASARC II) with the promise that the lagging technology would be ready next month, next year, etc. Programs that are maintained in a full-scale development mode are very expensive, and due to the lack of progress, are vulnerable to cancellation by decision makers outside the Army. Due to Congressional requirements for a formal review prior to volume production, the two-step process becomes three steps in DoD.

- Establishing consistent metrics. An underlying problem in justifying programs is the lack of consistent metrics by which to evaluate both the potential cost and benefits of the program.

A set of Military Worth Metrics (MWMs) is proposed, which evaluate a comprehensive set of parameters that relate to the utility, total life cycle cost, and maturity of the technology.

- Utilizing modeling and simulation capabilities; conducting a majority of system development in a virtual environment. The proposed process includes:

  - Concept evaluation in a hybrid simulation environment (e.g., Simulation Network [SIMNET], constructive models, sand table exercises, etc.). The purpose is to evaluate promising concepts and/or technologies to solve an identified need. The result is a generic Mission Need Statement (MNS).

  - System concepts are optimized in a high-resolution system model to define and refine all important system parameters. The result is a revised Operational Requirements Document (ORD), with much better specification of the desired system. The first two steps help to eliminate the "nice-to-have" concepts and identify the potential winners. The MWMs are refined to support the decision to move into a full, detailed design phase.

  - The system design is developed in a Virtual Integrated Design System (VIDS)—a CAD/computer-aided manufacturing (CAM) environment capable of design down to the nuts-and-bolts. The product of the VIDS is the Total System Description (TSD). This simulation-based analysis and development would be complemented by supporting technology demonstrations only when necessary. The need for a physical prototype of the system would be eliminated in most cases. This process follows the precedent of the Boeing 777 development.

  - Finally, candidates for engineering development are played in an annual war game to estimate their impact on the overall force capability. The MWMs are updated based on the results of these exercises.

  These steps lead to and fully support the Milestone II ASARC.

- Revising the requirements process. The current requirements process includes many voluminous documents which defy comprehension by the decision maker and the warfighter. The proposed simulation development will afford the end user the opportunity to observe the proposed system in a battlefield environment. The requirements are captured by:

  - The MNS as currently defined.

  - An ORD that is much more specific in defining the parameters of the desired system.

  - The TSD, which is the full engineering documentation necessary to build the item.

The current requirements documentation will need to be revised to reflect this more focused approach.

- Maintaining a continuous design environment. The Army has difficulty maintaining a high level of capability of weapon systems over their fielded life. The VIDS environment coupled with flexible manufacturing facilities supports the maintenance of a current design while incorporating the latest proven technology. By moving all significant programs into the VIDS environment, the Army can improve its fighting capability while at the same time refining the technology to reduce the cost of ownership.

- Synchronizing major programs with the Program Objective Memorandum (POM). The final step in this process, which the Panel believes will improve the "packaging" of the Army's overall program, is the synchronization of all programs to coincide with the development of the POM. By considering all major programs in the same time frame, within the context of a consistent set of metrics derived from MWMs, the Army can present a much more consistent picture of its goals. This focused approach to program development has been the hallmark of many successful Navy and Air Force Programs.

THE WAY AHEAD

A specific recommendation is made for each element of the proposed reengineered approach. These recommendations are:

- Establish an IPDT for all major programs in acquisition.

- Adopt a streamlined three-step acquisition process tailored to manage program risk.

- Implement a structured process to definitize programs at Milestone II, with primary reliance on hybrid simulation and MWMs.

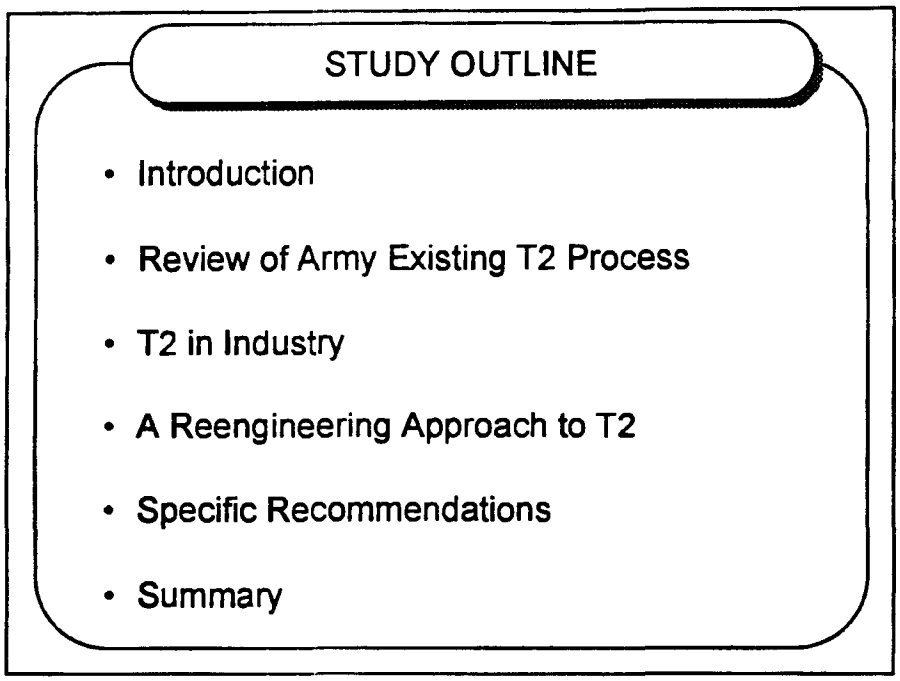
- Redefine the requirements process.

- Institute procedures for a continuous design process, employing VIDS.

- Synchronize the acquisition process with an annual consolidated ASARC.

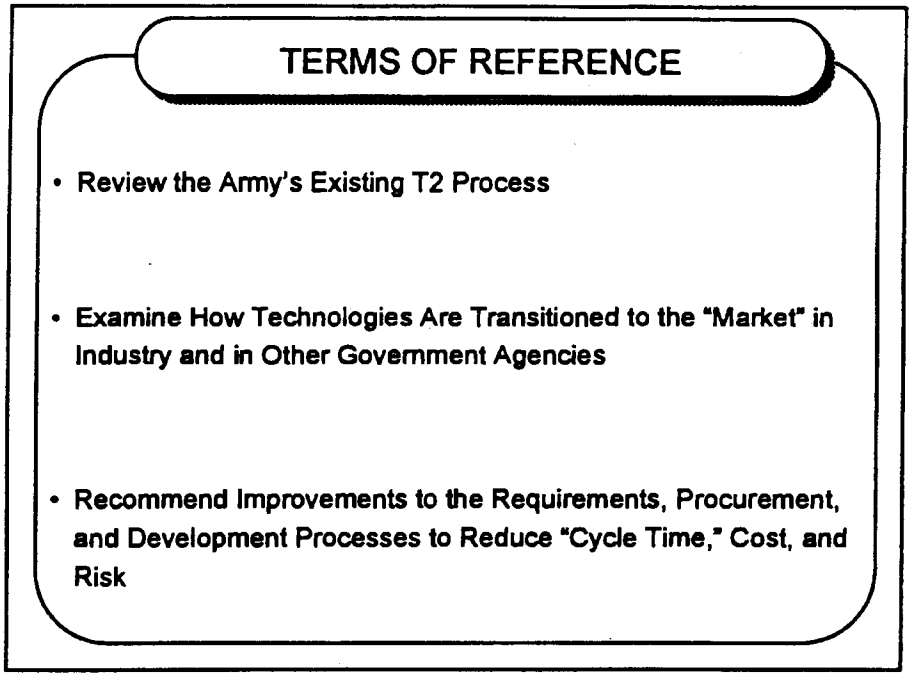
Many of the recommendations include a "tiger team" to flesh out the concepts presented above. Actions are assigned to various staff elements for the execution of the recommendations.

This is not business as usual. Early modeling will permit a much more exhaustive look at candidate solutions at a modest cost relative to overall system development. Early and continuous evaluation of relative worth can and will support the parsing of winners and losers, with major cost avoidance. And, finally, the move to modern design techniques and automated manufacturing will facilitate the rapid procurement of systems with high commercial off-the-shelf (COTS) content and reduced life cycle cost.



This Report is divided into six subject areas:

- The introduction presents the Terms of Reference (TOR), the personnel involved in the Study, and the Panel's definition of technology transfer (T2), along with an overview of the Study Group's fact-finding efforts.
- The Panel's review of the Army's current T2 process involved discussions with representatives throughout the Army and the Department of Defense (DoD).
- In identifying T2 processes utilized by industry, the Panel was able to hold in-depth discussions with industry leaders who have demonstrated the power of serious business process reengineering.
- Based on observations of the Army's existing T2 process and the industry's revolution, a reengineering approach is posited to significantly improve the Army's process, based largely on the industrial model. This approach improves the focus of the requirements process, enables the harvesting of good technology, develops detailed system design in a virtual environment, ensures the management of technical risk, and identifies and kills marginal programs early in the process to minimize wasted effort.
- A series of recommendations to enable the proposed approach are presented.
- Finally, a brief summary is given as a capstone to the Study.



The Study's TOR are paraphrased on the above chart. They direct this Panel to:

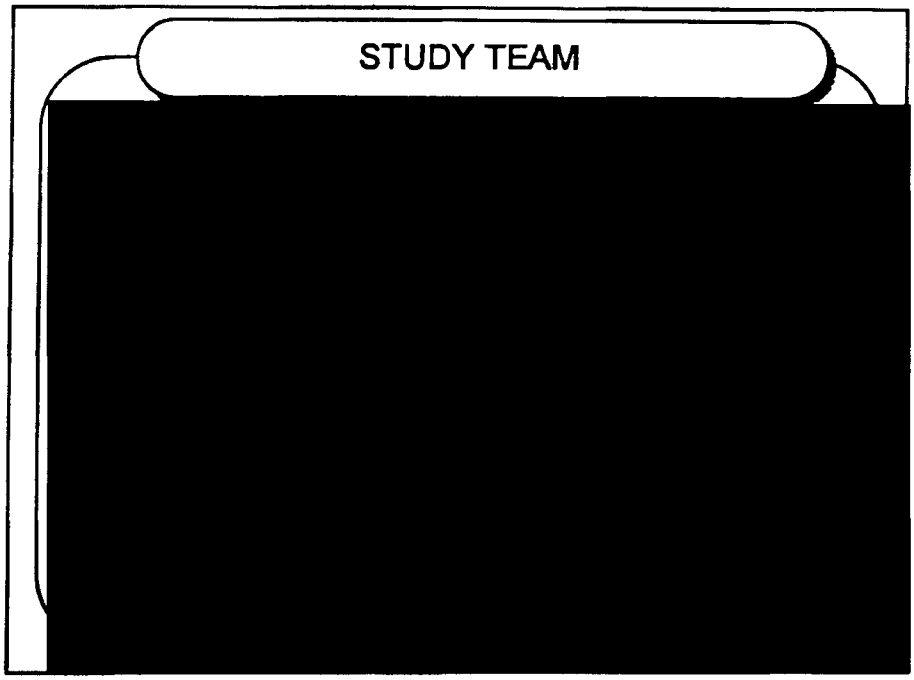
- Review the existing Army process for transitioning technology from the technology base to the customer.
- Identify all of the critical elements and organizations of this process.
- Examine the process by which technologies are transitioned to the "market" in industry and other government agencies.
- Recommend improvements to the requirements process which could reduce "cycle time," costs, risks, or improve other attributes. With regard to requirements, the Panel was asked to address:
    - The roles of materiel developers, combat developers and Battle Laboratories.
    - How to rapidly transition promising technologies and advanced concepts from demonstrations/experiments (i.e., Advanced Technology Demonstrations [ATDs], Advanced Concept Technology Demonstrations [ACTDs], Advanced Warfighting Experiments [AWEs], and Battle Laboratory Warfighting Experiments [BLWEs]) to the customer (i.e., the Program Executive Officers [PEOs] to the Program Managers [PMs] and thence to the warfighters).
    - Tailoring the requirements process for timely program approval.
    - Achieving timely approval of post-6.3 acquisition activities and funding within the Army and Office of the Secretary of Defense (OSD) staffs.

- Streamlining and tailoring simulation, testing and evaluation based upon ATD, ACTD, AWE, and BLWE results.

- Solutions and corrective actions that require Army, OSD, and/or Congressional approval.

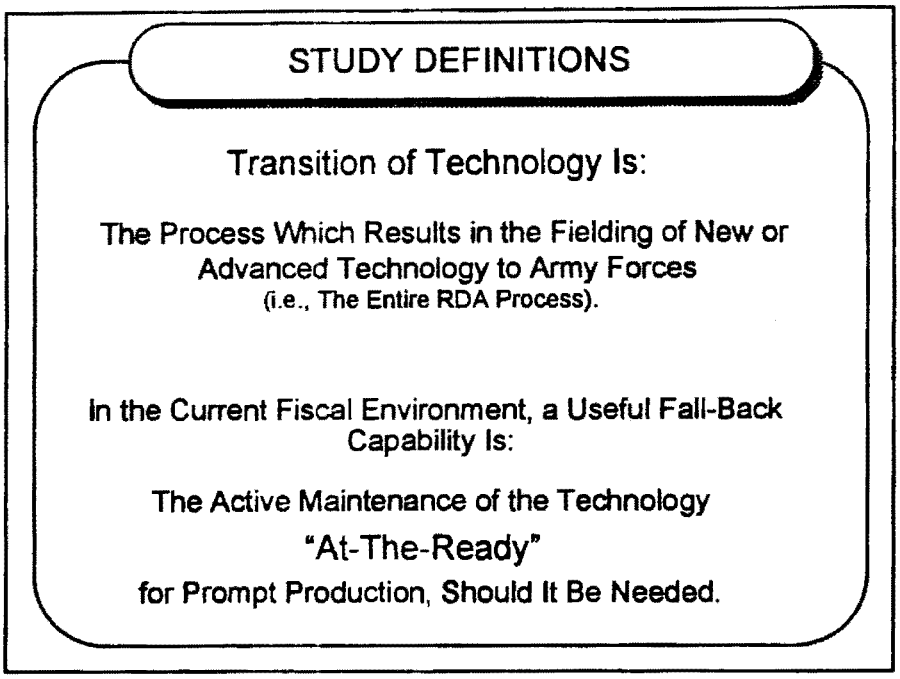
After extended discussions with the Sponsors and with other interested parties, the Study Team paraphrased the TOR to focus its efforts as presented. The complete TOR is included as Appendix A.

Based on the TOR, this Report is structured per the format discussed next.



The Study Team was fortunate to have knowledgeable and interested Sponsors and Cognizant Deputies, who lent their time and considerable experience to "pointing" the study in the right direction. Similarly, the Study Co-Chairs were fortunate to be able to lead a very august group of Army Science Board (ASB) members, including industry leaders, retired military personnel with both acquisition and operations experience, and former Army staff personnel and consultants. Finally, the Panel enjoyed truly excellent support from the Study's staff assistants.

During its initial meetings, Panel members did not find a consensus on the definition of T2, causing the Study Group to "invent" its own definition.

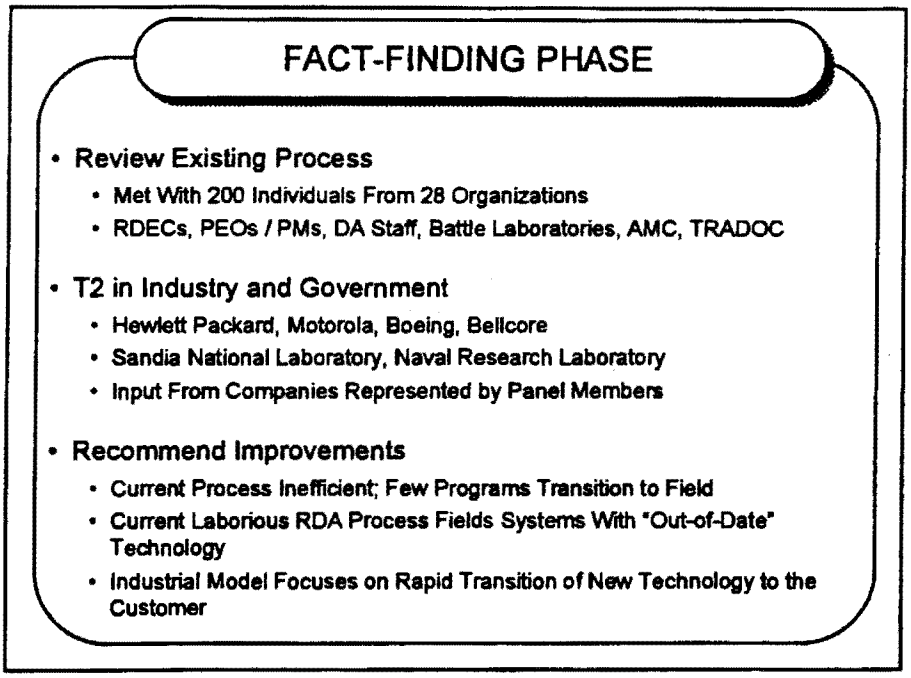


During the fact-finding process, the Panel discovered a number of very narrow, focused views regarding T2. For example, a research laboratory might be satisfied with the definition that T2 is accomplished when a technology is delivered to a Research, Development and Engineering Center (RDEC) and is no longer being developed in its own laboratory. Likewise, the RDEC declares success if the technology finds its way into an ATD. Although each of these steps represents a "transition" in the eyes of the researcher, it may or may not be a useful action for the Army.

Taking a more global viewpoint, the Study Team defined T2 in terms of placing technology/systems into the hands of warfighters.

A lesser, but still very desirable, outcome relates to the statement by the Secretary of Defense that it will be necessary to put the development and implementation process on hold by placing new technology "on-the-shelf." The Panel has interpreted this statement to define an intermediate status in which a system can be placed in dynamic reserve, kept ready for production by being continuously updated. This construct will be elaborated later in this Report.

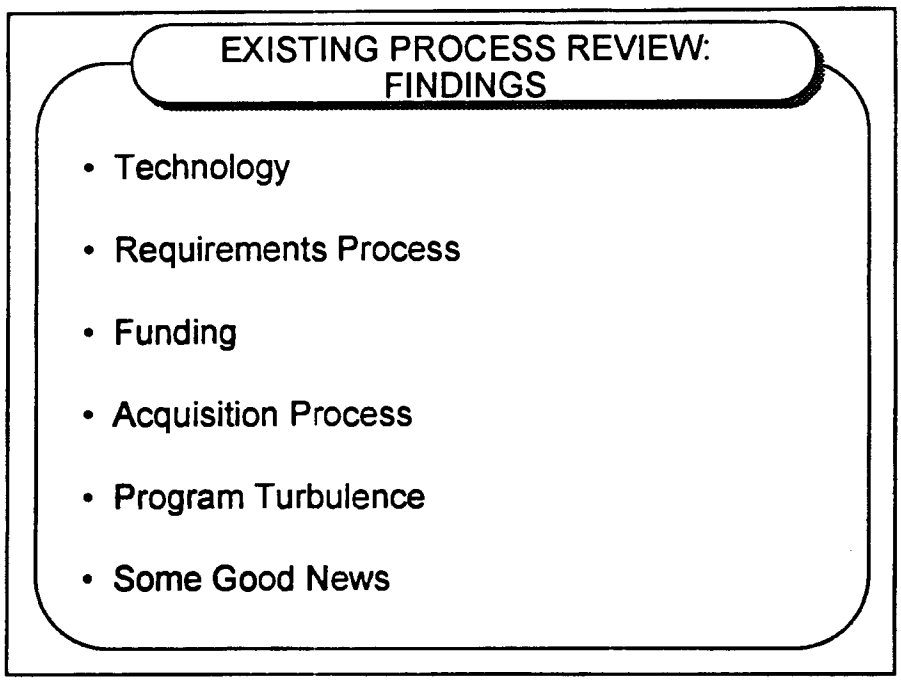
Given these definitions, the Panel then embarked on an exhaustive fact-finding mission.



In addressing the individual elements of the TOR, the Study Group held formal briefings at the Pentagon, with industry officials, and at the Battle Laboratories. The Panel also met one-on-one with individuals from such diverse organizations as the Lawrence Livermore National Laboratory, the Jet Propulsion Laboratory, and the University of Michigan Institute of Transportation Engineering and others. Use was also made of the experience of individual members of the Study Team. These meetings and the individuals involved are cataloged in Appendix C.

The synthesis of an improved T2 approach evolved over the course of the Study, with a major focusing of the Panel's views occurring during the Summer Study Session held in Irvine, California in June, 1995. There were three major drivers of the Panel's solution: 1) the need to improve the efficiency of the T2 process; 2) the desire to transition current technology to the field rather than obsolete technology that has been captured by the development process for a decade or more; and 3) the attempt to replicate the industrial model, which moves technology to the customers in months rather than years.

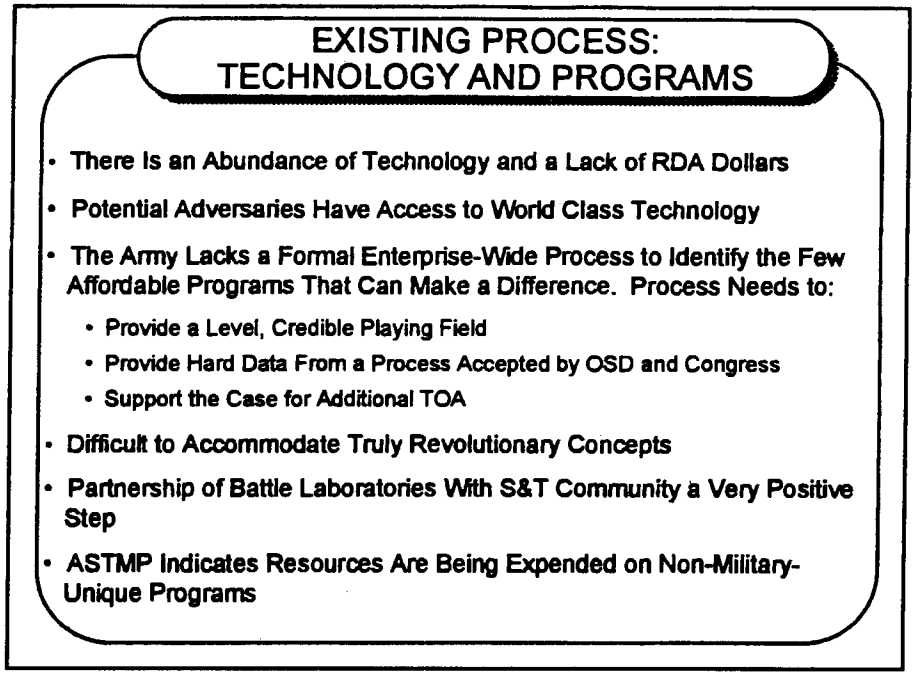
Presented on the following page are the Panel's six major findings with respect to the Army's existing T2 process.



As the Panel's review of the Army's existing T2 process evolved, six areas of concern were identified:

- There is an abundance of useful technology, but the Army lacks a process that sorts the real winners from the marginal performers.
- The requirements process is largely insensitive to the many technological opportunities available, and often focuses on a "point solution" to a perceived problem.
- The Army's Total Obligation Authority (TOA) has declined precipitously over the past decade, and now severely limits the ability to develop and field needed modern systems.
- The current acquisition process as defined in DoD Regulation 5000.1 and as implemented by the Department of the Army (DA) results in expensive programs that are doomed to field obsolete equipment by the very length of the development period.
- As is commonly known, there is too much turbulence in DoD programs. The Panel identified the usual areas and observed that current technology revolutions such as digitization also cause turbulence in the Army's overall acquisition program.
- The Panel also includes in this Study a number of observations of areas in which the Army has enjoyed great success in certain programs, almost always under a management structure that is outside the normal course of events.

Each of these topics is further discussed in the following pages.



Given the Army's extreme budgetary constraints, far more promising technology is available than can possibly be brought through the system to fielding. Further, there is technology in the commercial sector that could be purchased as ruggedized equipment. This commercial off-the-shelf (COTS) equipment could be bought in sufficient quantities to permit repair through replacement, greatly reducing the maintenance tail. Further, the practice of "shadowing" commercial capabilities, where the Army spends a dollar while the market spends thousands, is clearly not productive.

During the Cold War, the Soviet Union sold arms, but tended to sell "second-tier" systems. Although the Cold War is now over, Russia is continuing to use arms sales as a source of hard currency. In so doing, it sometimes sells its most sophisticated systems. For example, a T-84 tank is now available in the international arms market, if its price can be paid. Further, other nations will sell to the buyer of these tanks the forward-looking infrared radars (FLIRs), night vision goggles (NVGs), and other additions which improve their capabilities. These can be used to produce hybrid systems of high capability in time frames on the order of a year or so.

In a regional conflict, the United States could face hybrid systems in the hands of a foe that are roughly comparable to its own. Further, the adversary could choose the venue so as to use a few sophisticated weapons to repulse a beach head, for example. Even if this were unsuccessful, the enemy would probably have the benefit of a much shorter logistics tail than that of the U.S. for subsequent battles.

The 1994 ASB Summer Study, "Capabilities Needed to Counter Current and Evolving Threats," provided an exemplary "watch list" of items and sales in the international arms market. However, even noting such sales is not enough for the Army to remain competitive with possible opponents. The Army's present system does not allow for the transition of technology in a time frame less than or even equal to the previously mentioned one year for the production cycle of

hybrid systems. The Army currently cannot "turn inside" possible innovation by competitors. Thus, the end of the Cold War has not meant the end of the arms race; rather, it has meant that a few identifiable players have blossomed into many possible participants.

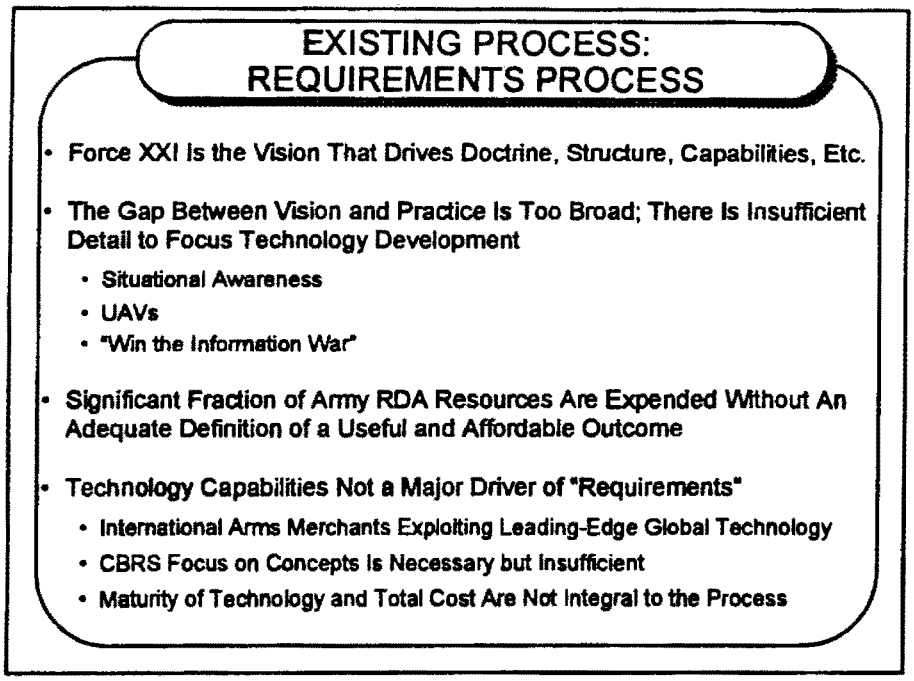
A perception gained by the Panel during this Study is that the process for technology selection in the Army has not been revised to reflect significant changes in the Army's mission and resources. The Army lacks a comprehensive, coherent, consistent and merit-based selection process which is synchronized with the annual budgeting cycle. Such a process would provide a level, credible playing field on which all proposals would be evaluated and compared. The hard data provided by this process would allow OSD and Congress to support additional TOA.

As is often the case when searching for new solutions, truly revolutionary products and doctrine are only reluctantly accepted. In the Army's case, the fighting force must be prepared for a "come-as-you-are" war. Therefore, any proposed changes to the Army's current T2 system must maintain at least the same level of efficiency in weeding out neat-but-impossible new technologies, yet be better at accepting revolutionary concepts that would ultimately provide a quantum enhancement in warfighter capabilities.

The Battle Laboratories represent a credible attempt to overcome the "stove-pipe" structure of the Army's listing of development priorities imposed by the various branches within the Army. However, a jaundiced observer might examine the research, development, test and evaluation and acquisition (RDTE&A) priority lists and determine that the rankings therein are a composite of the top items from each branch. In the current era of diminished resources and collapsing time scales, what is needed is an Army-wide priority list that supports the Army's total warfighting doctrine. An important outcome of the Battle Laboratory system is that the RDECs are supplying technical support to the laboratories, resulting in the important cross-fertilization of the operational and technical communities. This joining of talents can result in a more focused approach by both sets of organizations.

The Panel found elements in the Army Science and Technology Master Plan (ASTMP) which indicate that resources are being expended on non-military-unique programs. This finding was corroborated to a limited extent by some of the discussions held with representatives of the Army's research and development (R&D) organizations. This subject was further evaluated as an element of the ASB's study on "Reengineering the Acquisition and Modernization Processes of the Institutional Army," conducted in 1996 for the Secretary of the Army (SA) and the Chief of Staff, Army (CSA).

As discussed in the following pages, the abundance of technologies is currently interfacing with a lethargic Army requirements process that lacks the rigor to identify those few critical needs which do fit within the available budget.



Force XXI articulates the vision of the Army of the future. This vision drives doctrine and leader development, as well as the structure and required capabilities of the force.

While the potential capabilities offered by technology are considered in the vision's formulation, there is a significant gap between the vision statement and the application of technology to a specific area. An iterative dialogue between the user(s) and developer is generally necessary to capitalize on the potential of technology to meet a specific military requirement. Current examples of this problem include:

- *Situational awareness.* What data are needed by whom? What shall be the size of the area of operations? How current, how precise must the data be? What echelons are to be covered?...to be skipped?

- *Unmanned Aerial Vehicles (UAVs).* What are the missions? Who should the operators be? Who manages the tasking? Are they surveillance platforms, do they direct weapons, or do they carry warheads? The Aquila fell victim to these and other questions and the program failed, largely due to the lack of a clear mission focus.

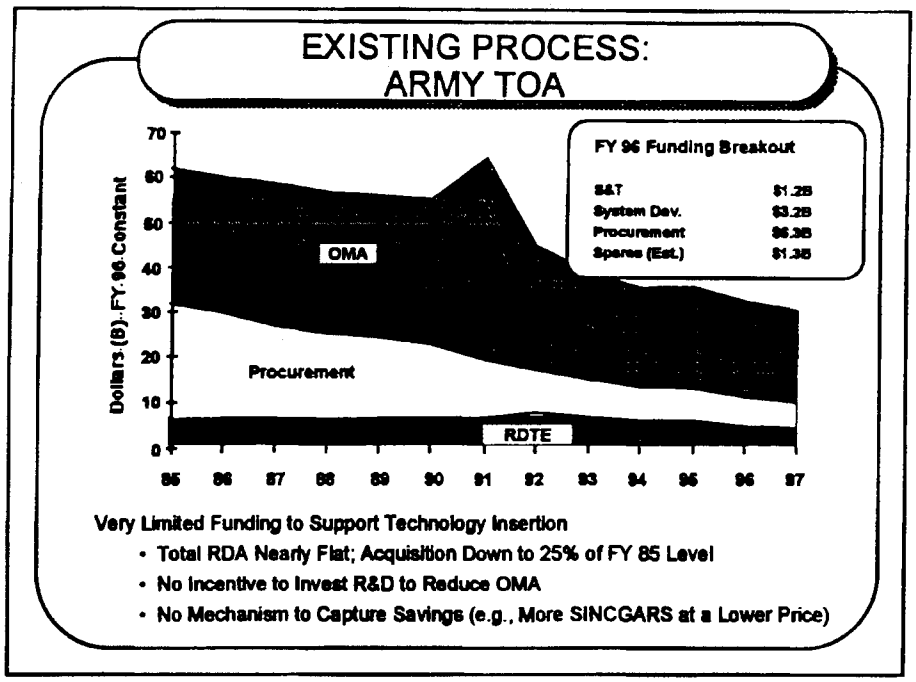
- *Win the information war.* What is the objective? What are the criteria for victory? How can success be determined? As the understanding of the objective is fuzzy, development efforts lack coherence, despite the efforts of the Army Digitization Office (ADO).

Under the present system, with its extended acquisition time and the high cost of implementing new technologies, not many programs will reach the field. Instead, it will require irresistible technology-push to produce a few improvements in existing platforms.

The Panel's review of the global threat to U.S. forces indicates that international arms merchants are making excellent technology rapidly available to potential adversaries. For example, better night vision devices (NVDs) are available in the international arms bazaar than are deployed to U.S. forces. Compounding this, an adversary does not necessarily have to maintain a global advantage. Thus, the availability of weapons in the international arms bazaar can dictate the technical sophistication of the threat the U.S. could face. Further, an adversary can choose when to arm himself with modern weapons, and then confront the U.S. in an environment of his own choosing. Given this situation, and the lengthy, cumbersome acquisition process currently used by the Army, U.S. forces could be relegated to an inferior posture in future conflicts.

The Concept-Based Requirements System (CBRS), and the revised requirements determination process, is necessary but insufficient. This process is not responsive to the current environment and does not facilitate the rapid transfer of technology to the warfighter. The rate of technological change, and hence the rate of obsolescence, is greater than the time needed for a program to successfully negotiate the CBRS/Planning, Programming, Budgeting, and Execution System (PPBES) cycle. This is especially true with systems which contain extensive information processing and/or electronics technology. Similarly, in the armor/anti-armor arena, changes are rapidly occurring in armor package recipes, penetrator design, missile sensor design, warhead design, and active and reactive protection systems. Adhering to the current pedantic processes results in trailing-edge technologies reaching the field. Further, due to the duration of the process, there is always a mix of systems with high and low technology present in the field. However, the rapid technological advances available in the international marketplace have meant that leading-edge technology can be sold to whomever has the money to buy it, as the international market is driven by technology and the profit motive. This gap between what is available in the international market versus what is in the hands of U.S. troops is a major concern, especially as DoD programs are stretched and pushed further to the right. Technological potential does not drive the Army's requirements process. The dynamics of the CBRS/PPBES processes need to be synchronized with the global rate of technological advancement.

Future technological capabilities must have a stronger impact earlier in the requirements process. Technology needs to be considered a co-equal driver with the concept. Some of the approaches used by the U.S. Air Force (USAF) in leveraging technology could be useful if appropriated into the enhanced CBRS. Further, mechanisms must be in place which can define the trade-off between, for example, "one more mile-per-hour" and a 20% increase in the cost of the item. The affordable "90%" solutions to the Army's needs must be found.

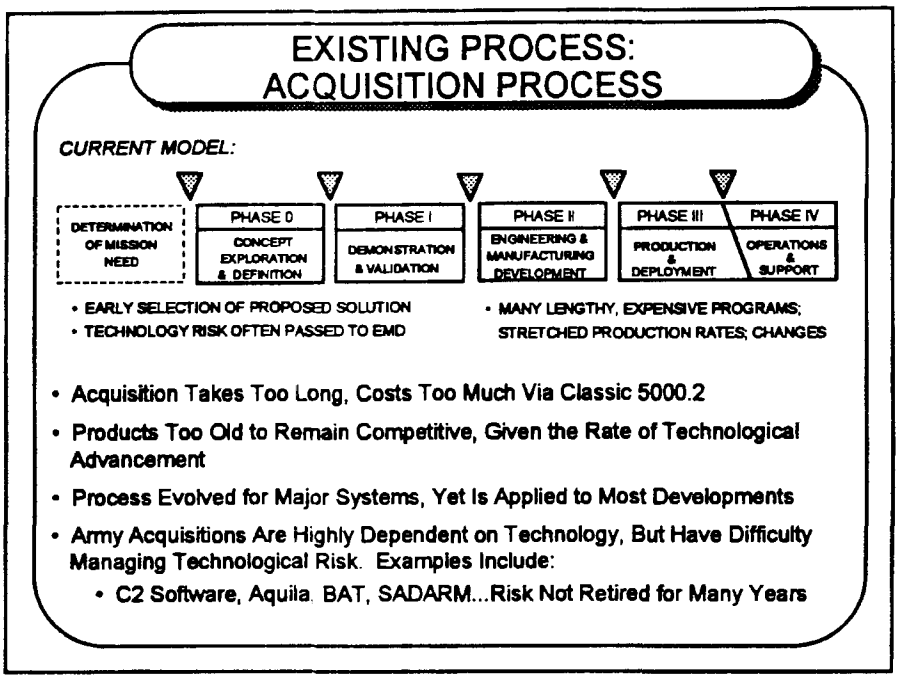


Over the past decade, the magnitude of the Army's TOA has declined dramatically. In an effort to maintain a viable technology base, research, development, test and evaluation (RDT&E) funding has been protected at a nearly constant level. Where the ratio of procurement to RDT&E dollars was 4:1 in the 1980s, it is 1:1 today—and will be for at least the next two years. Because the Other Procurement, Army (OPA) is insufficient to fully fund those systems already in procurement, there is little or no money to fund technological "targets of opportunity," no matter what they might add to warfighters' capabilities.

Operations and Maintenance, Army (OMA) expenditures continue to account for more than $20 billion; this represents a large target of opportunity. In theory, reducing OMA by improving the quality and reliability of weapon systems could provide funding for research, development and acquisition (RDA). However, there is no mechanism to capture any of these savings and, as a result, there is no incentive to invest RDA dollars to reduce OMA costs.

During a recent procurement of the Single Channel Ground and Airborne Radio System (SINCGARS), the unit cost of the radios was less than anticipated, resulting in unobligated savings. Rather than reward the Army for the efficient buy, DoD reclaimed the savings, further removing incentives for future economies.

The bottom line is that it is essential to maximize the benefit from truly scarce funding resources. Unfortunately, the Army's current acquisition process squanders money unnecessarily.



Under the current interpretation of 5000.2, the development process is both lengthy and expensive. It is characterized by a series of relatively independent phases, often with new PMs and vendors. This repeated change of leadership, compounded with the normal rotation of other military personnel involved in shepherding the program, results in the loss of lessons learned and the need for "on-the-job-training" for many of the new personnel.

Often, the solution to the military need is selected early in the process, without adequate consideration of other technical alternatives, with unidentified technical risks, and with a very limited analysis of the overall costs involved in the development and fielding of the item. The result is a development process which spans ten to twenty years, with high expenses associated with the maintenance of a major program office and with the vendor(s) staffs, as well as the inevitable improvements in technology which render the original design obsolete.

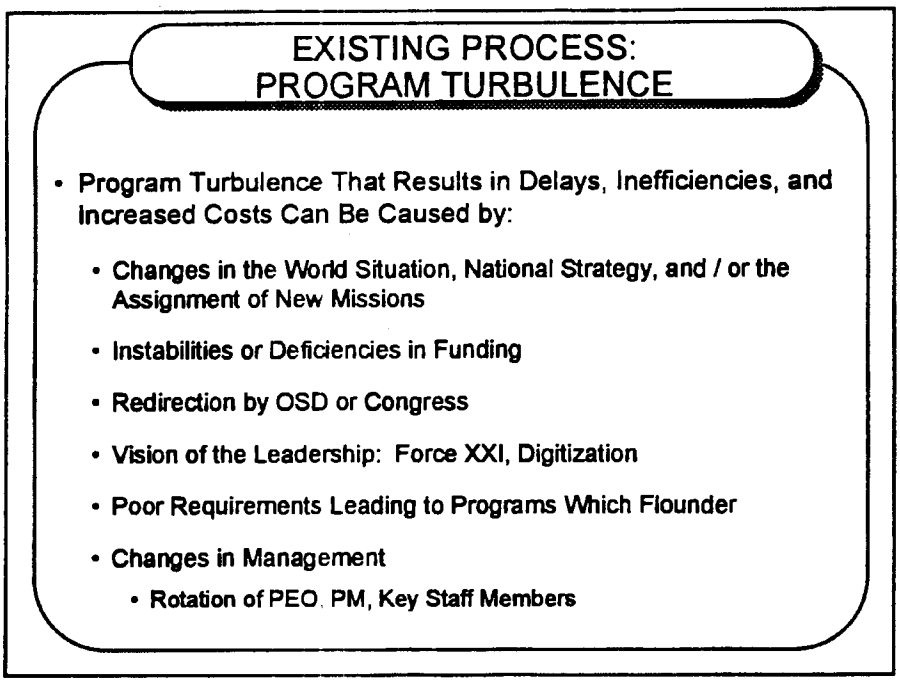
This technology gap leads management to institute running engineering changes (e.g., redesign) at great expense—or else the Army finds itself with equipment which is far from the state-of-the-art. Further, the desire to incorporate the latest technology is often undertaken without adequately evaluating the maturity of that technology. This turbulence leads to program stretch and concomitant cost overrun.

A further result of this lengthy process is the fielding of systems which incorporate obsolete technology. This was a major problem early in the fielding of the Vehicular Radio Communications (VRC)-12 series of radios, when the germanium transistors utilized were no longer available and the design had to be revised to replace them with silicon devices. In an attempt to stay close to available computer technology, the command, control, communications and intelligence (C3I) community has established the common hardware/software program; however, the acquisition time associated with this "nearly COTS" procurement still provides products which are less current than those available at a computer store.

The process described in the above figure has evolved over many years, with primary focus on the development and procurement of major systems. Many of its features were instituted by well-meaning managers to reduce/eliminate waste, fraud and abuse. The application of all of the attendant rules and regulations defy the efficient procurement of military systems, large or small.

Most, if not all, Army system acquisition is highly dependent on technology. The frequent reviews required in 5000.2 imply that technological risk should not be a problem, but this is not the case. Often, in the press to stay on schedule, a PM will argue that the technology is progressing satisfactorily and will be ready in months. However, if the example of multi-level security is reviewed, that claim would be found to have been made tens of times each year for the past decade, yet that technology is still not available. There is no requirement in the current process to demonstrate that technology is in-hand and producible, and that is a major shortcoming. The examples given in the above figure illustrate the difficulty of completing system development with immature technology and/or soft requirements. For example, the Brilliant Anti-Tank (BAT) sub-munition relies on acoustic homing for its initial acquisition of the target. A multi-billion dollar program was launched in the mid-1980s to deliver the BAT, before the acoustic technology was proven. Now, some fifteen years later, the weapon remains in engineering and manufacturing development (EMD). Likewise, the Sense and Destroy Armor (SADARM) warhead had demonstrated devastating effects in the early 1970s. It was assumed that the sensor technology to acquire targets from a sub-munition was straightforward, and a major program was launched to "weaponize" SADARM. After many years in R&D, low-rate initial production (LRIP) commenced in 1995. These carts were ahead of the horses.

The net result of this protracted acquisition process is that cost and schedule overrun are the norm, systems are antiquated by the time they reach the field, and it is frequently difficult to maintain the old technology.



Changes in almost any program cause delays and increase costs. Many of the changes the Panel examined are a result of events that to some degree are beyond the Army's control. These include shifts in world events, national priorities, national strategies, and mission assignments.

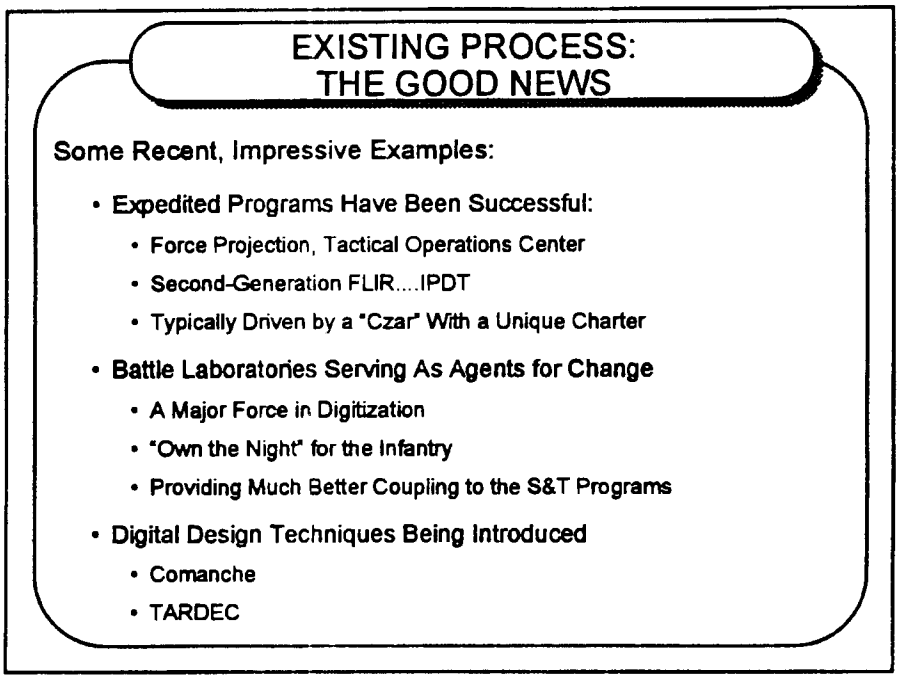
Further, the vagaries of funding frequently impact the planned orderly execution of programs. And although turbulence can be created by Congress and the OSD staff, many of its causes are in fact within the Army's realm of control.

Changes in Army leadership can lead to changes in both vision and direction that result in the restructuring of programs. The development of the digitization concept by General Sullivan, then Chief of Staff, has caused considerable turbulence, as funds have been allocated to the development and field trials of Task Force XXI at the expense of other approved programs, many of which have since slipped or been cancelled. This is not to belittle the digitization program, rather to point out that even the best-intentioned changes can and do disrupt the "established program."

The Army is well aware of the importance of technology in its systems; however, CBRS is technologically naive in selecting those technologies which are most likely to produce adequate, effective systems. Because of this, requirements tend to be loose at the beginning of programs and are tightened—at great expense in time and money—as programs move through the process. Further, initial requirements may be set that are beyond the ability of technology to satisfy or are not physically possible. Later, these requirements are relaxed to match technical and physical reality. These and other difficulties produce program turbulence that can lead to program cancellation.

The rotation of PEOs, PMs, and key staff members almost always results in program changes, as deficiencies are recognized and overcome. In most of these cases, the changes are rationalized

by the perceived improvements in the program or system that is obtained. One method of handling troubled high-priority programs is to tax other programs which exist in the same PEO structure, resulting in program stretch. This practice should be stopped and replaced with the cancellation of lower priority programs, even if those programs are successful.



Recently, there have been some excellent examples of acquisition programs or fragments of programs that have done very well. Programs have produced systems with high utility (they are not "gold-plated") in a minimum amount of time at a relatively modest cost. Expedited programs continue to represent a successful means of rapidly satisfying needs with solutions based on modern technology. The limited buy of the Force Projection Tactical Operations Center (FPTOC) by the Space and Strategic Defense Command (SSDC) resulted in a system that employs current COTS technologies that are being fielded within a period of months at a very low cost. Another example is the Second-Generation FLIR acquisition, which has made effective use of an Integrated Product Development Team (IPDT) and the horizontal integration approach.

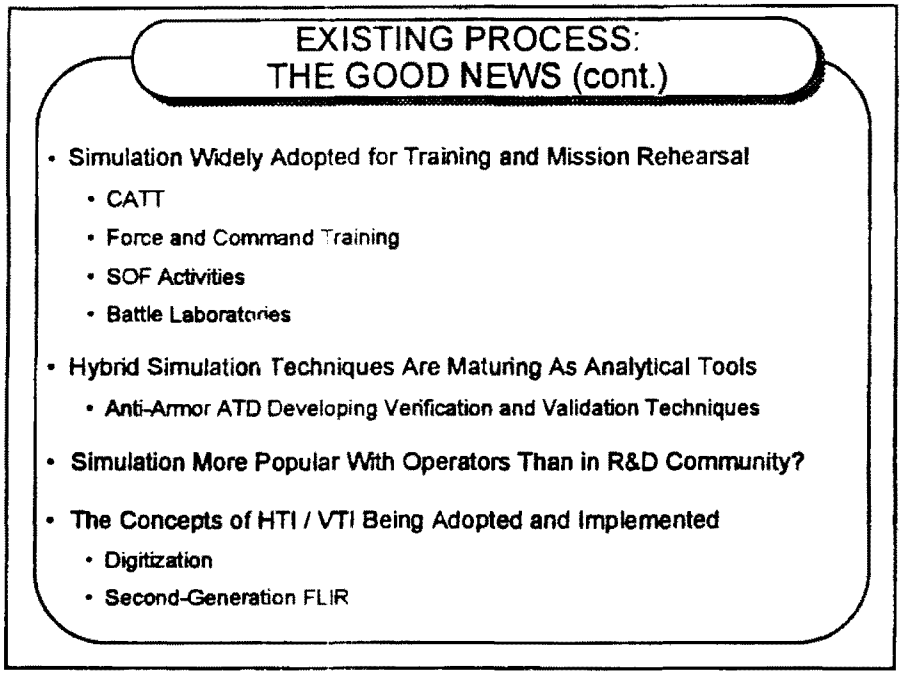
Typically, these expedited programs are driven by a "czar" with a unique charter and a high-level "corporate" sponsor. It is likely there will be a continuing need for exceptional, expedited programs regardless of what is done with the mainstream acquisition process.

The Battle Laboratories have become agents for change. They have been a major force driving the digitization program, with the Mounted Battle Laboratory at Ft. Knox leading the charge in the extensive experimentation. Working effectively with the Night Vision Laboratory, the Dismounted Battle Laboratory has developed and demonstrated the necessary equipment set and tactics, techniques and procedures (TTP) for the foot soldier to "own the night." A most important result of the Battle Laboratories' activities has been the greatly improved linking of the Army's R&D community and its contractors with the Training and Doctrine Command (TRADOC) user representatives

Digital design techniques are being effectively used by some programs. Examples include the Comanche Program Office and its developers, and the Tank Research, Development and Engineering Center (TARDEC). TARDEC's coupling of computer-aided design (CAD) with dynamic simulation is demonstrating the promise of minimizing or eliminating design errors and

optimizing the soldier interface early in development, significantly reducing the total cost and time needed to produce a new system.

The end result of these activities is that more effective systems are being produced in shorter time periods while costing less.



The increasing use of simulation throughout the Army illustrates the potential of the rapid definition and design of new and improved weapon systems for the warfighter. It has become an effective, widely-used tool for training. Recent advances have tied the constructive simulations used to train command staffs with the distributed virtual simulations used to train crews, and integrated these into live-fire exercises. The results of this use of simulators and simulations for training has been an increase in the duration of training, reduced costs (OMA expenses), and better trained units.

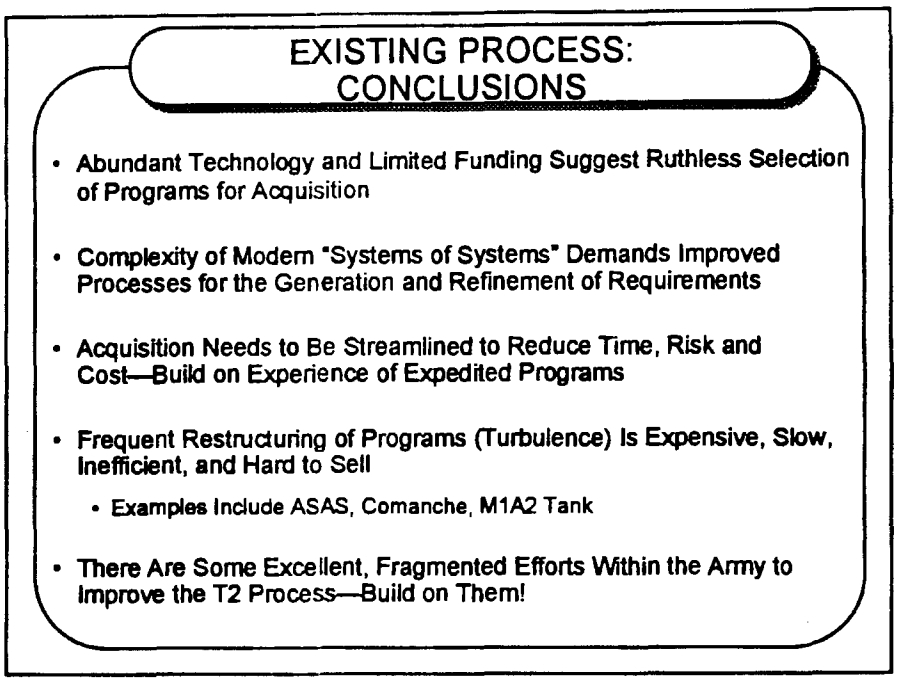
Simulation techniques have not been widely exploited in system development; however, this is changing. As previously indicated, TARDEC is employing simulations as part of its design process. The anti-armor ATD is developing verification and validation techniques for simulation-based evaluations. The capability to evaluate a proposed system (or modification) in a simulation environment has three benefits: 1) the simulation is much cheaper to develop than an actual hardware prototype; 2) the evaluation can be conducted with a significantly smaller cadre of troops at a reduced cost; and 3) because of the diminished burden, the evaluation can be more exhaustive, to include more trials and/or an evaluation of different system configurations.

It is clear that simulation coupled with digital design techniques provides the means to significantly reduce the time and cost needed to develop systems. Further, the success of simulation to date indicates that these techniques can lead to a product better matched to the needs and abilities of the troops in the field.

The adoption of horizontal and vertical integration philosophies provides significant opportunities for cost and schedule reductions. These are now being realized in the digitization program, with the commonality of appliqué hardware and the use of common software, both for the appliqué and as embedded software on existing weapon platforms. The Panel believes the

results of the Second-Generation FLIR Task Force should be viewed as a case study of how to succeed in horizontal technology insertion (HTI).

The Panel's evaluation of the Army's existing T2 process led to five distinct conclusions, discussed in the following pages.



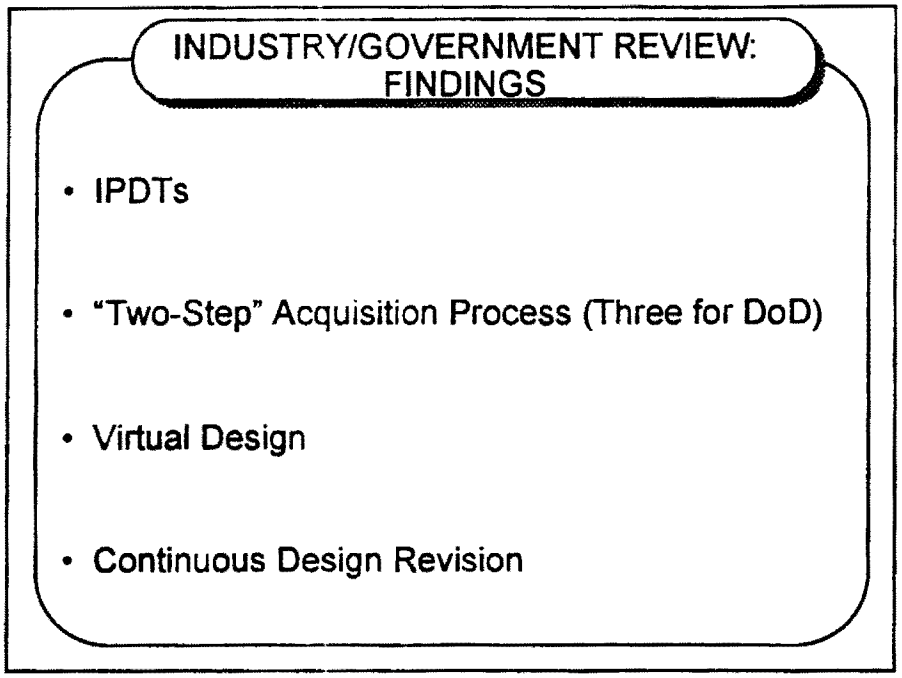
The abundance of valuable, applicable technology and the limitations on Army procurement dollars argue for an extremely parsimonious approach in launching and supporting new programs. The process of proposal evaluation must be thorough and ruthless. Limited dollars must be expended only for those capabilities which can make a significant difference, versus those which may be nice, but which will yield only a marginal contribution to the force. Once the Army is getting the maximum return on its scarce dollars, it can then make an irrefutable case for additional RDA and TOA funding.

The increasing complexity of modern weapon systems and the growth of the information age has led to very complex systems of systems. The intellectual challenge of defining the interrelationship of the many components calls for a new way to describe the expected performance of the composite system, as well as the interrelationships among the various elements. The struggle to develop and field the Army Tactical Command and Control System (ATCCS) offers ample proof that the current requirement system is woefully inadequate to the task.

The extended development cycle endemic to current acquisition programs is unaffordable. The acquisition process must be streamlined and disciplined to rapidly produce effective systems, and to kill those pretenders which consume valuable resources but which cannot or will not provide a significant improvement in force capability.

The prevalent turbulence in development programs is partially to blame for the program stretch discussed above. The Congressional and OSD comptrollers are always prepared to take money from programs that they sense do not enjoy full Army support. The restructuring of programs, drawn-out schedules and inefficient development are hard to sell to the Army's "masters." The extended time lines of programs such as the Maneuver Control System (MCS), the All Source Analysis System (ASAS), Comanche and the M1A2 Tank do not project the image that the Army's program is well focused.

As previously noted, there are some excellent initiatives in the development community today. It is important that the success of these programs be captured and institutionalized within the Army procurement process—the Army must build on its recent successes.



As the second step of executing the TOR, the Panel reviewed the process by which industry and to a lesser extent other government agencies conduct T2.

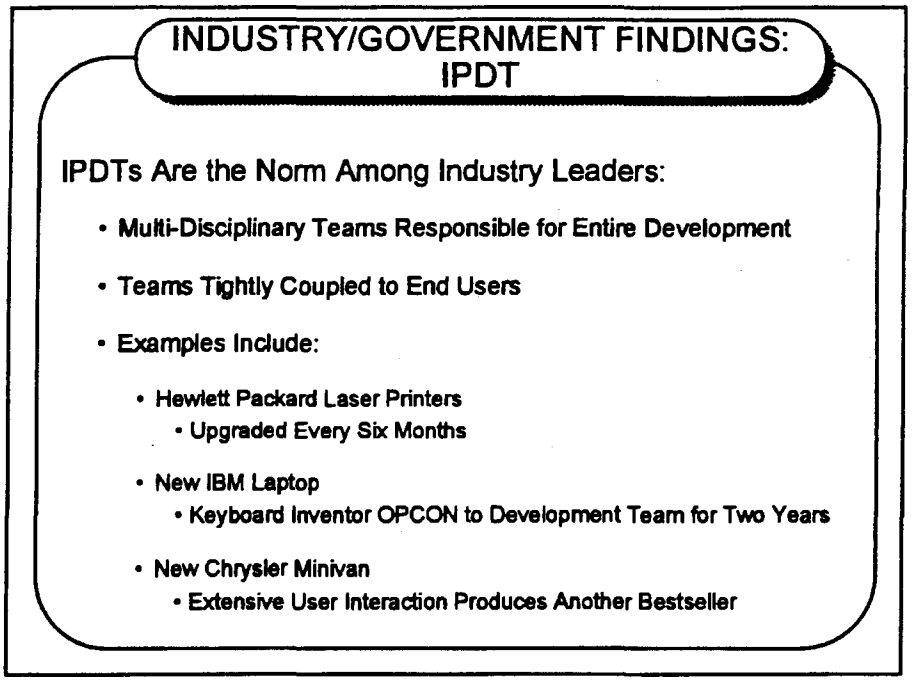
A common ingredient of most, if not all, programs examined was the establishment of an IPDT to shepherd development. These teams are comprised of all those organizations which have a stake in the outcome, and they are given extraordinary responsibility for program execution. They are success-oriented, with minimal second-guessing from the sidelines.

Industry practices what the Panel has dubbed a two-step acquisition process. Step one is the definition, design, and development of the system, and the verification that the necessary technology is mature. Only when the team and the PM or the proponent can certify that both the design and the technology are mature is the decision made to move to manufacturing. As this Report will later show, this translates to a three-step process in DoD, given the Congressional direction to "prove the system performance" in an operational test prior to full production.

As the computational capabilities of modern computers are more fully exploited, industry has learned to design and develop complex systems in a virtual environment. The lead horse in this process has been the very successful Boeing 777 aircraft.

A side benefit of the virtual design process is the flexibility it provides for future design improvements at minimal cost. The manufacturer is afforded the opportunity to conduct continuous design revision to improve the product, increase its reliability, reduce the cost of ownership, or extend the operational envelope.

The Panel will expand on each of these points in subsequent pages.



With the recent revolution of manufacturing processes in the U.S., IPDTs have become the norm among industry leaders. These multi-disciplinary teams include dedicated representatives from all of the stakeholders, and are responsible for the entire development process, from the definition of a business opportunity through the development of a product, its manufacture, and its support throughout its useful life. IPDTs have cradle-to-grave responsibility. An important element of their success is the tight coupling to the end-user through continuous user representation.

Examples of successful IPDTs abound:

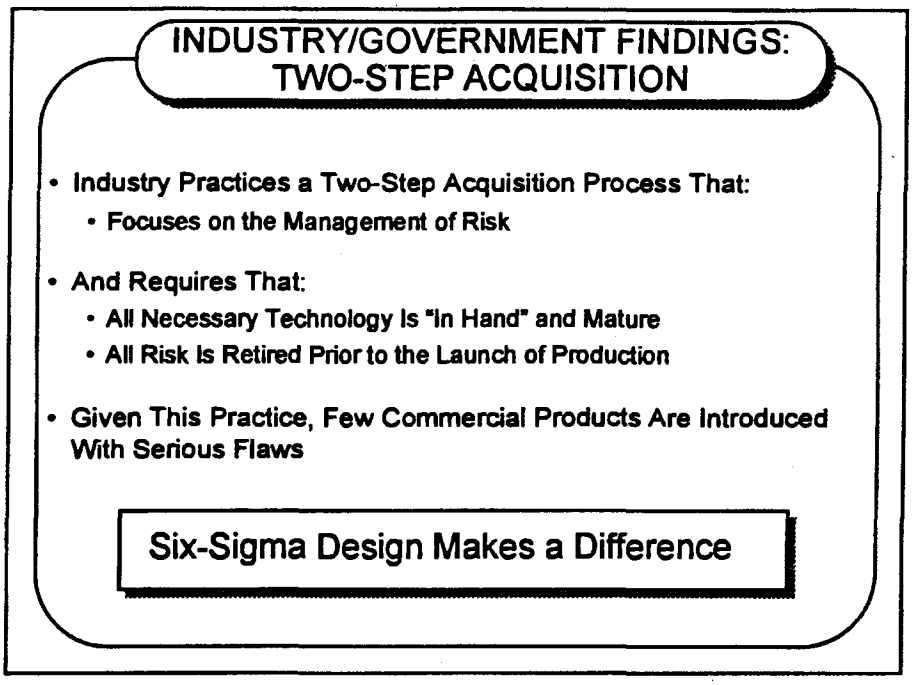
- Hewlett Packard uses IPDT concepts in the design of its laser printers, which are in a continuous development cycle. A new version of the printer, or a new printer, is released every six months. Each version of the device has a full IPDT. The result has been a dramatic decrease in the cost of these complex devices, with ever-increasing functionality and reliability over the decade they have been in production.

- Motorola, which uses comparable continuous development concepts, is moving to a similar process for most or all of its commercial products.

- In the development of IBM's unique Butterfly folding keyboard for the ThinkPad 701C, the mechanical engineer who invented the keyboard was assigned to the development team for two years to ensure that the vision was translated into a proper design.

- The latest (reengineered) version of the Chrysler Minivan made extensive end-user participation an integral part of the product development process, and Chrysler is reaping substantial rewards for its effort. The inventor of the minivan has remained the leader in minivan development.

These IPDTs consist of technical and managerial personnel who design, engineer, evaluate, and produce the virtual system. The number and type of team participants vary with each system, but the inclusive nature of the team is paramount to success.

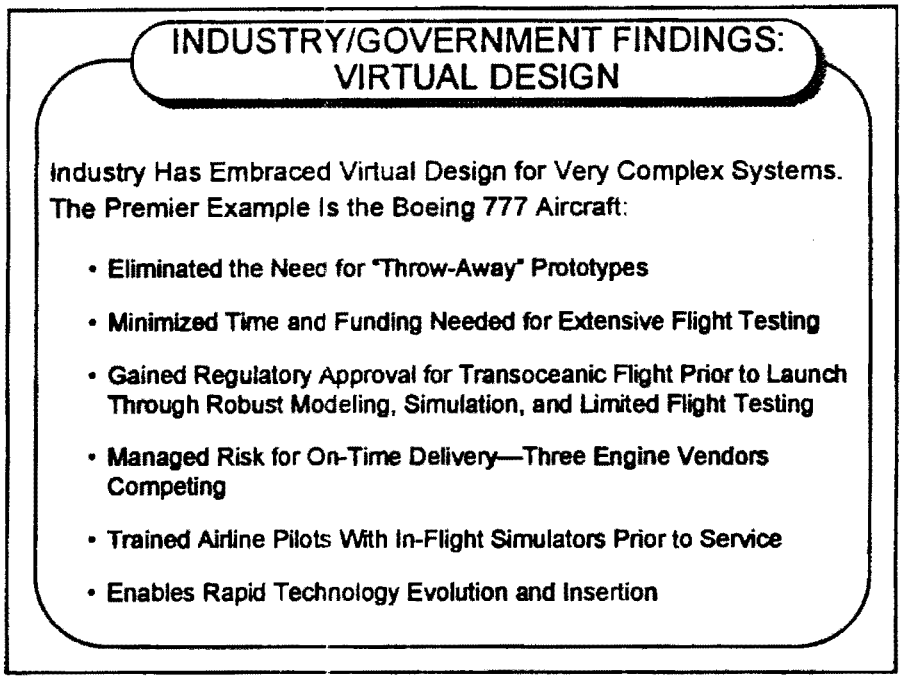


Most successful industries employ a two-step acquisition process which focuses on risk management. This process requires that all necessary technology be "in hand"* and mature, and that all risk be retired prior to production launch. This practice assures that few commercial products are introduced with serious flaws, and also minimizes the time span from product concept to commercial product, since the implemented technology does not have to be developed as part of the commercialization process (the technology must be available at the initiation of production launch).

The Motorola six-sigma design philosophy makes a difference! This design is one in which all products manufactured within six sigma of the mean meet delivery specifications. This translates to very tight distribution of product specifications about the norm and, therefore, there are very few product rejections based on failure to meet performance specifications. This is a design issue, not a manufacturing issue. The product is engineered to very close tolerances, both digitally and mechanically.

This finding echoes the results of the 1993 ASB Summer Study, "Innovative Acquisition Strategies for the 90s," which concluded that the Army development process should be a two-step, risk-based acquisition process. Development should be paced by quantitative evaluation of what is needed and what is produced; this will generate a structured method for producing a priority-ordering of the programs.

* By "in hand," the Panel means that the technology has been demonstrated to work in the intended environment, that it is reproducible in quantity, and that it is affordable; it is not just a gleam in the eye of the inventor.



The power of virtual design is evident in many U.S. industries. The Boeing 777 was carried from concept to fabricated metal parts in a virtual environment. This revolutionary process has had many benefits for Boeing, including:

- By building production aircraft from serial number one, Boeing was able to eliminate expensive "throw-away" prototypes. A major portion of the flight testing, which is normally conducted in actual aircraft, was executed in the virtual design and models residing in the company's computers.

- This virtual flight-testing minimized the number of aircraft involved in the testing and the number of hours which had to be flown, reducing both time and costs.

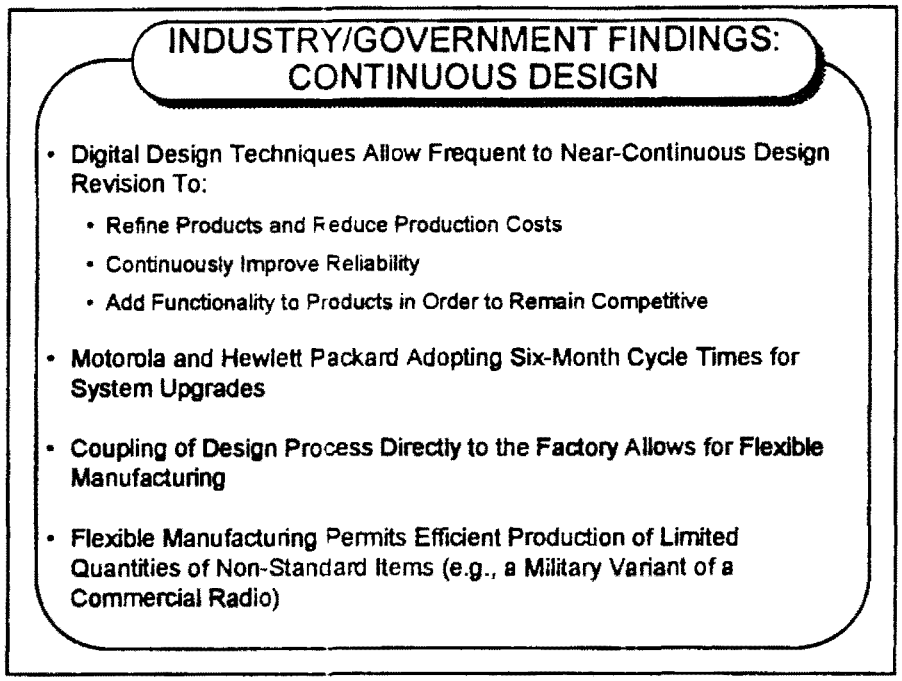
An added feature of the modeling conducted to support the design process was the ability to "demonstrate" levels of system reliability necessary for transoceanic flight with a twin-engine jet. This modeling was sufficient to convince the Federal Aviation Administration (FAA) to approve transoceanic flight with minimal live testing. The aircraft was the first twin-engine jet to be licensed for transoceanic service at its initial launch date.

The Boeing 777 demonstrated technology risk management in the development of the most powerful commercial jet engine to date. Recognizing that the engines could be the long pole in the tent, Boeing managed to keep three vendors in competition throughout the development process. When it came time for initial flight testing, two of the three had engines ready to go.

Flight simulators were an integral part of the 777's development. They had been employed early in the process to verify aircraft flight dynamics, and to refine the cockpit-to-pilot interface. They served as a transducer to the airlines who were deeply involved in tailoring the platform to

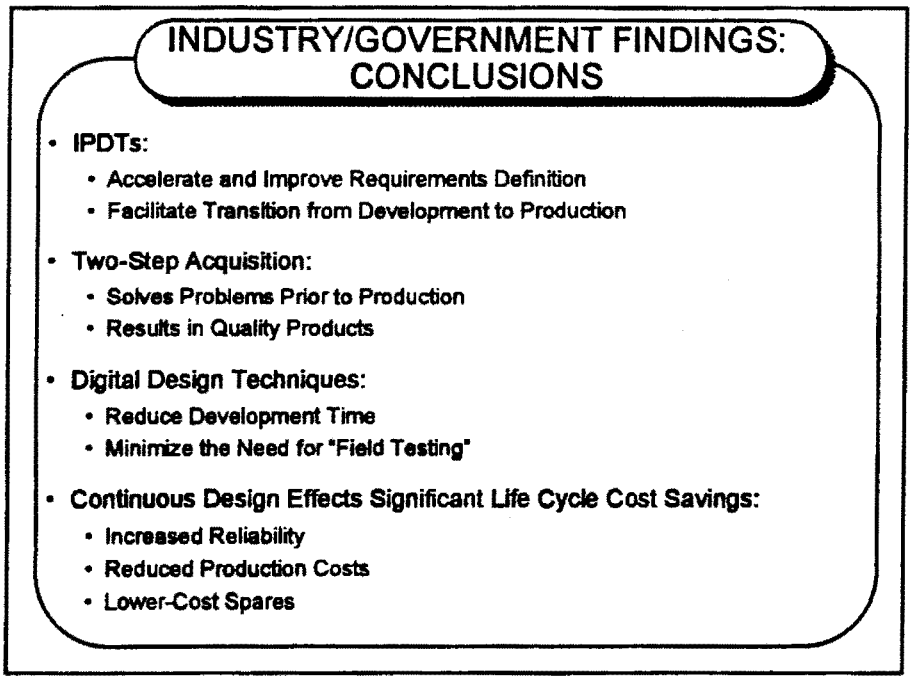
their needs. When the aircraft was ready to fly, pilots who had trained on these simulators were ready to go, because this same equipment had also been utilized to support pilot training.

The fact that Boeing now has a full model of the 777 permits it to rapidly integrate new technology, or to modify the capabilities of the platform.



Digital techniques allow frequent to near-continuous design revision of products in the production cycle. These techniques allow the vendor to refine the design in order to reduce production costs by either simplifying the product or by improving the production process; to insert newer, better components to improve overall system reliability; or to modify the design to add functionality in order to meet competitive needs. Hewlett Packard and Motorola have both adopted short cycle times for continuous product improvement to meet these objectives. The ability to accomplish near-continuous design revision has permitted Hewlett Packard to maintain its dominant position in the laser printer market year after year. Users have benefited with products having greatly increased capabilities and increased reliability, all at dramatically lower prices than those of the 1980s.

By coupling this digital design process directly to the manufacturing facility, a flexible production process can be created. The integrated capability provides for minimal delay in launching production, and a greatly reduced chance for error in translating the design into hardware. This flexible manufacturing capability can provide the means for efficient production of limited quantities of non-standard items. For example, the military variant of a commercial radio might be produced at a nominal cost increase relative to the price of the commercial counterpart (rather than having to pay for a custom configuration and short run on a conventional production line). The opportunity then exists for the military to procure high-quality items, built to commercial specifications, but with military-unique features added to the standard product; for instance, the military user might add encryption features to meet his needs.



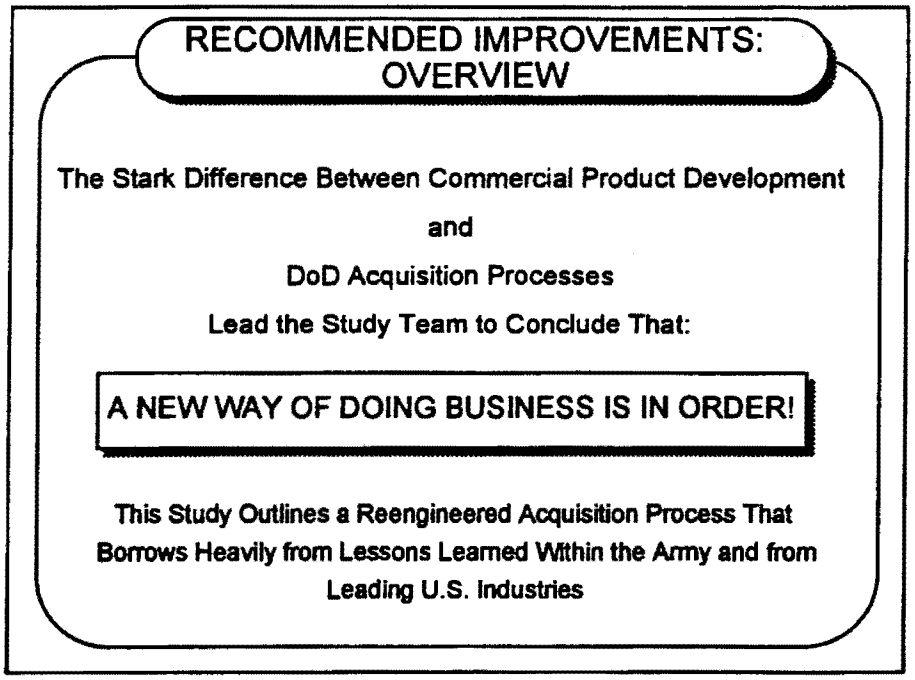
IPDTs accelerate and improve requirements definition and technology infusion into product design, and facilitate the transition from development to production. Involving representatives from all phases of design and production in the entire development process improves communication and work flow (work flow is improved by reducing the compartmentalization of process functions). Also, as there is end-user participation in the development process, delivered products are likely to find greater acceptance and utility in the marketplace.

Industry has demonstrated that a two-step development process greatly improves the quality of the fielded product. By solving technological problems prior to production launch, the customer is not exposed to an unsatisfactory, unreliable product. This focus on risk management results in a high-quality product, from its initial issue to the user throughout the life of the item.

Digital design techniques afford significant savings in development time and minimize the need for field testing. For example, the automotive industry is beginning to use simulation techniques for crash testing. These techniques allow automotive engineers to experiment with different design concepts, and to run them through thousands of virtual destruction tests; this would be absolutely unaffordable without simulation techniques.

A continuous design process yields significant life-cycle savings by improving performance, increasing reliability, and reducing production costs. The amazing advances in the personal computer industry provide numerous examples supporting this thesis. Just during the past two years, the price of a 540MB hard disk for a personal computer has declined from $700 to just over $150. In February, 1993, a 170MB hard disk sold for $250. In February, 1995, the same $250 bought an 850MB hard disk. And in early 1996, as this Study is being written, that same $250 would buy 1260MB and possibly more than 2000MB. The personal computer disk drive industry is driven to continuous improvement by enormous production volumes and intense competition. Further, the same continuous design process utilized by this industry is also evident

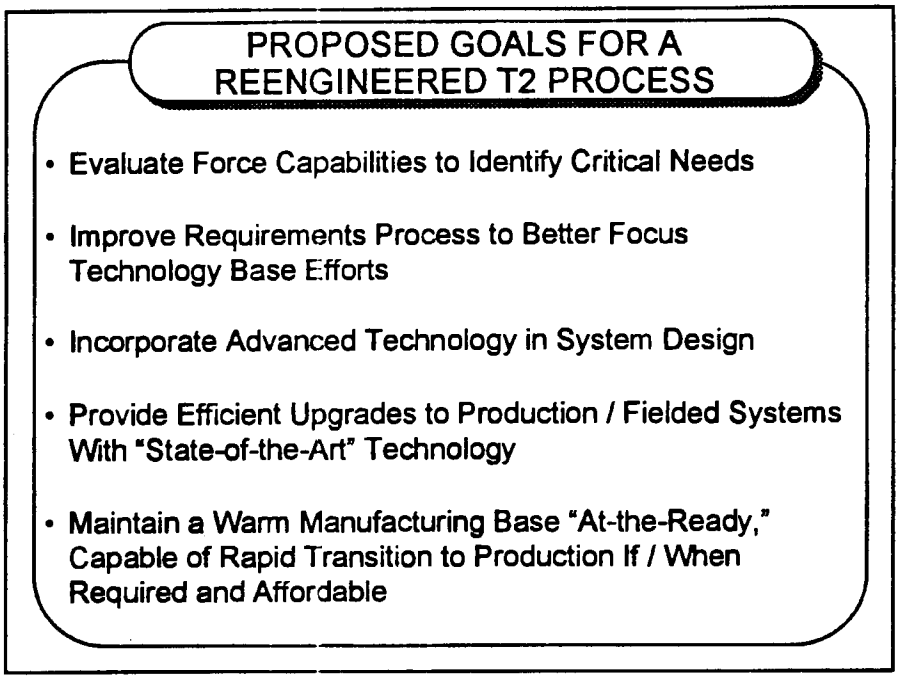
in the price of complete computer systems. For instance, the price of a complete DX2/66 personal computer system has dropped from $1300 to $800 in just over a year. For personal computer systems and subsystems, the continuous improvement process has led to cheap, reliable, high-performance products. Over time, consumers expect either a lower price for fixed performance, or higher performance for a fixed price. By adopting this same process, the Army can expect to produce weapons with more function for the same cost, or the same function at a reduced cost over time.



The TOR requested that the Panel recommend improvements to the process by which the Army transitions technology to the field. After a focused review of the processes employed in DoD, as contrasted with industrial processes, it must be concluded that a "new way of doing business" is in order for the Army/DoD.

The following recommendations build heavily on the lessons learned from the Panel's review of industry, with some excellent work within DoD also incorporated therein. Due to legal constraints on DoD, the industrial approach is necessarily modified to reflect this direction and to fit the more rigorous environment in which the military, of necessity, must operate.

Based on the Panel's understanding of the Army's T2 difficulties, a set of six goals to improve the process have been posited.



The reengineering of a complex process such as Army acquisition often requires major changes to the way an organization attacks a problem. In reengineering, new goals are stated to help focus the structure of the sub-processes. The five goals shown above identify technology transition areas which can benefit from restructuring.

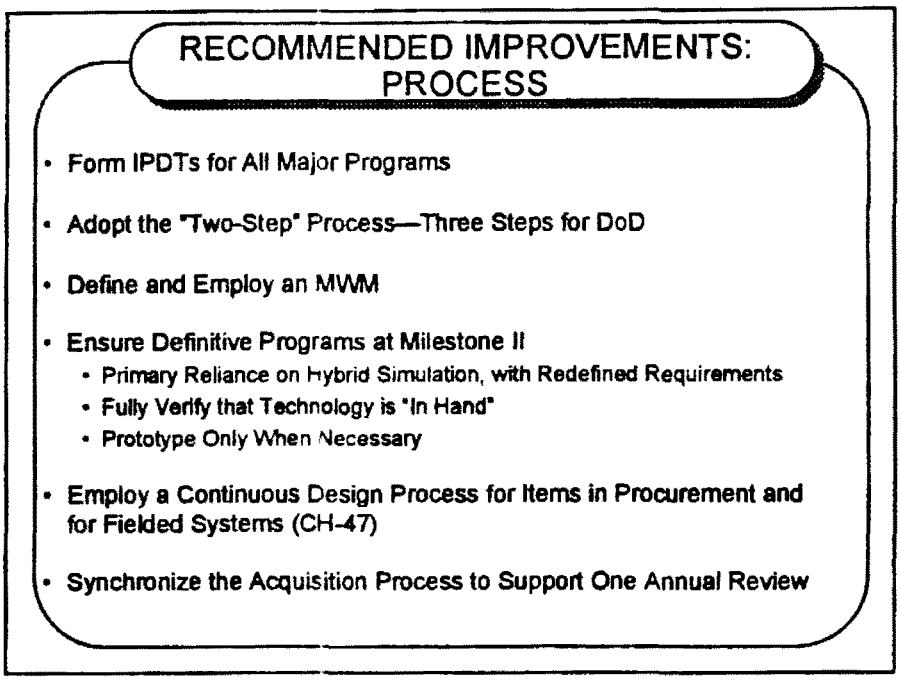
Given current resource limitations, the Army must focus its efforts on those few items which are likely to make a real difference on the future battlefield. To determine which proposals afford leverage, an improved methodology needs to be developed and institutionalized to quickly determine and convincingly document the winners.

For years, the requirements process has been viewed as a place holder for "desirable ideas." While the Army may choose to maintain such a library, there is a critical need to identify and accurately describe the important ideas. These few systems must be described in a disciplined set of documents which clearly identify those features that make a difference, and likewise must avoid those features which might be nice to have, but that are likely to result in a significant increase in the cost of procurement and/or ownership.

The life span of many Army systems is measured in decades, ranging from the VRC-12 series (1954 to the present), to the Utility Helicopter (UH) 1, only now leaving service after more than thirty years, and the M-16 rifle, also in its third decade of service with no end in sight. With the increasingly rapid rate of technological change in both the commercial marketplace and the international arms arena, the Army must utilize a development process that can incorporate changing technology into existing programs. The M1A2 and the Longbow Apache illustrate the benefit of technology insertion as well as the painfully slow pace with which these programs reach the field. The Army's new T2 process must be more responsive to technological opportunities.

In this age of agile manufacturing, industry develops and maintains "state-of-the-art" designs for its systems. Similarly, the Army could develop and maintain designs for advanced warfighting systems (e.g., next-generation tanks, attack helicopters, radios, etc.) which may not be needed at the moment or which are not now affordable, given the current world situation. This ability to maintain a design at-the-ready and to quickly transition to production can hold the key to maintaining a technologically advanced Army in the future.

To achieve these goals, the process changes discussed in the following pages must be developed.



All major programs can benefit from the combined expertise represented in an IPDT.

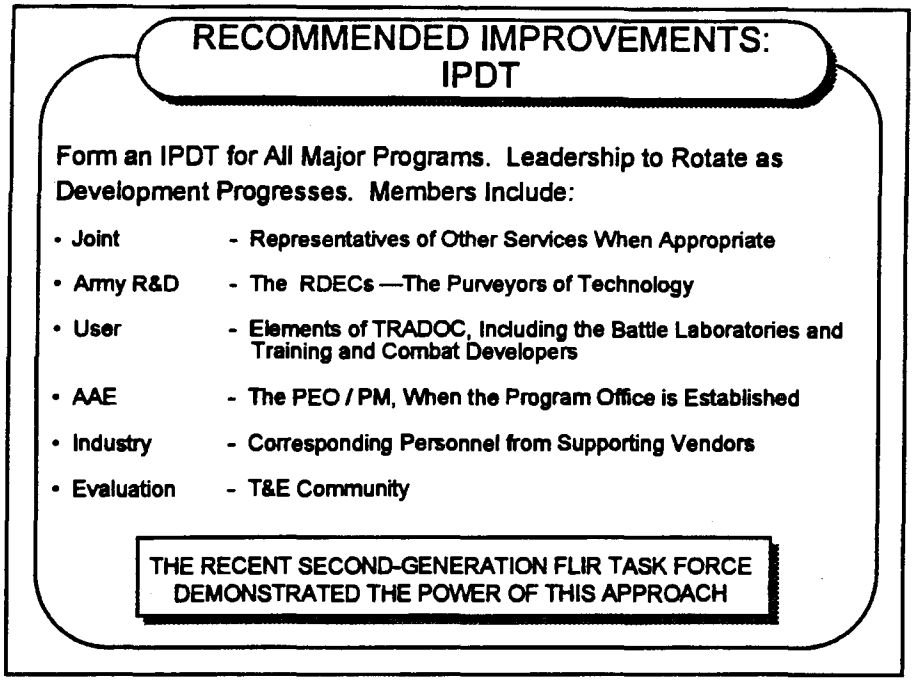
The streamlining of the DoD 5000 series of procurement regulations affords the opportunity to reduce the current five-step process to a much more streamlined form.

The concept of Military Worth Metrics (MWMs) will be developed to illustrate how system development can be better disciplined. The MWMs will be proposed as living measures of a proposal's status, and will include best estimates of both costs and benefits.

Many Army/DoD programs pass Milestone II, only to flounder for years in extended development, with massive cost overruns. The process proposed herein will build on success with hybrid simulation to produce more reasonable requirements with verifiable expectations. The supporting technology will be verified prior to the Army Systems Acquisition Review Council (ASARC) meeting to avoid carrying the cost of engineering development while waiting for the technology to mature (for example, command and control [C2] software would be satisfactorily demonstrated before major hardware commitments are made). Technology will be demonstrated in mature programs when necessary, but the prototyping of entire systems in the concept phase and again in engineering development will be curtailed or eliminated.

Systems in procurement and in the field will be defined by a digital design process that is coupled to the manufacturing facility(s). This flexible manufacturing environment will permit the insertion of new, proven technology with minimal perturbation of the process. This process emulates that employed by many successful U.S. firms.

By synchronizing the acquisition selection process with the building of the Program Objective Memorandum (POM), the Army can focus its energies on the allocation of its resources as an integrated package, and then execute a program with more uniform support across the Service.



By forming IPDTs for all major programs, the Army can expect to improve the quality of its products as well as minimize the time and cost of development. The list of team members can be expected to change from program to program, but is illustrative of the set of "stakeholders" who should be included.

Since most Army deployments are in the context of a joint force, it is critical that all Army developments be harmonized with the sister Services. Further, with the Congressional push toward commonality, the Army should expect more multi-Service procurements in the future.

The Army spends billions of dollars each year in the RDECs. To capitalize on this investment, it is important that these expenditures address relevant problems, and that RDEC staffs be available to support the procurement process. By participating in the IPDT, the lab technicians become a part of the solution, and not merely inventors of interesting demonstrations.

The relevant TRADOC personnel who serve as the users' surrogates during development must be an integral element of the team. They play the critical role during concept definition and requirements development. They must complete the combat development activities, and include all the non-materiel elements of doctrine, training, leader development, organization, materiel and soldier (DTLOMS). The training developers must be involved to ensure the trainability of the final product, and that the necessary training tools, simulators, and courseware are developed synchronously with the weapon system. Every effort should be made to ensure that software developed to model the early system's performance forms the foundation of the final system software, as well as the basis of performance models and virtual and constructive simulations.

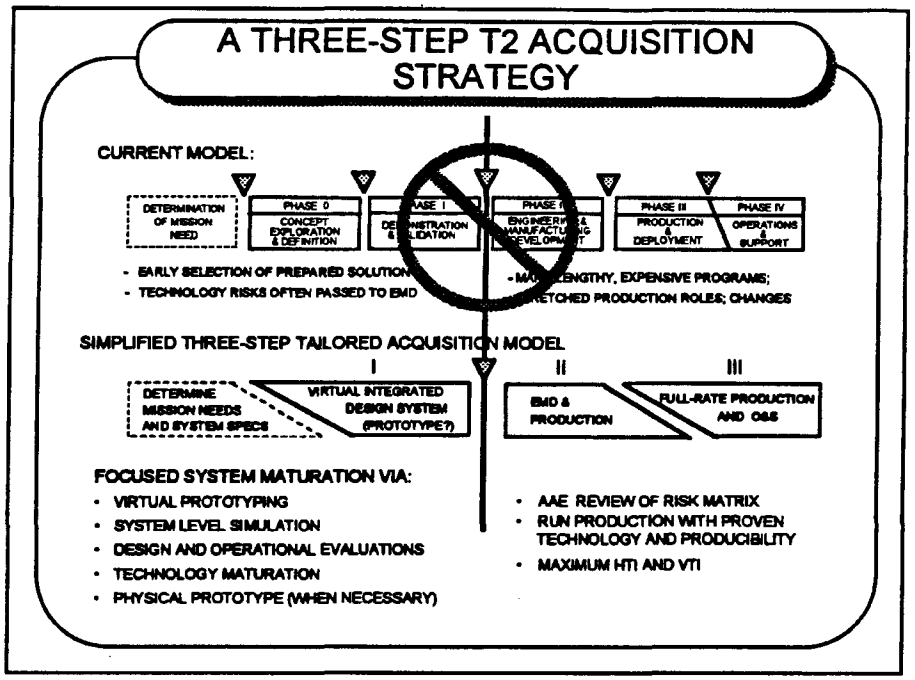
As soon as a program reaches the stage where a PM is appointed, he and his staff will become principal players in the IPDT. The PEO and the Army Acquisition Executive (AAE) will be represented on a day-to-day basis by the PM.

With the drawdown of the defense industrial base, there will many cases where the available vendor base (e.g., General Dynamics for tanks) will be very limited. To maximize information flow and enhance the learning process, vendor engineering personnel should be included on the IPDT whenever possible. In cases where procurement is competitive, parallel support operations of the vendors may be appropriate. The vendor needs to understand the government's intent, and the government needs to be fully aware of the vendor's capabilities. This pairing becomes ever more important as the Army moves to agile manufacturing in which the manufacturing facility(s) is coupled to the design process.

The "honest broker" in this process is the analytical/test community. An early performance evaluation of virtual models and the ongoing evaluation of the cost and effectiveness of the proposed solution should be the responsibility of the test and evaluation (T&E) personnel.

The recent second-generation task force on the Second-Generation FLIR demonstrated the power of having all of the stakeholders involved in a complex decision-making process. The success of the FLIR HTI program clearly rests on the work of this group.

In essence, the IPDT is the glue that will hold a new, streamlined acquisition process together.



The history of system acquisition in the Army and across DoD is replete with program overruns (time and cost). The continuing saga of the Army Battle Command System (ABCS), the Army Battlefield Interface Concept (ABIC), and ATCCS, the difficulty in achieving reasonable levels of reliability at Milestone III in the Phase Array Tracking Intercept on Target (PATRIOT) and SINCGARS programs, and the inability to field modern air defense systems in the cases of the Division Air Defense (DIVAD) and the Air Defense Anti-Tank System (ADATS) are but a sampling of the problems of the past two decades. In response to these difficulties, the acquisition system has evolved a defensive strategy based on mistakes encountered in major weapon systems development, resulting in a process which costs too much and takes too long (an average of fifteen years from requirements definition to first fielding). The current approach is clearly broken!

In today's austere environment, with few new platforms, the primary task will be to insert technology appliqués into or on existing systems. The Army will not have the luxury of long, costly development processes. Further, as a nation, the U.S. has learned certain fundamental lessons from successful programs, including the benefits of retiring technological risk, the need for focused leadership, and the value of integrated user requirements.

The increasing rate of technological progress in the commercial arena, with the ever-shortening development cycle of computers, digital circuitry, and a variety of consumer-driven technologies, makes it harder for the U.S. military to remain on par with technology available to its enemies. The Army has recognized some of these issues in the ATD and ACTD programs, but it needs an inclusive risk-based acquisition system which incorporates these realities.

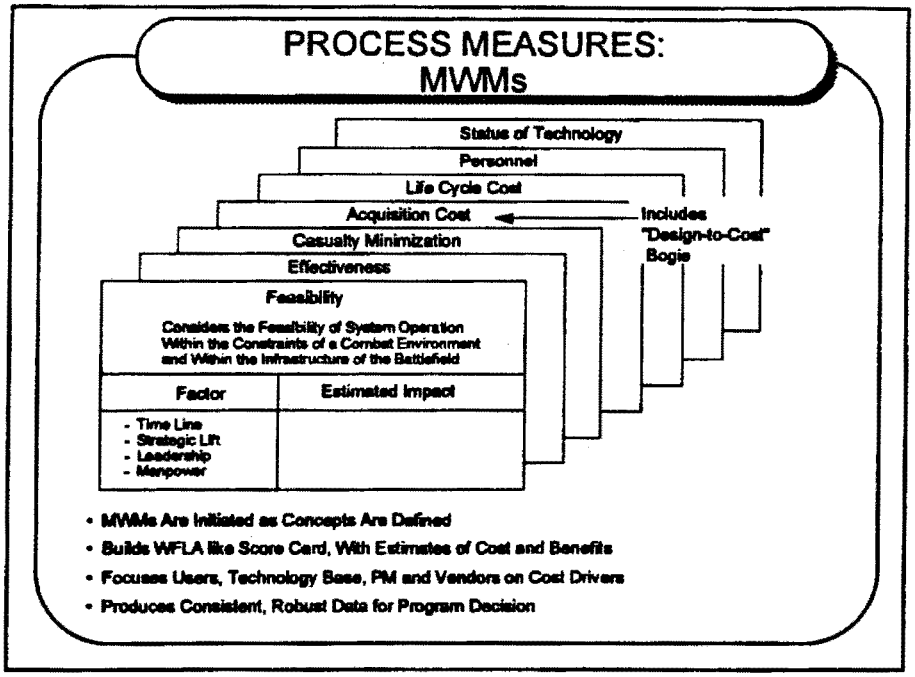
The first action is to simplify the current model by reducing the number of steps from five to two, with the virtual integrated design system featured in step one, with or without a physical prototype. As the development community becomes more confident in the Virtual Integrated

Design System (VIDS), the need for physical prototypes will certainly decrease. The second step then encompasses the production engineering phase and actual production. Because of Congressional direction that a weapon system must be tested in an operational environment prior to its full production, the second step will be sub-divided, with limited production leading to Milestone III, followed by full production.

This two-to-three-step process can be performed within the guidelines of 5000.2. The intention to proceed with a two-step process should be clearly stated in the original step one Request for Proposal (RFP).

Technological risk is incorporated in the technology matrix of the MWM. The issues identified in this matrix are worked continuously by the IPDT, until all areas are "in hand."

The discipline of this process is simple and tough. At the end of step one, risk is retired, functionality is met, or the program is automatically cancelled. The only "out" is if the Assistant Secretary of the Army (Research, Development and Acquisition) (ASA[RDA]) deems the program to be essential to the national interest and orders its continuation.



There is no standing process for the estimation of the "military worth" of programs within the Army. The increasingly competitive environment for resources demands a more rigorous method for the allocation of the Army's scarce resources. The proposed metrics are based on multiple factors—including resources—that impact the warfighting capabilities of U.S. forces. Programs which are selected must be acceptable based on all of the factors, without singular burdens. The proposed process for structuring and standardizing the technology selection process via MWMs incorporates a multiple-factor evaluation of a proposed technology, program, or system. While the proposed list is not exhaustive, the Panel believes the evaluation must address, at a minimum, the following factors:

- *Feasibility*. Is the proposed system capable of accomplishing critical tasks within the time, space and means available? Can it be accommodated by already overtaxed strategic lift capabilities? Are the impacts on both the leadership and the overall manpower within consideration? Does it fit?

- *Effectiveness*. Is the proposed technology significantly more effective than alternative capabilities? It is critical that the level of effectiveness be a major improvement, versus a marginal gain.

- *Casualty minimization*. Is this capability likely to reduce expected casualties through enhanced protection, improved agility, or by reducing its overall signature?

- *Acquisition cost*. Is the system affordable within the context of the overall force? Does it require extraordinary support systems, including new training systems, special ranges, or simulators that must be factored into the acquisition cost?

- *Life cycle costs.* Does the proposed system reduce or at most minimally increase support system costs? Does it require new military occupational specialties (MOSs), heavier transport equipment, new classes of test equipment, or special "decommissioning" at the end of service life?

- *Personnel.* Are the personnel demands generated by the system achievable within the decreasing force structure? Is the total manpower required to field and support the system greater that of the capabilities it is replacing?

- *Status of technology.* Many major Army programs drag on through years of expensive R&D because the required technology is not sufficiently mature to support engineering development/production. It is critical that all required technology be verified before major investments are made to facilitate production. The development approach taken in the case of the Second-Generation FLIR program illustrates the power of solving technology development problems prior to a production commitment. In this case, the technology was developed throughout the 1980's and early 1990's, before the current HTI program was established to capitalize on this capability.

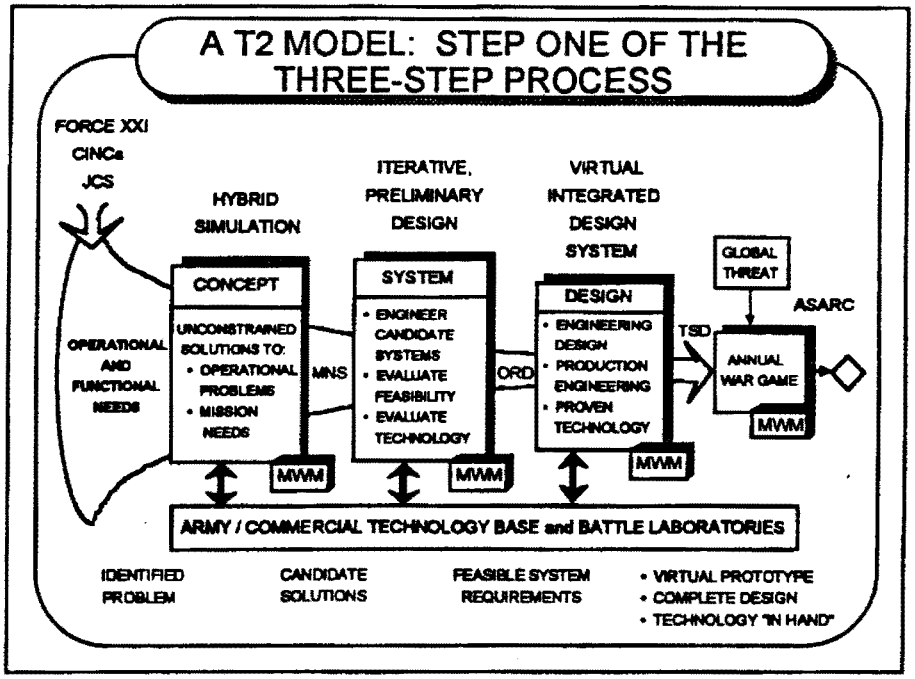
In practice, the MWMs are initiated as new concepts are defined. Early estimates of the metrics will be rough, but early consideration will cause both the technologist and the user to consider the spectrum of costs associated with the system, as well as the desirable attributes.

The MWM is an extension of TRADOC's Warfighting Lens Analysis (WFLA) concept, with a more extensive set of measures and a more enduring charter. This "score card" will serve as a major measure of a technology's capability at each and every stage of a system's development.

The MWM's virtue is the fact that the entire development team—the IPDT—will be forced to address many of the factors in system development that are typically ignored until much later in the process. The team, users, technology base technicians, PM, and vendors will be focused on the system's total costs, and given the IPDT process, can address their impact coherently. For example, this process offers the potential to have the early simulations lead to system software that can transition to the actual system and to its training systems.

Given a consistent process for the development of the MWMs, the decision makers will be afforded a much more complete description of both costs and effectiveness over the span of a system's development. With this tool it may be possible to determine, for example, that some "good ideas" are just not affordable, leading to an early cancellation of programs, with major cost avoidance.

Much more detail on the construct of the MWMs is included in Appendix D.



A perception gained by the Panel during the course of this Study is that the Army's technology selection process has not been revised to reflect significant changes in the Army's mission and resources. The Army lacks a comprehensive, coherent, consistent, merit-based selection process to identify those important programs which it can afford. The T2 process proposed herein provides a structured winnowing from technology-based enhancements and systems initiation through VIDS to expedited fielding to the force. Specific gates are established at each stage in development through which all options would pass. There are three very significant and remarkably different changes to the current practices associated with DoD Directive 5000.2 and the PPBES. These changes are focused on the ability to: 1) harvest technology; 2) stabilize programs; and 3) prioritize the Army's RDA thrusts.

As a result of the Panel's deliberations, this Study is proposing a process that can support rapid, efficient transition of technology to the field. This structure is based on both the Army's technology base and on innovations in American industry, and would be guided by the vision of Force XXI. This approach is revolutionary in that it moves the Army from a risk-avoidance, technology-naïve process to one where risk is managed and sophisticated selections of technology are made in a virtual evaluation environment. To this end, the Panel proposes that the Army build not only on the emerging capabilities of industry, but on its own existing strengths in simulation and analysis to utilize a "virtual product development" approach to its requirements/RDT&E and acquisition programs.

Just as the evolving war-gaming capabilities mix real and simulated forces with analytical models, the Panel proposes to expand the use of system simulation as the foundation of the "virtual product development" capability. Finally, by designing for operations and support (O&S) minimization within the MWM discipline, money now spent to support systems in the field could be made available to acquire more units and/or to support more effective RDT&E.

The development of robust requirements and reasonably accurate cost estimates is a complex process. This proposed approach begins with the identification of a problem and/or need. It evaluates multiple solutions in a cost- and technology-constrained environment to determine if an affordable solution exists.

The first step is the evaluation of competing concepts in the context of a high-level war game or sand-table exercise to determine one or more potential solutions to a perceived need. This evaluation would begin with a "blank sheet of paper." Proposals would be developed within the team, other elements of the Army, and by industry. With TRADOC in the lead, the IPDT would employ a balanced approach, considering the DTLOMS. For example, the team might evaluate competing strategies for improved Identification, Friend or Foe (IFF). The competing approaches might include current visual techniques. laser question and answer (Q&A), radio/radar Q&A, and high-fidelity situational awareness systems linked to weapon systems. Evaluation factors might include the reliability of the process, the complexity and cost of the solution (MWM), the feasibility of extending the solution to joint and allied forces, and other limiting or exotic technologies needed to make the solution work. One result of this process is the development of a Mission Need Statement (MNS).

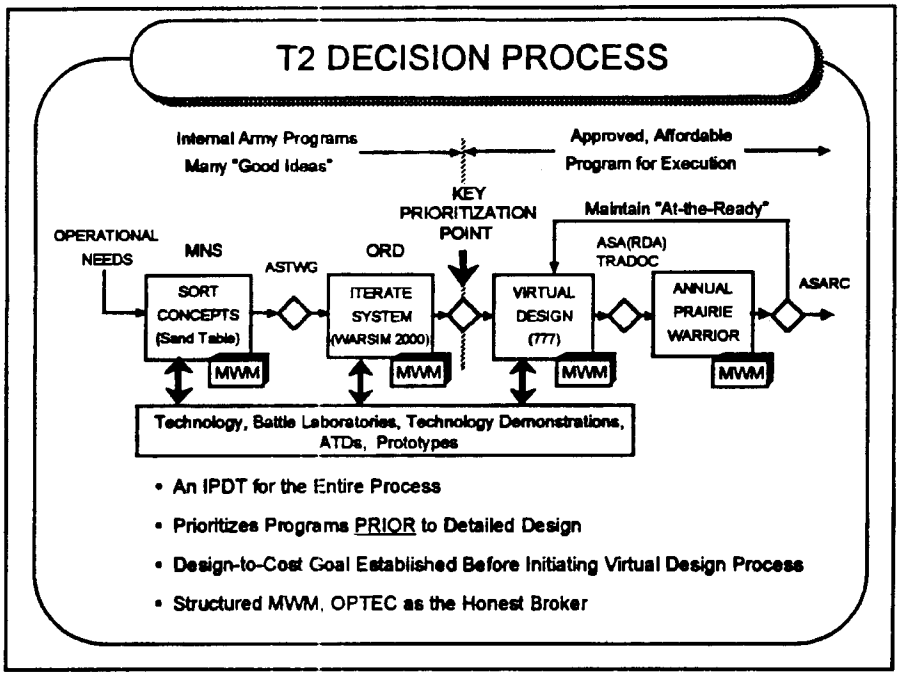
Those concepts which appear to meet the MNS are screened by the Army Science and Technology Working Group (ASTWG) based on its MWM, and the "winners" graduate to a preliminary design phase.

Based on the MNS, competing system concepts are evaluated in a high-fidelity war-gaming environment to determine the necessary performance parameters and to evaluate the relative performance and cost of the competing approaches (MWM). Based on this evaluation, the Army would look for those systems which provide a significant incremental increase in warfighter performance and which are affordable on a life cycle basis. If a strong candidate is identified, an Operational Requirements Document (ORD) would be prepared based on the performance parameters required to support further development. This ORD would differ from the current version in that the modeling phase would provide solid but reasonable estimates of system specifications, along with a model of expected overall system performance. The homework has been done, and the trade-offs have been made to identify the 90-to-95% solution that can make a difference and is affordable. The next step—ASARC approval to proceed into the virtual design phase—is critical to minimizing the expenditure of resources on those programs which the Army cannot or will not commit to full development. The virtual design phase will be a major investment of dollars and human resources, which should not be expended on marginal ideas.

The few selected programs would then be fully developed in a virtual design facility, similar to that employed by Boeing with the 777. This process includes the development of dynamic system models for both engineering and operational evaluations, and the detailed design necessary for transfer to the factory floor. Based on data generated in the design process, the MWM is updated and refined to provide a very accurate estimate of the system's cost and performance. A key activity in this phase is the verification of the supporting technologies. The Army's technology base and potential vendors would be expected to demonstrate that the technology is "in hand," and that any *producibility* problems have been overcome. When the design and the supporting DTLOMS are complete, the program is nominated for inclusion in a major annual AWE.

The annual war game will evaluate the candidate program's contribution to the force in a variety of scenarios. The evaluation is designed to provide an objective, non-parochial assessment of the overall effectiveness of the program, along with other factors that describe the overall cost (burden) of the program. The MWM will provide consistent data to the decision makers. The Panel proposes that an annual ASARC session take place each August, following the war game, for all systems which are proposed to enter EMD (Milestone II) in a given fiscal year (FY). This phase of the decision-making process is developed in a later section of this Report..

As is next discussed, the decision-making structure supporting this process is critical to its success.



The T2 decision-making process builds on four fundamental principals. An IPDT is formed to support concept exploitation and is maintained throughout the development process. As previously outlined, the MWM forms the basis of evaluating the relative cost and worth of a technology throughout the process of requirements definition and system development . All programs are prioritized prior to the initiation of the detailed virtual design process to keep the focus on affordability. Finally, design-to-cost goals are established as constraints on this design process.

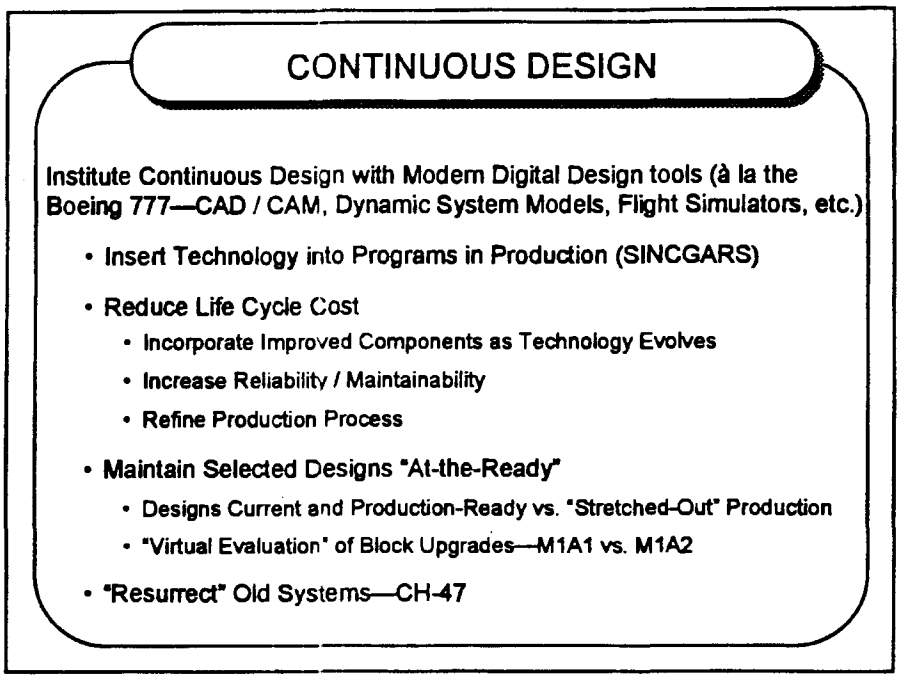
The first step is the evaluation of competing concepts in the context of a war game, resulting in the development of an MNS. Those concepts which appear to meet the MNS are evaluated by the ASTWG based on its MWM, and the "winners" are promoted to a preliminary design (PD) phase. The PD iterates the design in a war game environment, perhaps War Simulation (WARSIM) 2000 when it is available, to fine tune the performance parameters and evaluate the maturity of the technology necessary to implement the design. Based on the MWM, a design-to-cost bogie is established. The Panel would emphasize that many "good ideas" will be carried through the PD phase; however, the Army can only afford to conduct a full engineering design on a select few candidates. Thus, the migration from the PD to VIDS is a critical selection point. The need for well-executed MWMs is critical. The Army must fully understand the cost and benefits of the proposed system, and must also be sure that the necessary technology is mature so as to execute the program. Due to the cost implications of this decision, the Panel recommends this be considered an ASARC-level decision, essentially a "pre-ASARC II."

The selected programs are fully developed in VIDS. Based on data generated in the design process, the MWM is updated and refined to give very accurate estimates of system cost and performance. A key activity in this phase is the verification of supporting technology, to aid in the decision process. When the AAE and TRADOC are satisfied that the design and the supporting

DTLOMS are ready, the program is approved for inclusion in a major annual AWE—perhaps Prairie Warrior.

Based on the results of the exercise and on the cumulative merits of the technology, as represented by the MWM, the ASARC can: 1) kill the program; 2) approve it for manufacturing development; or 3) keep it in a current design state until it can be shown that it is both needed and affordable. The ability to maintain a design "at-the-ready" allows a modest design team to insert new or improved technology into the design, maintaining a state-of-the-art capability that is ready to transition rapidly to the production environment when needed.

The power of this process is in the discipline to accurately evaluate the status of a program based on the MWM, and the resolve to move only those programs which make a significant difference to the warfighter into the virtual design phase. Good ideas are allowed to develop, but only the few of consequence move into full design and development.



Given VIDS-based acquisition, it becomes possible, and highly desirable, to maintain system design in the synthetic environment. Maintaining current technology in these designs is then relatively straightforward. When a component becomes available that offers higher performance, more reliability, or lower costs it can be incorporated into the design. Further, this new component can be accommodated in flexible manufacturing with little delay.

This process can benefit systems currently in production. For example, SINCGARS could incorporate new, smaller, more reliable, and/or lower power consumption technology that has been developed for the commercial marketplace. This process contrasts with the Army's experience with the VRC-12, which was originally built with germanium transistors and then had to undergo a major redesign to accommodate the shift to silicon technology. In the future this process can be much simpler.

This ability to facilitate technology insertion can both increase the reliability of a system and reduce the cost of spares. An added benefit is the potential to improve the design over time to reduce production costs or improve maintainability. The move to larger, more capable chips illustrates the potential for greatly increased reliability at reduced cost.

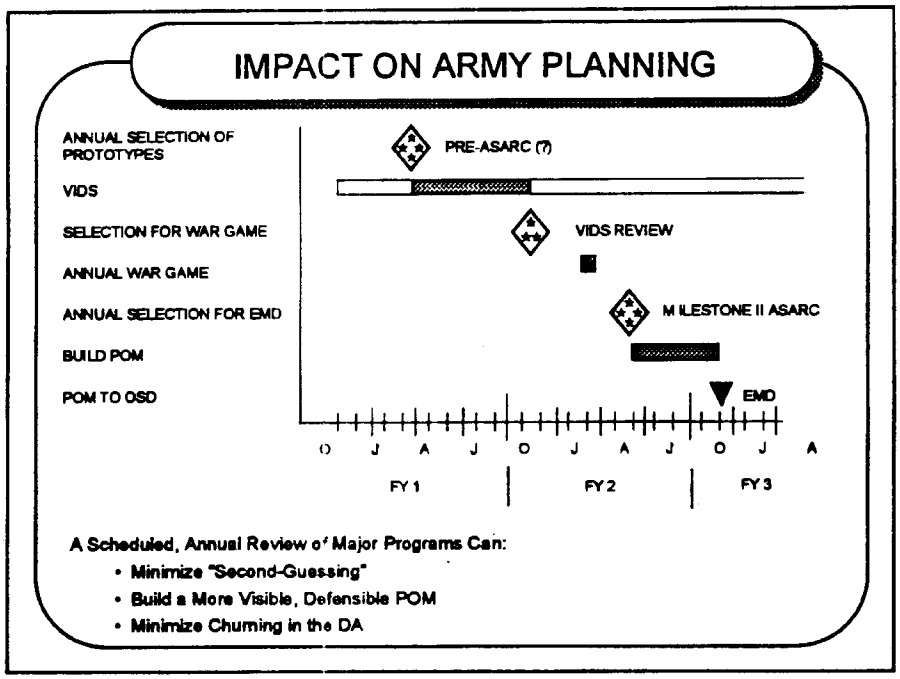
Given current resource limitations, the Army may have to delay the production of "next generation" systems. For example, the M1 family might have three designs in the VIDS environment:

- The M1A1 would be maintained for logistics purposes, with technology insertion to improve reliability, reduce costs and ensure that the components are still available in the marketplace; e.g., to avoid any "germanium transistors" in the system.

- As the current production model, the M1A2 would likewise be maintained in VIDS to keep technology current on the production line.

- Finally, a design for the "M1A3" would be developed and maintained against the eventuality that the threat changes and a more capable system is needed in the field. This ability to keep the design "at-the-ready" for a relatively modest investment is excellent insurance against future surprises, and permits rapid transition to production if the need arises.

A different option is represented by the Army's heavy lift helicopter, the Cargo Helicopter (CH)-47. This machine, which saw duty in Southeast Asia, needs to be "replaced." The economics of the situation argue for a major overhaul of the current fleet rather than building a new one. Moving the aircraft design into a VIDS environment and then inserting current technology for the obsolete equipment and components of the present system would present a lower cost alternative to an unaffordable new platform.

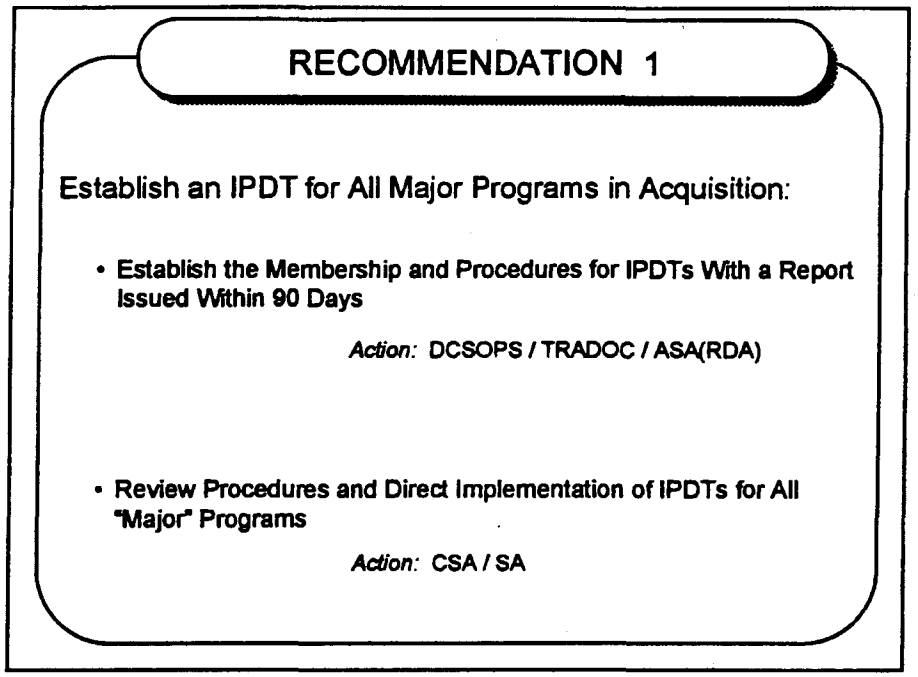


The Panel believes there is great merit in a selection process synchronized to the POM cycle. The Army's delivery of the POM to OSD provides a fixed date to drive the sequencing and scheduling of decisions. The timing of these decisions, coupled with the consolidated, integrated agenda, is key to providing program stability and to gaining consensus for the Army's priorities for RDA thrusts. The results of the annual war game should be presented to the ASARC, and will provide the opportunity to achieve the necessary consensus in the Army leadership.

POM preparation is between May and November, so the ASARC meeting for the selection of new EMD programs should occur in April. The decision to enter EMD at a time other than this proposed annual decision-making meeting would be considered a rare exception. Allowing time to prepare for the annual war game dictates that the selection of systems for it be made in October.

Recognizing that systems will spend varying periods of time in the VIDS cycle, the timing of the selection of options to enter VIDS is arbitrary. However, it is desirable to schedule this decision with the possibility that a system could complete the VIDS cycle and be considered for the annual war game within one annual cycle. This would put the annual selection of prototypes in February or March.

Some schedule flexibility to accommodate other competing requirements in the Army is certainly available. The important point here is that a rational schedule which synchronizes with the government's budgeting cycle is feasible. Further, single decision points for each stage of development can be achieved.

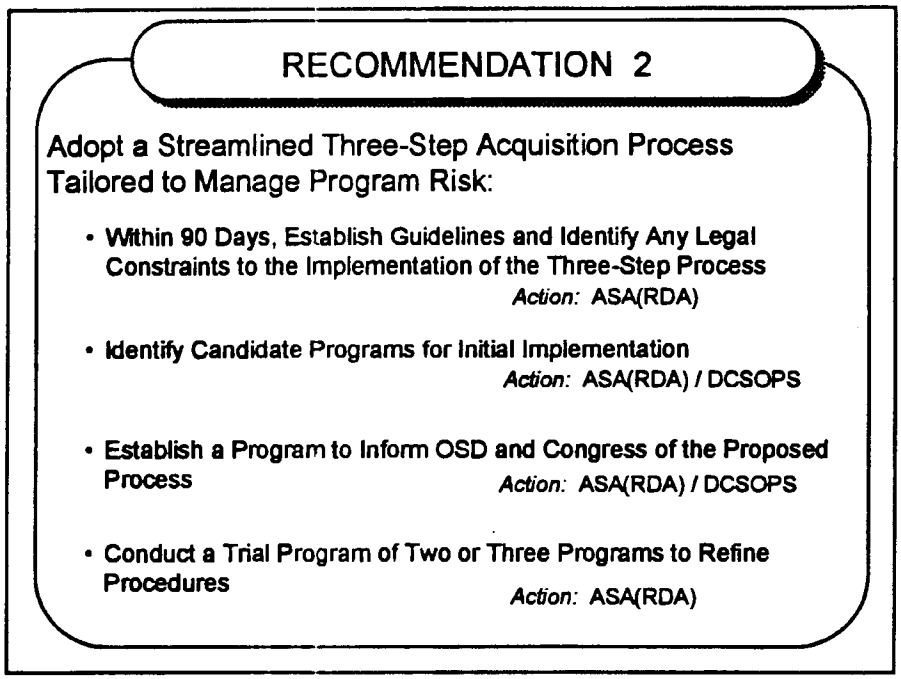


The power of IPDTs has been proven through both DoD procurement and in industry. IPDTs have demonstrated the ability to reduce development time, improve the utility of the final product, and reduce both the procurement and life cycle costs of the item. The formation of an IPDT is not without cost, since it requires intelligent, involved, dedicated individuals to make it succeed. Because of these costs, the Army must carefully structure the formation and operation of IPDTs.

The Army should establish the nominal membership and the process and procedures for its IPDTs through a task force composed of representatives from ODCSOPS, TRADOC and OASA(RDA). Each of these organizations has an important role to play in the success of the IPDT. The DCSOPS, as the Army resource allocator, must recognize that a finite portion of a program's resources must be expended to support the IPDT effort. TRADOC will be required to provide "user representatives" to many development programs to cover the evolution of requirements, the training implication, and long-term system support. The ASA(RDA) will need to guide the PEO/PM community into the world of "cooperative" development in which all "stakeholders" have a voice in program execution. A task force from these three organizations should be charged with the development of the "modus operandi" for IPDTs, with a 90-day suspense.

The second phase of this effort is a review by the CSA and the SA of the proposed procedures and the direction of implementation for all major Army programs.

The benefit of IPDTs cannot occur unless and until these teams are an established fact.



The three-step acquisition process is a significant shift in the way the Army does business. Within the guidelines of DoD Regulation 5000.1, this represents a major streamlining of the T2 process. To achieve a functioning three-step process, the Army must accomplish four distinct tasks:

1. Within a period of 90 days, the ASA(RDA) needs to establish the guidelines for the three-step process and identify any legal or bureaucratic hurdles to its implementation. This will require coordination with DoD and Congress to avoid any surprises "downstream."

2. The ASA(RDA) and the DCSOPS should identify a limited set of programs for an initial testing of the three-step process. These choices will have to be made based on the current stage of development of the selected system(s).

3. Given a procedural definition and set of candidate programs, the ASA(RDA) and the DCSOPS will need to establish a program to inform OSD and Congress of their approach. The tone of these briefings should be one of updating obsolete ways of doing business with current business practices. The advantages of saving time and money should be stressed.

4. Given the approval of the Army Operational Plan (OPLAN), the ASA(RDA) should conduct a trial program of two to three programs to refine the procedures. Given stable process definition and documentation, the three-step process should be adopted as the normal way of doing business.

The Panel notes that the three-step process and the formation of IPDTs are completely complementary, and must be considered as an integral package.

RECOMMENDATION 3

Implement a Structured Process to Definitize Programs at Milestone II, With Primary Reliance on Hybrid Simulation and the MWM:

- Within 120 days, Refine Elements of the Process, Establish Procedures, and Identify Shortfalls in Simulation Capabilities

  Action: ASA(RDA) / DCSOPS / TRADOC

- Direct a Working Group to Define the MWMs and to Establish Procedures for Implementation, with a 120-Day Suspense

  Action: ASA(RDA) / DCSOPS / TRADOC / OPTEC

- Identify and Fund Simulation Programs Necessary to Conduct an Initial Trial

  Action: ASA(RDA) / DCSOPS

- Establish a Trial Program Tailored to Available and / or New Simulation Capabilities to Refine Procedures

  Action: ASA(RDA)

The process described in this Report relies on simulation to define requirements as well as to support the development of a system. It offers both speed and economy in the development of complex systems, as shown by the Boeing 777. The addition of MWMs to discipline the process can result in a much more focused effort, with serious review of the "nice to have" features against their overall program impact. The current practice of building multiple generations of hardware representations of the final system can be reduced to at most a single prototype to verify engineering performance.

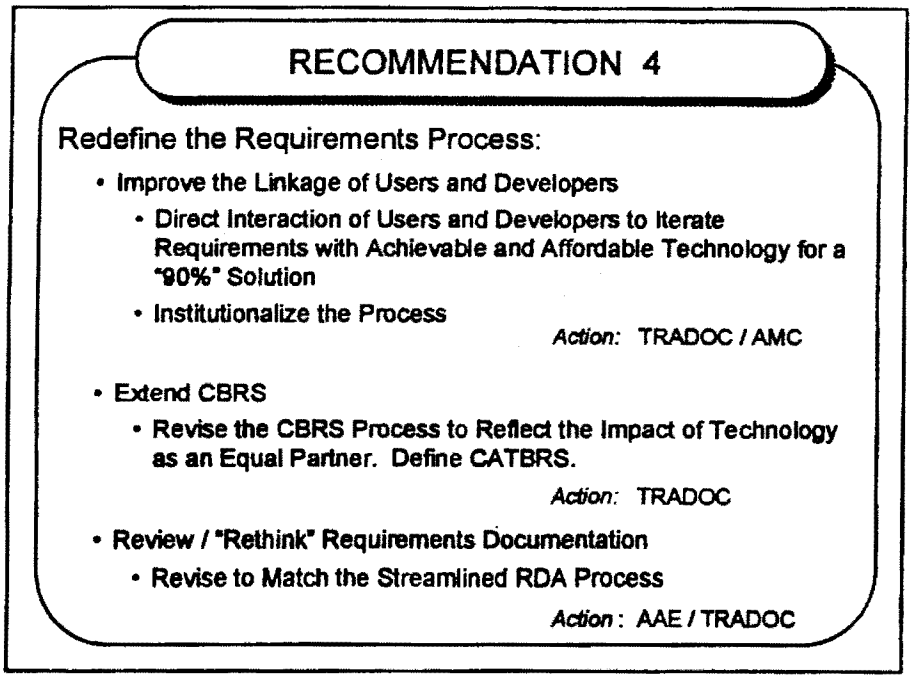
It is proposed that a task force be established to refine the process described in the chart on page 42, to develop process guidelines, and to establish the limitations in current simulation capabilities. This is an action to be taken by the ASA(RDA), the DCSOPS, and TRADOC, each of which must support the end process. The task force should be given 120 days to accomplish these goals.

A working group with membership from the analytical and acquisition communities should be established to refine the elements of the MWM to meet the Army's particular needs. A "straw man" for this matrix is included in Appendix D.

Based on the results of the task force's findings on the adequacy of current simulation capabilities, a program should be defined to develop those simulations necessary to support a demonstration program(s). Due to the funding implications of this action, the DCSOPS and the ASA(RDA) must jointly develop the plan.

Given the definition of the T2 process, the MWM, and the status of simulation, the ASA(RDA) should establish a program to evaluate this process. This initial effort should be viewed as an experiment to fine tune both the process and the MWM.

As experience and confidence are gained in "virtual system development," the process should be applied across the board.



The CBRS, even with recent enhancements, is necessary but insufficient. It is not responsive to the current environment and does not facilitate the rapid transfer of technology to the warfighter. The rate of technological change, and hence the rate of obsolescence, occurs over a few years, while many programs spend a decade negotiating the CBRS/PPBES cycle. This is true with systems which contain extensive information processing and/or command-related software. Similarly, in the armor/anti-armor arena, changes are rapidly occurring in armor package recipes, penetrator design, missile sensor design, warhead design, and active and reactive protection systems. Adhering to the current pedantic processes results in trailing-edge technologies reaching the field. Further, due to the duration of the process, the fielded force always contains a mix of systems with high and low technology. The rapid technological advances available in the international marketplace provides leading-edge technology to whomever has the money to buy it—the international market is driven by technology and the profit motive. This gap between what is for sale in the market place vis-à-vis what is in the hands of U.S. troops is a major concern.

Technological potential does not currently drive the requirements process. The dynamics of the CBRS/PPBES processes need to be synchronized with the rate of technological advancement. Future technological capabilities must have a stronger impact earlier in the process, and technology must be considered a co-equal driver with the concept. Some of the approaches used by the USAF in leveraging technology could be useful if appropriated into the enhanced CBRS.

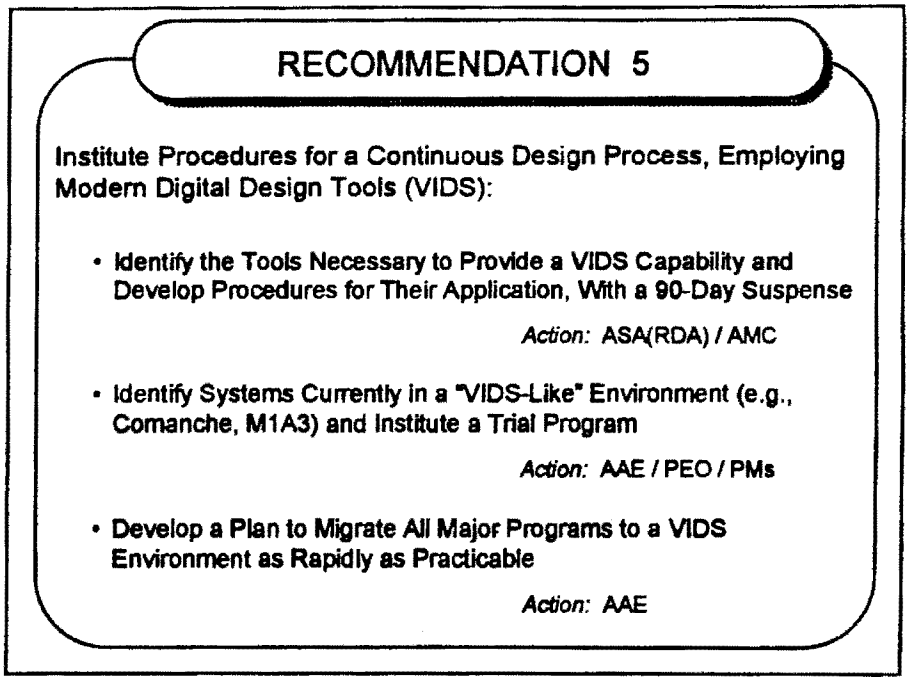
Three actions are recommended regarding the requirements process:

1. The Army has developed an advanced simulation capability and is favorably disposed as an institution to its use. This expertise can be utilized to significantly improve the coupling of the user community with the materiel developers. By exercising simulations with MWMs to discipline the process, the IPDT can achieve very good solutions relative to the "perfect" definition. For reasons of economy it is critical that the Army look to "90%"

solutions and not "gold plate" its requirements. As this process is developed, it must be institutionalized for all future programs.

2. The current CBRS process tends to ignore the realities of technological availability and maturity. Current attitudes argue that the requirement should not be constrained by technology. This leads to extended and often failed system development. This Panel recommends that the requirements process by explicitly changed to include technology as an equal partner in the definition of future needs. The Concepts and Technology Based Requirements System (CATBRS) would factor technological maturity into the requirements process and ensure that the "wishes" of the warfighter are not beyond the state-of-the-art and/or affordability. In today's environment, it is necessary to reason together to reach an achievable goal that will lead to the fielding of systems with affordable, contemporary technology, rather than obsolete capabilities.

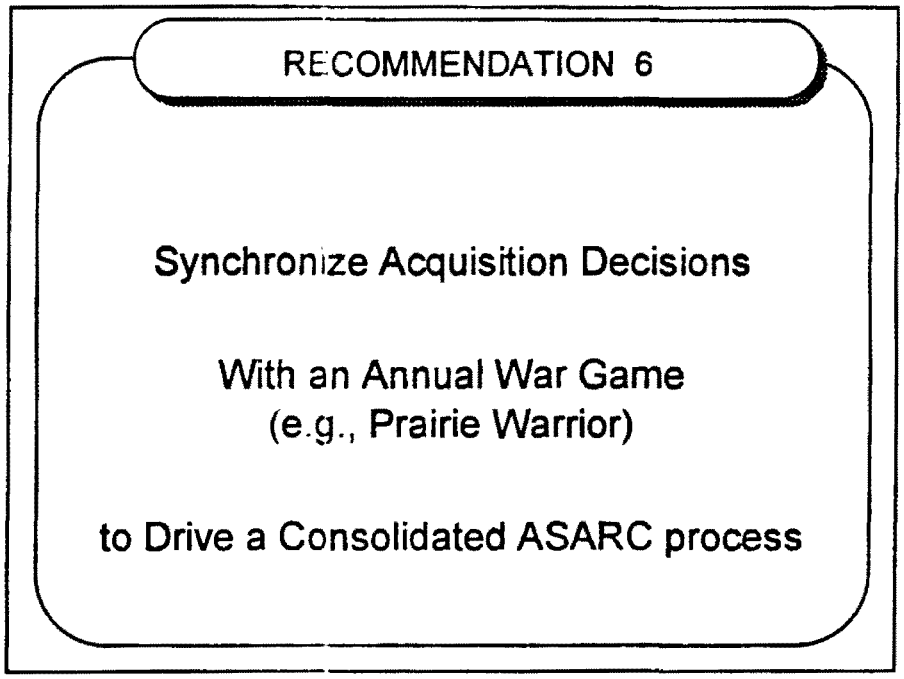
3. As indicated earlier, current requirements documentation does not provide the focus necessary to quickly arrive at satisfactory solutions. A revised MNS, a more focused ORD, and the Total System Description (TSD) can complement the proposed development process and greatly reduce the cost and time spent in system development.



It is recommended that a VIDS Process Action Team (PAT) be assembled to fully develop VIDS, building on the existing capability within the Army and industry. A total review of these tools is required to identify both the existing capabilities and the deficiencies that must be remedied. Given this inventory, procedures should be developed for a trial program.

The PAT should review existing programs which have VIDS-like tools in place. The trial platform(s) should be relatively simple systems that are currently being used, or have substantial existing virtual prototyping capability. For example, the High-Mobility, Multipurpose Wheeled Vehicle (HMMWV), Comanche, or Abrams tank are all likely to have developed substantial virtual prototyping elements. A UAV virtual prototype is relatively simple in construction, and this program would benefit substantially by having design capabilities and engineering features evaluated on a virtual battlefield. As a final task, the VIDS PAT should develop cost estimates for implementing the VIDS demonstration program.

Within twelve months, the ASA(RDA) should identify and program funding for an initial demonstration of the virtual prototyping system identified by the VIDS PAT. This will assure that the VIDS concept is carried forward to clearly demonstrate the impact virtual prototyping has on system development, and to estimate the attendant cost savings. Assuming success in the trial program, funding should be identified for the out-years to implement the VIDS approach for most or even all systems within the Army.



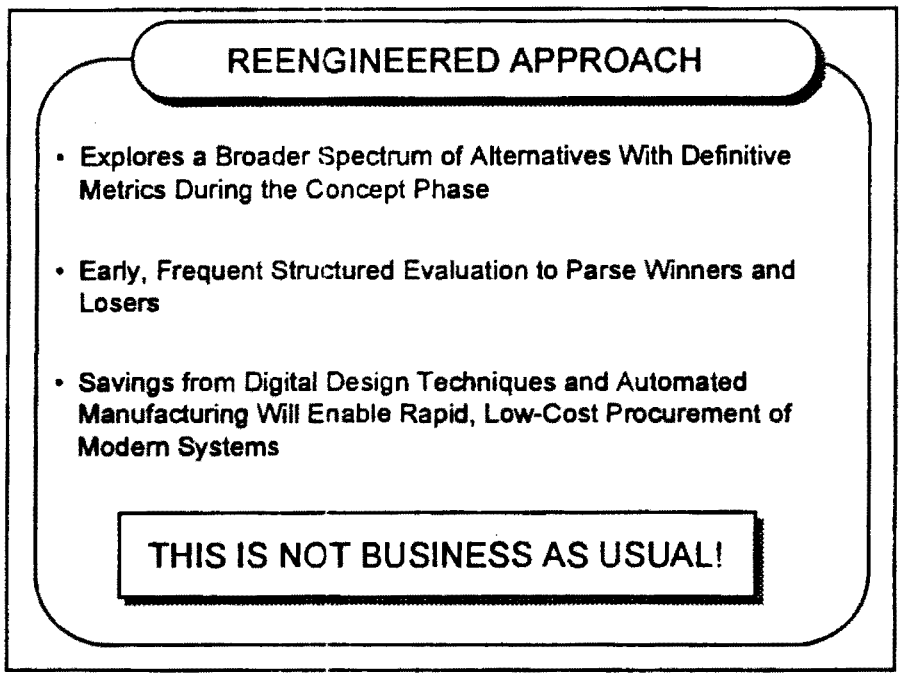
The annual war game provides a unique opportunity to evaluate candidate systems in the context of an integrated, combined arms team in a future force-on-force scenario. While high-resolution simulations provide useful insights regarding the performance factors of a system, the annual war game can provide critical insights into its overall effectiveness. Vignettes can be conducted as excursions to the base case to examine alternative threats or capabilities. Because the system is integrated into the force and the simulation is operated by the National Simulation Center, the objectivity of the results can lead to decisions without the concern of branch or parochial biases.

Given the effectiveness of a system based on war game results, the overall worth of the system can be examined in light of the cost (burden) and benefit via the MWM. As previously discussed, these costs are to be expressed in terms of personnel, training system support, and the O&S burden as well as the RDA costs. In addition to the cost-benefit arguments to be presented, the risk associated with program development must be assessed. The design process in VIDS and the associated specific technology demonstrations can verify that technical risk has been retired.

The decisions resulting from this process are the Milestone II decisions which the Army makes in the ASARC process. The fact that these decisions are to be made collectively at a time coincident with the beginning if the POM-build process is a remarkable shift from the current process. This annual review and decision point can provide the prioritization guidance necessary to stabilize the programs selected for EMD, and produce a significant streamlining of the existing process.

Programs not selected for EMD should probably be terminated, but occasionally one may be "recycled" for fine tuning. In the case of a few programs with high potential, if, for instance, the current threat does not warrant fielding a new capability or the RDA dollars do not support starting a program, the design could be kept "at-the-ready" in a hot production base. Keeping a

program at-the-ready is a preferred alternative to committing a program to EMD with insufficient funding, which can result in interminable development stretches, and often end in cancellation.

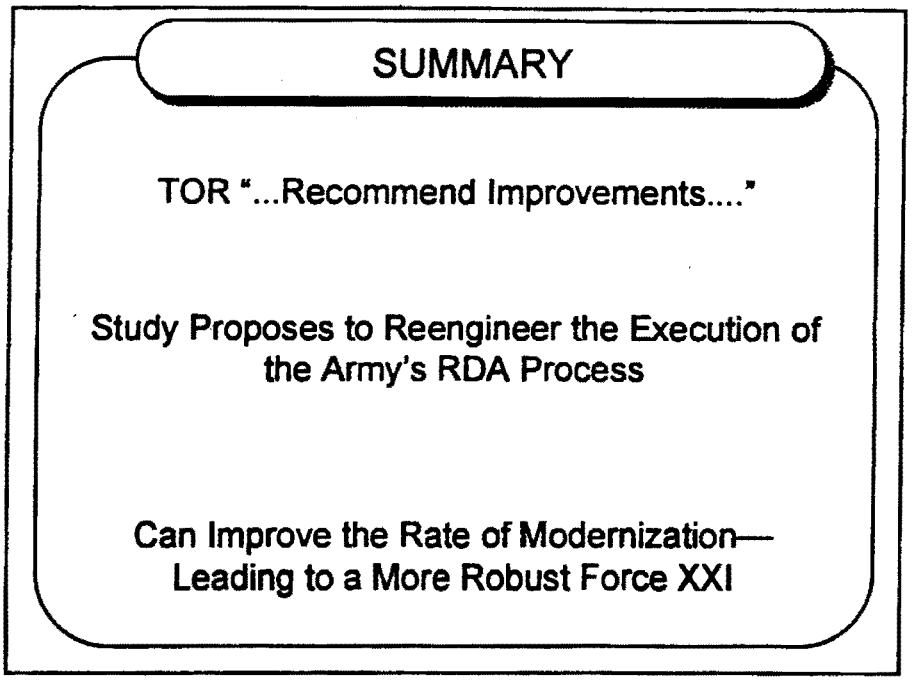


Based on its deliberations, the Panel believes the process proposed herein offers significant benefit to the Army. The consistent application of hybrid simulation techniques to the concept exploration phase can lead to a much more robust examination of available options. The early application of consistent metrics via the MWM can result in more reasoned selections.

The ability to conduct early structured evaluations can lead to the identification of the big winners and the parsing of the marginal contributors. It is critical that the Army develop a process to focus the very scarce resources it has available.

The application of digital design techniques in VIDS and VIDS' coupling to the manufacturing plant can lead to the rapid development of important capabilities and their transition to production. This process affords the capability to quickly assimilate new technology as it matures, and to maintain designs at-the-ready until they are needed.

Industry has redefined itself along the lines described in this Report. The Army needs to follow suit.



This Study's TOR asked that the Panel recommend improvements to the way in which the Army transitions technology to the field. The Panel:

- Found that the current process is inefficient and far less responsive than what has evolved in industry.

- Recommends a near total reengineering of the process by which the Army develops and procures systems. This reengineered approach is largely based on the model successfully employed by U.S. industry leaders, and captures a number of innovative ideas from the Army RDA community.

The move to improved requirements definition and a flexible manufacturing process can dramatically increase the Army's modernization rate—leading to a more robust Force XXI.

APPENDIX A

TERMS OF REFERENCE

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
RESEARCH DEVELOPMENT AND ACQUISITION
103 ARMY PENTAGON
WASHINGTON DC 20310-0103

7 MAR 1995

REPLY TO
ATTENTION OF

[redacted]
Chair, Army Science Board
Research, Development and Acquisition
103 Army Pentagon
Washington, DC 20310-0103

Dear [redacted]:

I request that you conduct an Army Science Board (ASB) Summer Study on **"The Transition of Technology from the Technology Base to the Customer."** The assessment should address, as a minimum, the Terms of Reference (TOR) described below. The ASB members appointed should consider the TOR only as guidelines and may include in their discussions related issues deemed important or suggested by the sponsor. Modifications to the TOR must be coordinated with the ASB Office.

I. Background.

Army technology is developed, demonstrated and transitioned in accordance with the vision, strategy, plan and priorities in the Army Science and Technology Master Plan (ASTMP). The ASTMP is endorsed by SECARMY, CSA, AAE, and DAS(R&T) each year and funded in the Annual Budget/FYDP submission. Demonstrations and experiments identify the warfighting utility of advanced technologies and concepts. These include Advanced Technology Demonstrations (ATDs), Advanced Concept Technology Demonstrations (ACTDs), Advanced Warfighting Experiments (AWEs), and Battle Laboratory Warfighting Experiments (BLWEs). In addition, a variety of materiel and combat development organizations are involved in the execution and management of these activities. These organizations include AMC RDECs, TRADOC Centers and Battle Laboratories, ODCSOPS, and OASA(RDA).

In today's budget environment, the Army must insure that it has a properly incentivized, efficient, streamlined process to transition its most promising technologies into traditional development, rapid prototyping or directly to rapid procurement, depending upon the urgency of need and sound risk management principles. The Army must reduce the "cycle time" and costs associated with this transition without unduly increasing risks, thereby improving customer satisfaction. Only in this fashion can the Army ensure that its soldiers are provided the best equipment in the world.

II. **Terms of Reference.**

a. Review the existing Army process for transitioning technology from the technology base to the customer, identifying all the critical elements and organizations involved in the process.

b. Examine how technologies are transitioned to "market" in industry and other government organizations.

c. Based upon the above investigations, recommend improvements that could be made to the current Army development, procurement and requirements processes that could reduce the "cycle time", costs, risks, or improve other attributes of the processes. Specific issues that should be addressed include:

- Role of the materiel development, combat development, and Battle Laboratory organizations in the process.
- How to rapidly transition promising technology and advanced concepts from demonstrations and experiments (i.e., ATDs, ACTDs, AWEs, and BLWEs) to the customer - the PEO/PMs and the Warfighter.
- Tailoring the requirements process for timely program approval.
- Achieving timely approval of post-6.3 acquisition activities and funding within the Army and OSD staffs.
- Streamlining and tailoring simulation, test and evaluation based upon ATD, ACTD, AWE and BLWE results.
- Identifying recommended solutions and corrective actions that require Army, OSD, and/or Congressional approval.

III. **Study Support.** I will Co-Sponsor this study with the VCSA, [redacted] DAS(R&T), and [redacted] III, ADCSOPS-FD, will be the Cognizant Deputies. The Primary Staff Assistant will be [redacted], SARD-TC. Secondary Staff Assistants will be appointed from SARD-ZS and DAMO-FD.

IV. **Schedule.** The study panel will initiate the study immediately and conclude its effort at the eleven-day report writing session on June 19-29, 1995 at the Beckman Center in Irvine, California. As a first step, the Study Chair should prepare a Study Plan for presentation to the Co-Sponsors that outlines the study approach and study schedule.

V. **Special Provisions.** It is not anticipated that this inquiry will go into any "particular matters" within the meaning of Section 208, Title 18 of the United States Code.

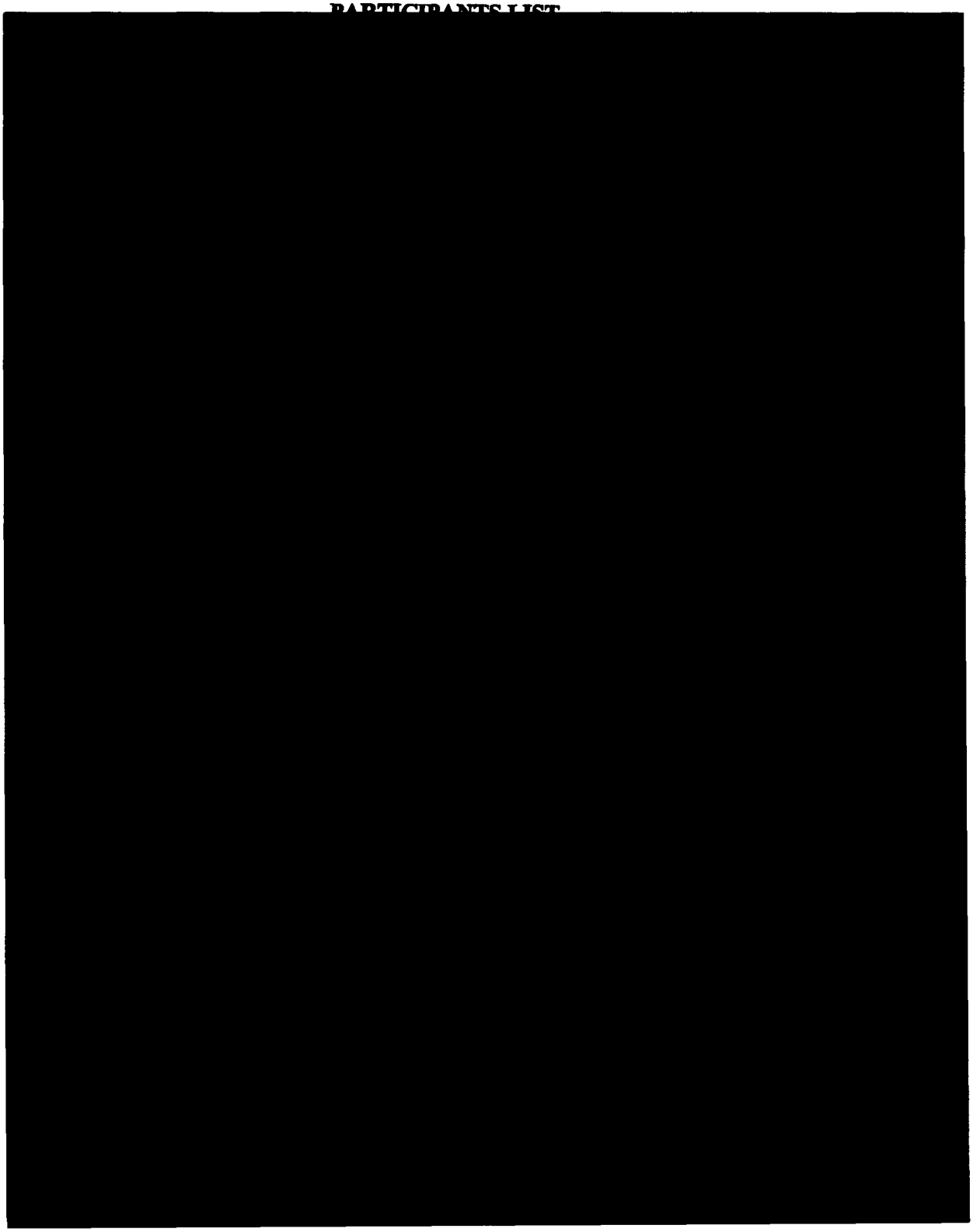
Sincerely,

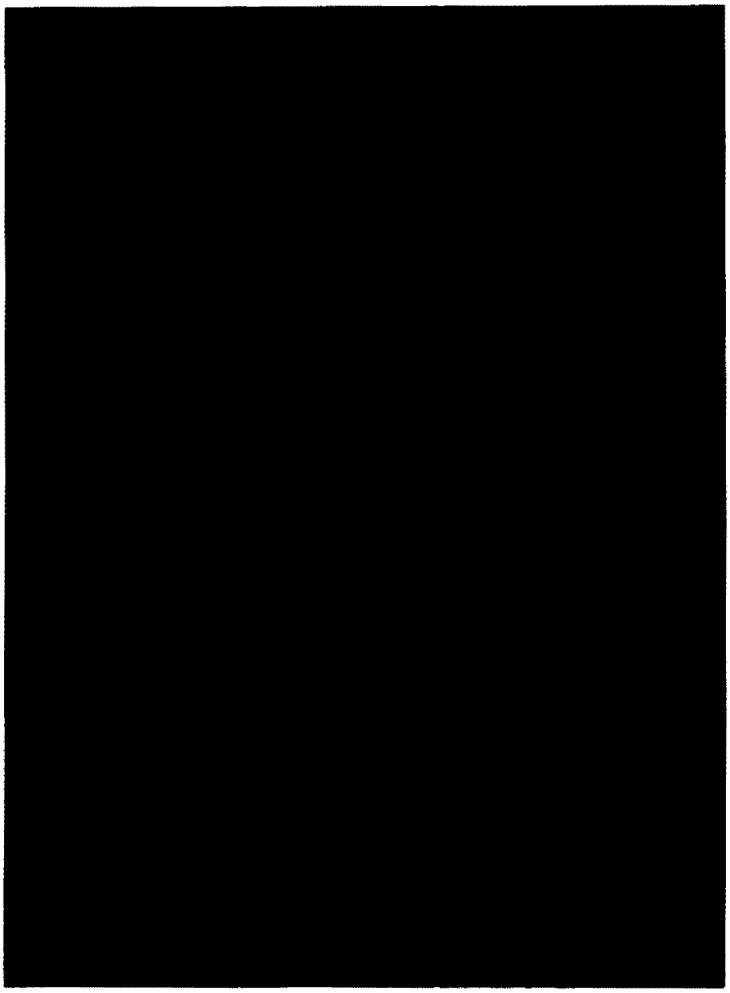
[redacted]

Assistant Secretary of the Army
(Research, Development and Acquisition)

APPENDIX B

PARTICIPANTS LIST





APPENDIX C

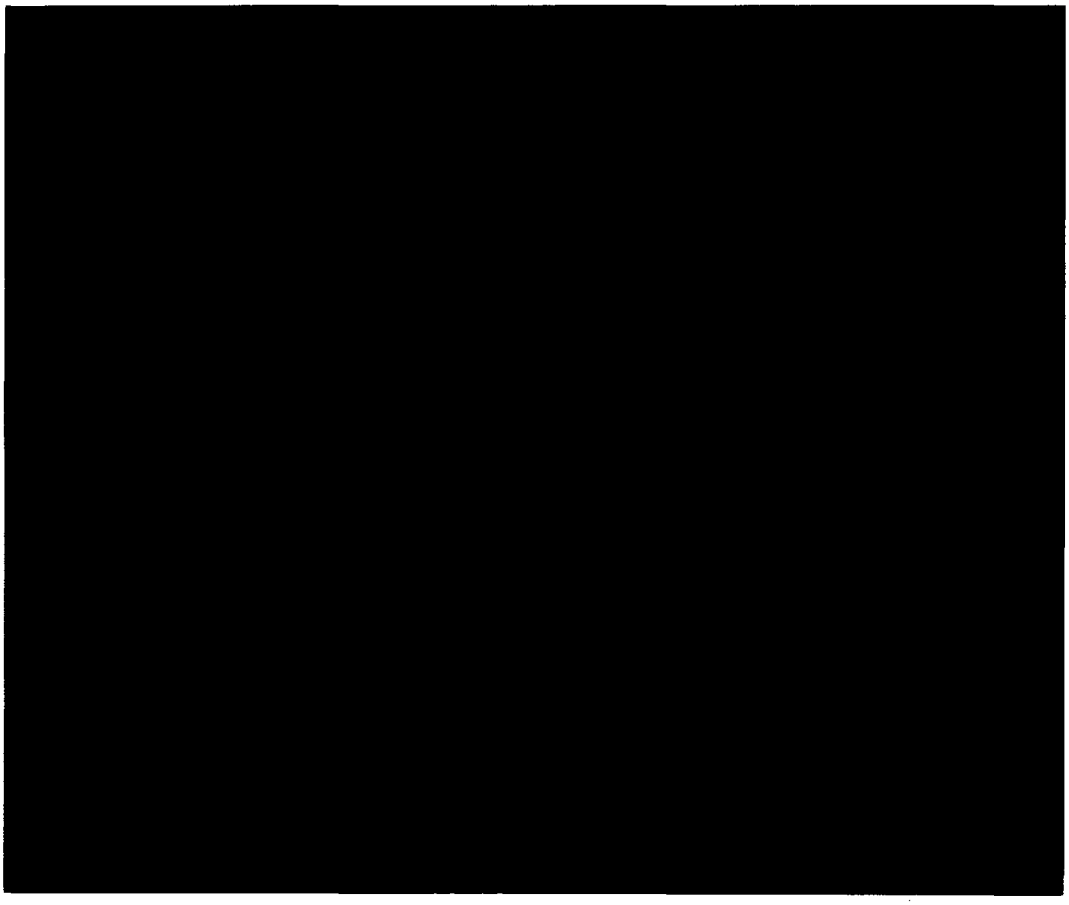
MEETINGS

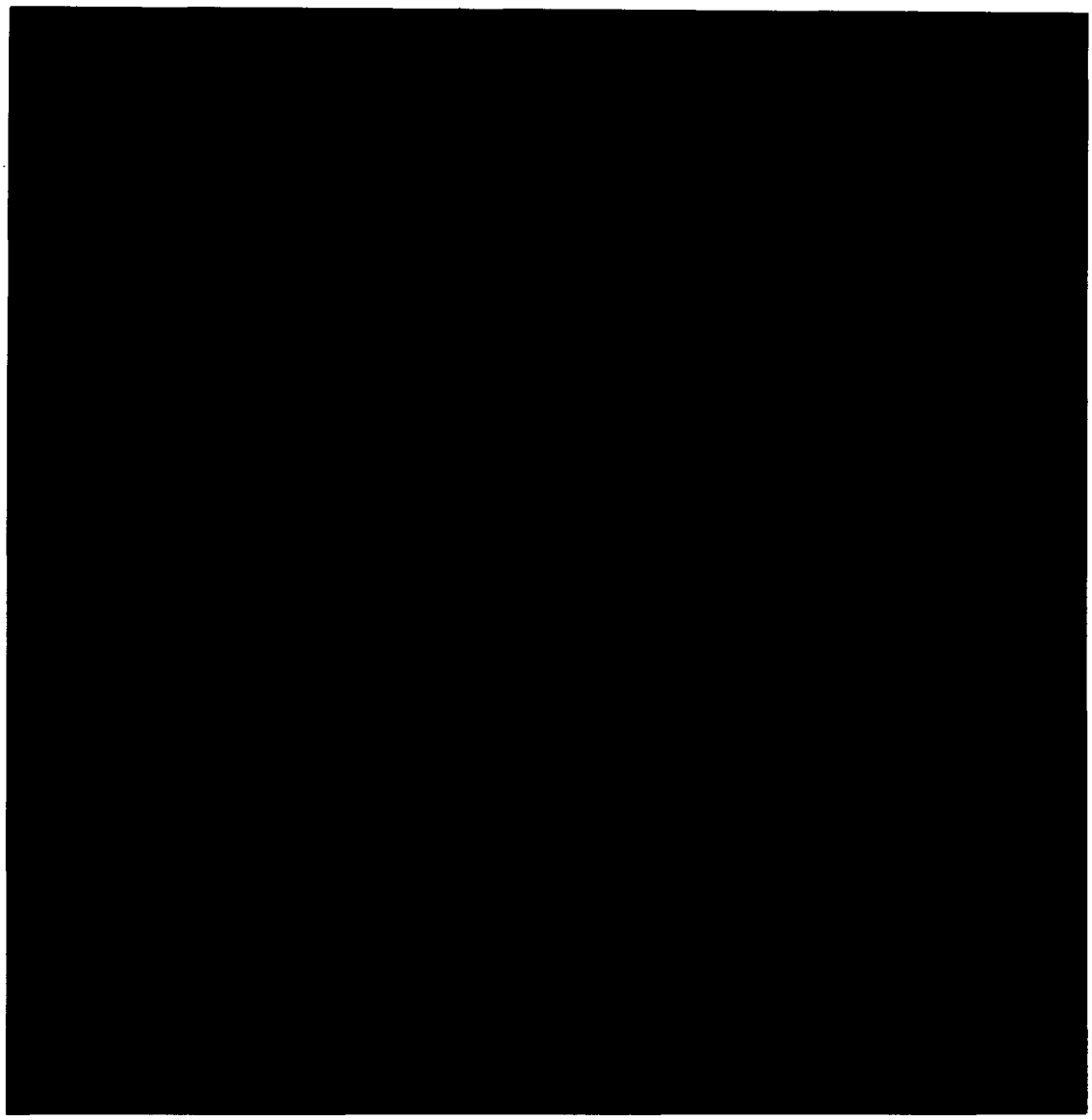
MEETINGS

Meeting Dates and Locations (1995)

9-10 February	Pentagon
27-28 February	Pentagon
13-14 March	Pentagon
27-28 March	Bellcore/Ft. Monmouth
22-23 May	Pentagon
10-13 April	Huntsville, AL
14 April	Ft. Leavenworth, KS
24-25 April	Ft. Huachuca, AZ
4-5 May	Ft. Benning
12-13 June	Pentagon
15-25 July	Beckman Center, Irvine CA

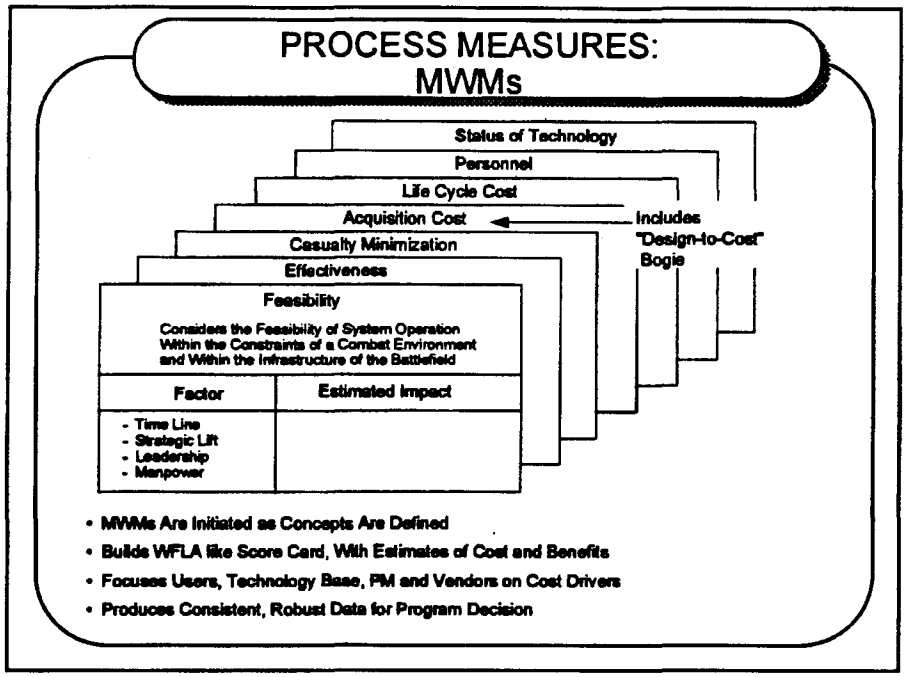
Plenary And Individual Briefings From Over 200 Individuals, Including:





APPENDIX D

MILITARY WORTH METRICS



The estimation of the "military worth" of programs is not standardized within the Army. The fundamental principles by which resources are allocated must be based on multiple factors, including the limitation of resources, that impact the warfighting capabilities of U.S. forces. Those programs that are selected must be acceptable based on all of the factors, without singular burdens. The proposed tool for structuring and standardizing the selection process, the MWM, incorporates a multiple-factor evaluation of a proposed technology, program, or system. While the list presented below is not exhaustive, the Panel believes the evaluation must address, at a minimum, the factors which follow.

Feasibility

Given a vision of the future, what is then needed is an organizational construct, the operational environment, and a concept of operation so that a mission can be derived. Given a mission and a concept of operation, the mission-critical tasks can then be explicated, which provides a basis for assessing the contribution of alternative technologies.

The first critical criterion would be the system's contribution to the mission-essential tasks, and they must be the critical tasks. These could be Critical Operational Issues and Criteria. Questions to be asked include: Does the alternative technology accomplish the mission? Is it suitable? If a technology does not satisfy this criteria, it would not be suitable for the Army of the future and would be consequently rejected. No further analysis is needed.

- **Time Line.** Given that an alternative technology is suitable—i.e., it would accomplish mission-critical tasks significantly better than current methods—the feasibility of accomplishing the task within the time, space, and means available should then be examined. These three factors are the finite characteristics of the physical world, the only three dimensions with which to work.

- **Time.** Future battlefields will have different dynamics than those of today. They will be more challenging, more stressful, more complex, more lethal, require and utilize more information, and operate under a higher tempo. Any evaluation of future technology must thus be made in the context of greater battlefield dynamics. Other demands on time, such as time needed to train on new systems, are also significant, and if a system makes significant claims on available time, it may not be a feasible course of action. For example, if training a combined arms force on a particular system requires six to nine months, but there are only three months before deployment for battle, it would not be feasible to pursue that particular technology. Similarly, a weapon system which requires 4x hours of sustainment training per month when only 1x hours are available would also be an unwise choice.

- **Space.** The spatial characteristics of a future battlefield must be defined, and more than likely they will not be the same as those of the past. The World War II battlefield, with forces cheek-by-jowl, the rear reasonably secure, friends on the flank, and enemy mainly to the front was significantly different than what was faced in Operations Just Cause, Desert Storm, and Restore Hope. The spatial distribution of the forces involved will also point to other dimensions which need to be addressed; those are tactical, operational, and strategic issues. Changes in the peacetime deployment posture of U.S. forces have emphasized significant strategic spatial considerations, while the paucity and density of friendly forces create significant operational and tactical challenges. Inability to occupy adjacent or interstitial spaces significantly adds to security and reconnaissance requirements. As most of the U.S. military's analytical tools were developed during the Cold War, they now often fail to adequately portray the relevant context for evaluation. Therefore, the Panel recommends "hard thinking" and the application of logic rather than merely "turning the crank" on model X. For example, Panel members are not aware of any current analytical simulation that adequately portrays the role of reconnaissance, yet this is precisely what is needed to assess the efficacy of a future scout vehicle.

- **Means.** People and materiel. The critical means for future battlefields can be postulated. Some of these, such as strategic lift, are used once. Others are rate-functions for consumption. Whatever the means being considered, however, the focus should be on those which are expected to be critical.

- **Things.** Combat consumables will always be a critical asset. The burden and expense of battlefield logistics and the criticality of mission-essential consumables make these crucial means. Similarly, items which require unique logistical considerations—that demand special handling or consideration under battlefield conditions—are likely to impute undue demands on a fragile, limited logistic infrastructure. Given the disposition of U.S. forces and the world (dis)order, strategic lift will likely remain a key consideration. Any technology which increases demands on strategic lift should be offset by an overwhelming effectiveness advantage.

- **Leaders.** People must be led, and the leadership dimensions of the T2 issue must be examined. Leader development is the longest pole in the R&D tent. It is not often considered in the technology arena, but it should be. The accession, training, and

development of competent leaders is a key consideration, and the quantity of competent leaders is a finite critical means. Given the complexity of future battles and the expanded battlespace, for example, it could be presumed that leader-to-led ratios in the future would argue for smaller, more efficient organizations. Even today, most maneuver forces do not fight at the Army's maneuver combat training centers, and the true potential of a force is seldom realized. What about tomorrow? It will likely be more difficult.

- **Manpower.** The foremost asset of the Army is its people. People are important; their lives, families, and well being are important. Furthermore, the Army does not have an abundance of people. Thus, the claims on Army personnel should always be a special consideration, and those claims should be minimized.

Effectiveness

Given that an alternative technology is suitable and feasible, its acceptability should then be examined. What is the gain compared to the pain? The first consideration is potential casualties that could result from using the alternative technology to accomplish the mission. A second consideration is time. If a conflict drags on, support can wane, and the Army could find itself as point man on a zero-strength squad. Yet another concern may be irreparable or irreversible damage to people or material items. The determination of what is actually "painful" is frequently best handled by decision makers, although some preliminary screening analysis vis-á-vis casualties, time, and unwanted collateral effects could be useful.

Casualty Minimization

Is the proposed capability likely to minimize casualties? Does it provide:

- **Increased Protection.** Is the new technology or system likely to reduce friendly casualties in the accomplishment of the mission (e.g., increased ballistic protection, self-protection equipment, or reduced signature on the battlefield)?

- **Real Time Situation Display.** Does it provide improved situational awareness and/or active IFF which can reduce losses due to fratricide and/or hostile action?

- **Reduced Signature Techniques.** Does the proposed capability reduce the signature of the system on the battlefield? Reductions might include visual, audio, or radio frequency emissions or simply a lower volume, making concealment easier.

Acquisition Cost

Is the acquisitional cost (RDA) of the item, including any unique training and support systems it requires, comparable to the system it replaces?

- **RDA.** Are the total development costs reasonable and affordable? Has the developer capitalized on current virtual development capabilities to minimize development costs?

- **Supporting Infrastructure.** Does the system require a new or significantly different supporting structure? Is the training base capable of teaching the new system, or does it require new, expensive simulators or ranges? Does it require a new generation of support equipment, which might include ammunition carriers, test equipment or recovery vehicles?

Life Cycle Costs

Examine the O&S costs of the system, to include demilitarization and/or retirement costs. Does capitalizing on flexible manufacturing techniques provide higher reliability and maintainability? Are spare parts requirements eased? Can maintenance personnel be reduced? Is there a concomitant reduction of transportation requirements?

- **Logistical Burden.** Does the technology feature modular design with integral test capability for fault location and crew-replaceable modules?

- **Commercial Standards.** Does the design incorporate commercial standards, components, and support systems wherever possible to eliminate expensive military-unique elements?

- **Operating Tempo (OPTEMPO) Costs.** Does the new system reduce the training costs associated with maintaining the required level of proficiency? Is the training infrastructure reduced? Is the operating cost of the system to support training reasonable? Can it be further reduced through modern simulation tools?

Personnel

Does the system afford a reduction in manpower, or is there an increased requirement? Any evaluation should include:

- **Operational Crew.** Is the crew larger than that needed by the current system? For example, the move to two-man tank crews could afford considerable savings across the Army's tank fleet.

- **Support Personnel.** Does the system require increased personnel to support its operation? Impact should be evaluated in terms of resupply (ammunition and petroleum), field maintenance (including special test equipment or vehicles), a new MOS for a unique maintainer, and any impact on depot support (e.g., more spares, frequent depot rebuild).

Technological Maturity

The evaluation of the technology itself does not exactly parallel the other metrics previously identified, but it is equally as important. A critical element of this proposed process is the early identification of all critical technologies necessary to implement the system. This process would begin in the concept-evaluation phase, and be carried forward to the ASARC decision. Factors to be considered include:

- **Performance.** Can the proposed technology meet the design goals set by the system implementor? The desire to make something faster, smaller, and/or lighter is not always matched by the realities of the available technology or funding.

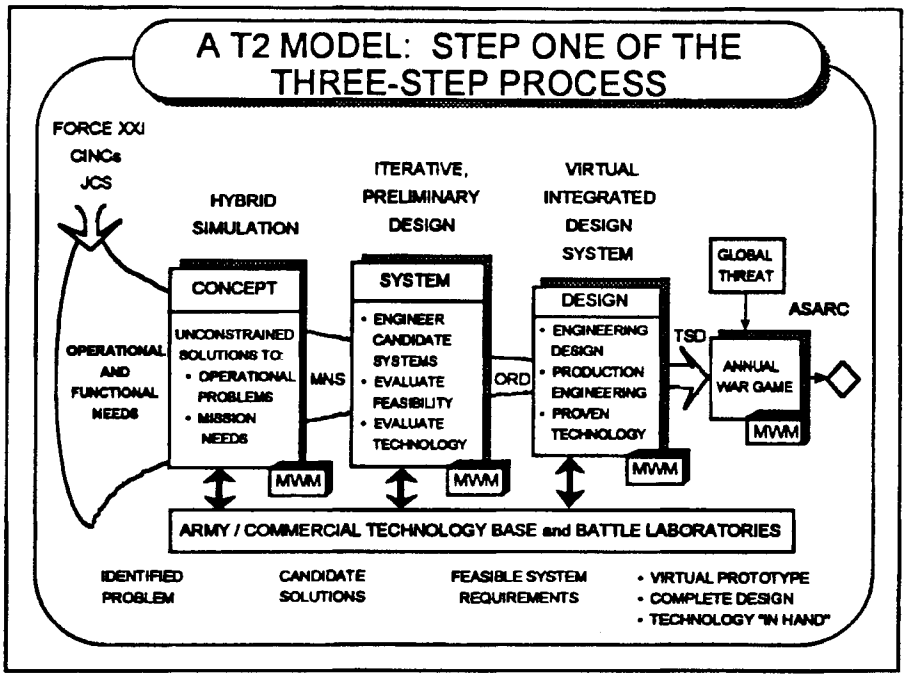
- **Software.** While many goals can be established for software processes and algorithms, experience has shown that the desired goals are not always attainable. Until a software capability is demonstrated, and while operating on representative input data, the assumption must not be made that a problem is solved, or is even solvable.

- **Producibility.** Many technologies have been demonstrated in small numbers of hand-made items, only to find that the manufacturing technology does not exist for reproduction in the quantities required for utility.

By identifying and tracking the progress of technology development, the Army can avoid launching major programs that fail to reach the field due to the inability to produce some key element of the solution. The measured approach taken in the transition to the Second-Generation FLIR demonstrates the value of waiting for the technology base to develop the key technology prior to a major commitment at the system level.

APPENDIX E

A MODEL FOR TECHNOLOGY TRANSITION



The T2 process proposed in this Report relies heavily on a family of digital tools that is emerging within the Army and in industry. These tools include improved combat models (constructive simulations), virtual simulations as exemplified by the Simulation Network (SIMNET) and the Close Combat Tactical Trainer (CCTT) and their integration with live field exercises, and the entire CAD/computer-aided manufacturing (CAM) tool set being developed and employed to aid in rapid design and transition to manufacturing.

A major problem in solving complex Army needs is the definition of effective and cost-efficient solutions—i.e., the establishment of requirements. These solutions must consider the entire spectrum of DTLOMS and the many "cost" factors explicated in the MWM. The decision sequence to support this process is discussed on pp. 45-46.

Early Combat Modeling of Concepts

Given an identified shortcoming in the Army's combat capability, a structured, no-holds-barred look at potential solutions can identify those with promise relatively quickly. Technological opportunities and new and innovative system proposals can be evaluated through a number of relatively simple combat simulations. During these early stages, the simulations can provide gross estimates of the performance of a candidate system or capability. The Army routinely uses a variety of constructive simulations such as Janus, CASTFOREM or BBS for this purpose. Occasionally, the need or opportunity may arise for force-on-force evaluations using embedded simulators for weapons and their effects. The Army has significant capability and expertise in designing these experiments. Similarly, extant virtual simulations such as SIMNET or AIRNET can be used in the Battle Laboratory environment. Ongoing development of the Combined Arms Tactical Trainer (CATT) will significantly add to the Army's capability to conduct virtual war games at the system, platoon, or company level.

These simulations and experiments have been linked with the virtual and physical prototypes in the development arena, and together they are the kernel of the VIDS process.

The product of this concept definition phase is the MNS—a general description of the military's need for the capability and an outline of the operational concept in which the technology would be applied. The potential technologies and key operational capabilities should be identified to facilitate the trades necessary to drive preliminary design exercises. Pertinent constraints or limitations should be described, and the relative values of elements of the MWM defined.

Iterative System Refinement

An iterative process at this early stage facilitates the refinement of the design, and the user gains a hands-on understanding of the capability. This enables the refinement of the need statement and the rationalization of the required capability. Properly executed with competent oversight by experienced designers and users, this process will provide the data to support the needed capability or the high-payoff systems to be recommended for further development through the VIDS program.

An integrated list of recommendations from TRADOC should be reviewed by the DCSOPS and the ASA(RDA). This review is critical due to the need to translate good ideas into programs which can be afforded and sustained. The primary criteria to be used for this evaluation should be the military worth of the proposed systems. Affordability is but one of the considerations at this time, but is not the primary criterion. It is important that MWMs be used consistently throughout the RDA processes. The use of simulations provides the objective basis for describing the performance of the system that is captured by the MWM. A system which is not selected to proceed to VIDS is likely to be terminated, but it might be returned for additional work, refinement, or realignment.

The primary product of this phase is a revised ORD that is based on trade-off analysis and technology determination: following definition of the concept, the design requires iteration to determine the trades among operational needs, technological capabilities, and costs (as described via the MWM). This stage should result in an iterated design in a revised ORD that provides an inherent cost-benefit trade, guided by the MWM.

Completion of this stage should result in a refined operational concept, TTP, and model and simulation capability, as well as the identification of the critical issues and criteria for testing. Once a system is selected to move to VIDS, additional supporting items (including DTLOMS) need to be addressed. The total burden to the Army must be known (approximately) and described to properly integrate it into higher resolution simulations and to assess the feasibility and costs of the alternatives.

VIDS

The virtual prototype is produced using VIDS. VIDS software consists of CAD, CAM, numerous analytical models to determine how the system responds to its environment and man-machine interfaces, software to develop and control system simulators for design refinements and training, Distributed Interactive Simulations (DISs) that allow a network of users to use, train on and evaluate the system, and war game software that shows the military value of the system design.

The VIDS process is supported by the IPDT, which consists of technical and managerial personnel who design, engineer, evaluate, and produce the virtual system. The number of participants and composition of the team will vary with each system; however, combat users who must fight and train with the system, and Battle Laboratory representatives who provide guidance on the incorporation and value of new technology and who experiment with design concepts, will provide major inputs to system design parameters and requirements. Engineering and scientific support staff from the RDECs will provide scientific, design, and engineering support. Industry representatives will contribute to system engineering and design and are likely to manufacture the system or support its production through subcontracts. Additionally, the myriad of other participants who ultimately contribute to the production of the system will be team participants.

Utilizing VIDS, the IPDT produces "rolling baseline" virtual prototypes. Rolling baseline systems are continuously refined and evaluated as information is gathered and more is learned about system performance, limitations, and desirable features. The VIDS process borrows heavily from Boeing's successful development of the 777 aircraft.

A TSD will be produced by VIDS. The TSD that supports EMD should reflect a carefully considered statement of requirement with an implicit trade-off and prioritization. Consequently, rather than being an exhaustive document containing endless details of requirements minutiae, the TSD should reflect the essential required capabilities and engineering attributes to a very definitive level, based on the VIDS process. The fully developed DTLOMS products will serve as the operational context for the use of the item. The priorities and trade-offs reflected in the previous work should enable consistent rationalization with the MWM as the basis for the cost-benefit trades. (Note: This "TSD requirement" does not exist in the current development process. Its definition deserves careful thought and refinement.)

The other products of the VIDS process are described in Appendix F.

Annual War Game

The annual war game at Fort Leavenworth, which has included an adjunct evaluation of future systems and capabilities, provides an extant capability that could be adapted to the need for an integrated objective evaluation. This annual war game, conducted by the National Simulation Center, provides a high-resolution force-on-force simulation with the capability for adapting to a variety of threat doctrines and opposing force (OPFOR) capabilities. The specific scenarios to be used in the annual war game can be adapted to provide realistic evaluations of the candidate systems. Design of this scenario and definition of the attendant input data represent a significant work effort that must be sequenced with the decision processes that describe the systems and capabilities being evaluated.

The current simulations that could be used are the Corps Battle Simulation (CBS) and EAGLE. If required, higher resolution vignettes may be run using the family of constructive models mentioned earlier. Future work would be conducted utilizing WARSIM 2000 as it replaces CBS. The linkage of virtual, live (subsistent), and constructive simulations demonstrated in the Synthetic Theater of War-East (STOW-E) portends an important future capability to further streamline this process.

The OPFOR capability resident in the National Simulation Center and the Battle Command Training Program (BCTP) provides a superior capability that can be used in this annual war game.

The resident OPFOR has the capability to replicate a variety of threat doctrines, organizations, and materiel.

Potential Impact Of An Annual Virtual War Game

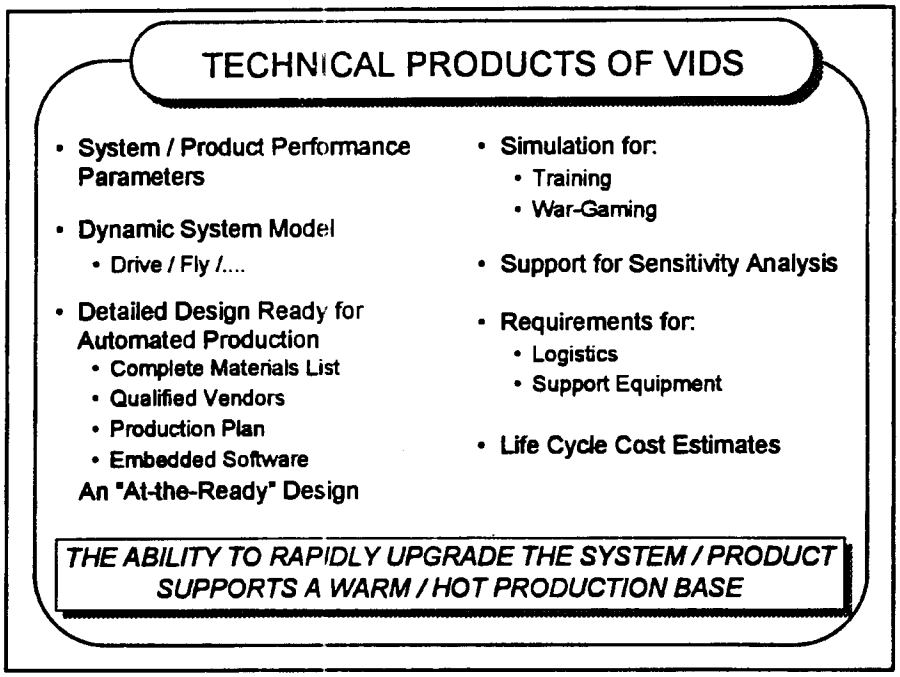
The annual war game can provide a unique capability to evaluate candidate systems in the context of an integrated, combined arms team on a future battlefield in a force-on-force scenario. While prior high-resolution simulations provide useful insights regarding the performance factors of a system, the annual war game will provide the critical insights into its overall effectiveness in a combined arms environment. Vignettes can be conducted as excursions to the base case to examine alternative threats or capabilities. Because the system is integrated into the force and the simulation is operated by the National Simulation Center, the objectivity of the results can lead to decisions without the concern of branch or parochial biases.

Given the effectiveness of a system as seen by the war game results, its overall worth can be examined in light of its costs (burden) and benefits, via the MWM. These factors include personnel, training system support, and the O&S burden, as well as the RDA costs. In addition to the cost-benefit arguments, the risk associated with the program must be assessed. The earlier VIDS work and parallel technology verification programs should provide the basis to establish that technical risk has been retired.

The decisions resulting from this process are essentially the Milestone II decisions that the Army makes in the ASARC process. The fact that the decisions here are made collectively at a time coincident with the beginning of the POM-build process (see the chart on p. 49) is a remarkable shift from the current process, and will provide the prioritization guidance necessary to stabilize the programs selected for EMD. This should produce a significant streamlining of the current T2 process. A program not selected for EMD could be terminated or returned for additional work. If the threat did not warrant a change at this time or if RDA funding would not support starting a new program, the system could be kept "at-the-ready" in a hot production base. Maintaining a program in this state is a preferable alternative to initiating a program with insufficient funding, which results in interminable development stretches.

APPENDIX F

VIRTUAL INTEGRATED DESIGN SYSTEM



The VIDS products are extensive and detailed. They define the system as well as or better than an actual production model because system/product performance parameters are explicitly defined in simulations for system operational training and for war gaming.

The training simulators produced by VIDS are dynamic system models that allow operators to drive, fly, shoot, or otherwise operate the system in an operational-like environment.

Detailed design products from VIDS include identification and lists of qualified vendors, complete materials lists, a production plan and costs, facilitation requirements, training for users, embedded software required for field training, and ready-for-automated-production software that can be used to manufacture the system.

Additionally, virtual prototypes can be used to define system parameter sensitivity analyses, and to provide requirements for logistics and support equipment and detailed life cycle cost estimates.

The virtual prototype is an "on-the-shelf" system that can be rapidly upgraded and which maintains a warm/hot production base through the direct interaction of industry in system development.

APPENDIX G

GLOSSARY

GLOSSARY

AAE	Army Acquisition Executive
ABCS	Army Battle Command System
ABIC	Army Battlefield Interface Concept
ACTD	Advanced Concept Technology Demonstration
ADATS	Air Defense Anti-Tank System
ADO	Army Digitization Office
AMC	Army Materiel Command
ASA(RDA)	Assistant Secretary of the Army (Research, Development and Acquisition)
ASARC	Army Systems Acquisition Review Council
ASAS	All Source Analysis System
ASB	Army Science Board
ASTMP	Army Science and Technology Master Plan
ASTWG	Army Science and Technology Working Group
ATCCS	Army Tactical Command and Control System
ATD	Advanced Technology Demonstration
AWE	Advanced Warfighting Experiment
BAT	Brilliant Anti-Tank
BCTP	Battle Command Training Program
BLWE	Battle Laboratory Warfighting Experiment
C2	Command and Control
C3I	Command, Control, Communications and Intelligence
CAD	Computer-Aided Design
CAM	Computer-Aided Manufacturing
CATBRS	Concept and Technology Based Requirements System
CATT	Combined Arms Tactical Trainer
CBRS	Concept-Based Requirements System
CBS	Corps Battle Simulation
CCTT	Close Combat Tactical Trainer
CH	Cargo Helicopter
CINC	Commander-in-Chief
COTS	Commercial Off-The-Shelf
CSA	Chief of Staff, Army
DA	Department of the Army
DCSOPS	Deputy Chief of Staff for Operations and Plans
DIS	Distributed Interactive Simulation
DIVAD	Division Air Defense
DoD	Department of Defense
DTLOMS	Doctrine, Training, Leader Development, Organization, Materiel and Soldier

EMD	Engineering and Manufacturing Development
FAA	Federal Aviation Administration
FLIR	Forward-Looking Infrared
FPTOC	Force Projection Tactical Operations Center
FY	Fiscal Year
HMMWV	High-Mobility, Multipurpose Wheeled Vehicle
HTI	Horizontal Technology Insertion
IBM	International Business Machines
IFF	Identification, Friend or Foe
IPDT	Integrated Product Development Team
JCS	Joint Chiefs of Staff
LRIP	Low-Rate Initial Production
MCS	Maneuver Control System
MNS	Mission Need Statement
MOP	Measure of Performance
MOS	Military Operational Specialty
MWM	Military Worth Metric
NVD	Night Vision Device
NVG	Night Vision Goggles
O&S	Operations and Support
OMA	Operations and Maintenance, Army
OPA	Other Procurement, Army
OPFOR	Opposing Force
OPLAN	Operational Plan
OPTEC	Operational Test and Evaluation Command
OPTEMPO	Operating Tempo
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
PAT	Process Action Team
PATRIOT	Phase Array Tracking Intercept on Target
PD	Preliminary Design
PEO	Program Executive Officer
PM	Program Manager

POM	Program Objective Memorandum
PPBES	Planning, Programming, Budgeting, and Execution System
Q&A	Question and Answer
R&D	Research and Development
RDA	Research, Development and Acquisition
RDEC	Research, Development and Engineering Center
RDT&E	Research, Development, Test and Evaluation
RDTE&A	Research, Development, Test and Evaluation and Acquisition
RFP	Request for Proposal
S&T	Science and Technology
SA	Secretary of the Army
SADARM	Sense and Destroy Armor
SIMNET	Simulation Network
SINCGARS	Single Channel Ground and Airborne Radio System
SOF	Special Operations Forces
SSDC	Space and Strategic Defense Command
STOW-E	Synthetic Theater of War-East
T2	Technology Transfer
TARDEC	Tank Research, Development and Engineering Center
TBD	To Be Determined
T&E	Test and Evaluation
TOA	Total Obligation Authority
TOR	Terms of Reference
TRADOC	Training and Doctrine Command
TSD	Total System Description
TTP	Tactics, Techniques and Procedures
UAV	Unmanned Aerial Vehicle
UH	Utility Helicopter
USAF	United States Air Force
VIDS	Virtual Integrated Design System
VRC	Vehicular Radio Communications
VTI	Vertical Technology Insertion
WARSIM	War Simulation
WFLA	Warfighting Lens Analysis

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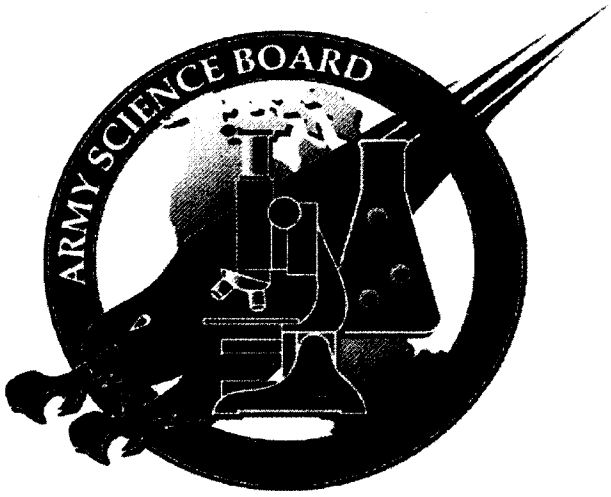
FINAL REPORT



DEPARTMENT OF THE ARMY
ASSISTANT SECRETARY OF THE ARMY
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"OVERCOMING BARRIERS TO THE IMPLEMENTATION OF ACQUISITION REFORM"

March 1998

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This report is the product of the Army Science Board (ASB). The ASB is an independent, objective advisory group to the Secretary of the Army (SA) and the Chief of Staff, Army (CSA). Statements, opinions, recommendations and/or conclusions contained in this report are those of the Issue Group on "Overcoming Barriers to the Implementation of Acquisition Reform" and do not necessarily reflect the official position of the United States Army or the Department of Defense (DoD)

CONFLICT OF INTEREST

Conflicts of interest did not become apparent as a result of the Panel's recommendations.

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13. ABSTRACT (Maximum 200 words)

This study analyzes the major barriers to the implementation of acquisition reform. Findings indicate the Army has yet to institutionalize acquisition reform as a wholesale buy-in. The evident culture of the buying community, burdened by insufficient communications, training, bureaucracy and a lack of leadership commitment, constitutes the greatest obstacle. The conclusions focus on ten initiatives and five key areas. These areas include: institutionalization of AR through focused communication; policy and organizational changes to support creation of a unified acquisition/logistics/sustainment initiative; and creation of a few simple trans-Army metrics for use by Army leadership.

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FINAL REPORT

"OVERCOMING BARRIERS TO THE IMPLEMENTATION OF ACQUISITION REFORM"

March 1998

AUTHOR'S NOTE

I am pleased to present this final report, Overcoming Barriers to the Implementation of Acquisition Reform, by the Army Science Board Acquisition Reform Issue Group. It is the last report of the Acquisition Reform Issue Group.

The merging of the Acquisition Reform and Logistics/Sustainability Issue Groups to form the new Life Cycle Management Issue Group is a fitting implementation of one of the key recommendations of this study. It bespeaks the reception given to the results by the study's sponsor, [redacted].

I extend my sincere appreciation to the Study Panel – [redacted] – for their effort, intellect and tenacity. To [redacted] I wish to offer my very special thanks for his invaluable insights and assistance into the personnel issues that pervaded this study.

The Study Panel could not have fulfilled its mission and provided the guidance contained in this report without the cooperation of all those who participated as members of the focus groups, briefed the Panel and cooperated in untold hours of lengthy interview. To all these people the Panel owes a special debt of gratitude.

No study, particularly one requiring the coordination and logistics of this effort, can be conducted smoothly and efficiently without the stewardship of the staff assistant. I, therefore, would like to thank our two, fine staff assistants, [redacted] who launched the Panel before his retirement, and [redacted], who shepherded us to the finish line.

As a final note, the study was completed in the Fall of 1997. Given the fast pace of acquisition reform implementation, readers must consider the timing of the data collection and analyses.

[redacted]
Study and Issue Group Chair

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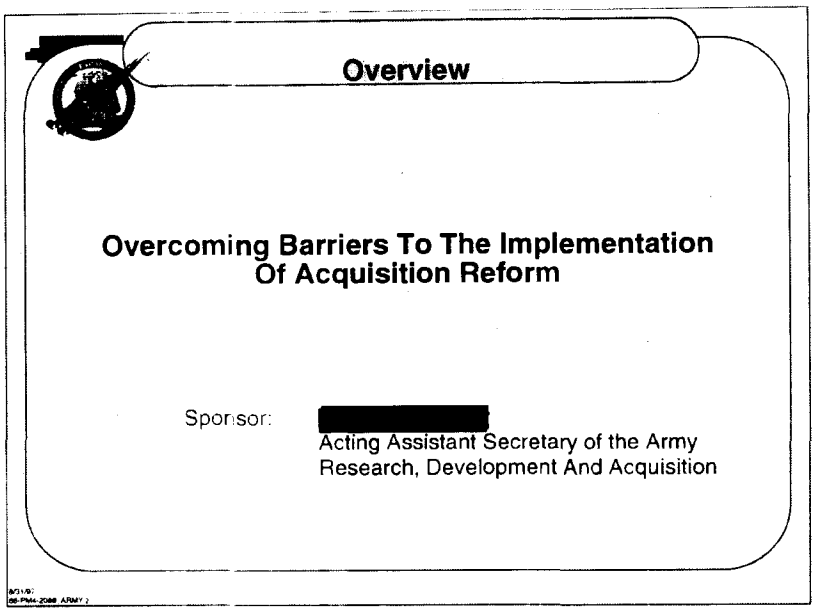
APPENDICES



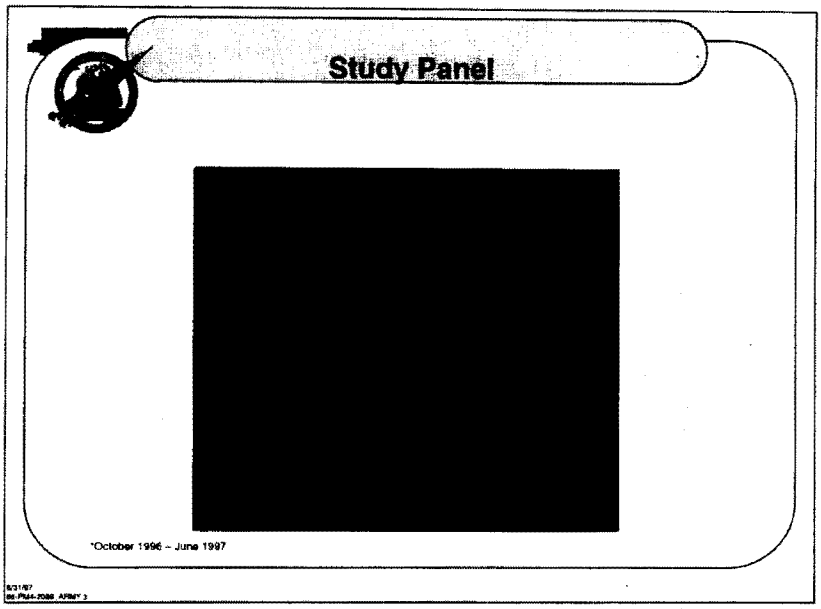
To successfully implement acquisition reform[1], Army leadership, acquisition leadership and all buying elements of the Army must have varying degrees of understanding of the revised acquisition laws and regulations, including their policy objectives; recognize opportunities for exercising judgment and discretion; exercise judgment and discretion with competent assistance from the elements that influence the acquisition process—auditing, compliance and legal—without fear of unwarranted criticism and scrutiny from those elements; and take personal responsibility for furtherance of the goals to be achieved by the reforms.

Frustration in achieving the savings and efficiencies promised by acquisition reformers has emphasized the barriers that are impeding and will impede successful implementation of acquisition reform. Some barriers, such as lack of training funds and mandated workforce reductions, cannot be overcome within the Army or Department of Defense (DoD); changes in legislative attitudes and statutory expressions of those changes are required. There are, however, cultural, organizational, political and behavioral barriers that can be overcome from within and need no legislative fixes.

In addition to government-wide initiatives, the DoD and the Department of the Army have also undertaken reforms to streamline military acquisitions. The Army has taken major steps not only to implement and adapt over-arching federal policy but also to use its own authority to initiate both savings and efficiencies. The purpose of Army acquisition is to equip and sustain the soldier. The purpose of acquisition reform is to do it faster, at a reasonable price, and with affordable ownership costs. This is Army policy in support of Army XXI.

In the fall of 1996, the then-Deputy Assistant Secretary of the Army for Procurement (DASA(P)), now Acting Assistant Secretary of the Army (Research, Development and Acquisition), [redacted], charged the Army Science Board Acquisition Reform Issue Group to assess the barriers to achieving the levels of acquisition reform the Army must realize to meet its objectives in the areas of readiness and sustainment, and recommend means by which to robustly meet the objectives of Army acquisition reform in light of the identified barriers.

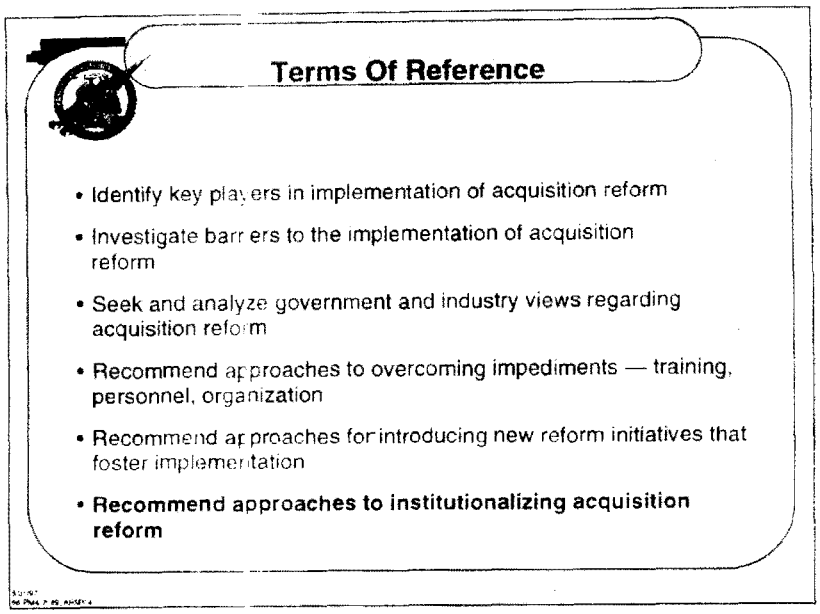
[1] Appendix G contains a précis of acquisition reform at the macro level.



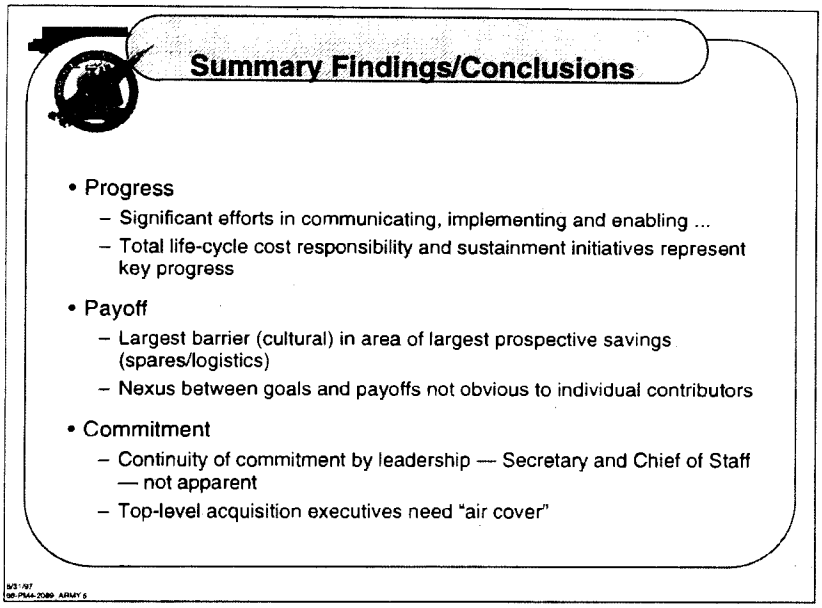
A subset of the ASB Acquisition Reform Issue Group membership participated along with several consultants. The panelists brought to the study expertise in military acquisition practices and organizations, military operational requirements, law, civilian and military personnel systems, operations research, metrics, and commercial practices.

The panel was supported by [redacted] with the Army Acquisition Reform Office (SARD-PR) and, after his retirement, by [redacted] of that same organization.

[redacted] was particularly instrumental in supporting the development of the study approach and organizing site visits and briefings.



The Terms of Reference are attached as Appendix B to this report. The panel expanded its efforts to include approaches to institutionalizing acquisition reform.



At the outset it is critical to know and keep in mind while reviewing this report that the panel was not charged with dwelling upon the successes achieved by the Army in acquisition reform, unless success could be used as a paradigm on which to base remedial actions. Rather, the panel was charged with ferreting out inadequacies and suggesting remedies. Thus, those who review this report may find it overly critical and, at times, harsh. That is to be expected given the panel's charge. This report should in no way be interpreted as diminishing the accomplishments of the Army in implementing reforms to the acquisition process.

The panel's findings and conclusions, broadly reflective of all facets of Army implementation of acquisition reform, may be reduced to five significant areas: the progress made by the Army to date; where the largest payoffs are and why they are not realized; the degree of commitment by the leadership to acquisition reform and its significance to successful reform initiatives; attempts to measure the effects of acquisition reform and the quality of the metrics employed; and the contributors to acquisition reform and the resources with which they are to achieve success. These summary conclusions also address some of the more noteworthy findings of the panel with respect to the ten key acquisition reform initiatives on which it focused.

Progress: The Army has achieved credible success in implementing certain acquisition reform initiatives, communicating new processes to some contributors and enabling those who actively seek a meaningful role in the acquisition process. Moreover, Army acquisition leadership has demonstrated innovation through its creative vision of total life cycle cost responsibility and management for Acquisition Category (ACAT) systems under DoD Directive 5000.1 whereby Program Executive Officers (PEOs) and Major Commands (MACOMs) that manage ACAT systems are now responsible for the management of the total life cycle costs for such systems. Additionally, the acquisition leadership's vision for sustainment and modernization through spares reflects a comprehensive understanding of the political and budgetary environment in which the acquisition mission — to equip and sustain the soldier — is realized.

Summary Findings/Conclusions

Notwithstanding the progress noted above, the Army has yet to *institutionalize* acquisition reform. Indeed, with the exception of credit card purchasing, the panel's analysis suggests that there is no evidence of a wholesale buy-in of any single acquisition reform initiative, let alone the very core concepts of simplification, commercialization and streamlining. It is this institutionalization of acquisition reform that will move the Army to a point where by it can, given selection and use of proper metrics, demonstrate the savings in time and dollars.

Payoff: Culture is routinely defined as the totality of socially transmitted behavior patterns, beliefs, institutions and other by-products of human work and thought characteristics. The culture evident in many large segments of the Army buying community is variably characterized by rigidity; fear of commercial practices; personnel actions; job loss; the misapplication of power by some in authority; and mistrust. There are, of course, exceptions both organizationally and individually. However, the culture of the Army buying community has been identified by this panel as the single greatest barrier to institutionalization of acquisition reform.

Nowhere is that culture more formidable than in the area of highest payoff — spares/logistics/sustainment. The panel found an almost universally negative (or lack of positive) response to acquisition reform amongst those members of th is subset of the buying community with which it spoke. In contrast, panelists found the new-starts subculture to be fairly responsive, at least during interviews, to embracing acquisition reform. However, as noted, where the greatest percent of acquisition dollars are expended — the purchase of spares/ sustainment – there appears the greatest resistance to change.

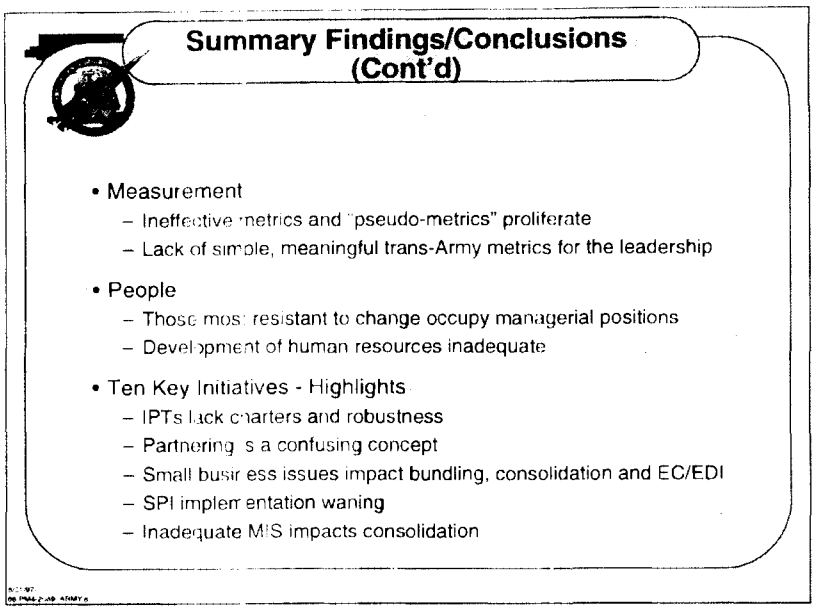
The panel attributes the negative characteristics of the culture and its impact on acquisition reform institutionalization in large part to the lack of an obvious nexus between acquisition reform goals and payoffs. Contributors have not been made responsible for achieving acquisition reform goals. This ties to other observations regarding commitment of the leadership and metrics discussed below. Notwithstanding the efforts at communications through road shows and other training media, achieving acquisition reform objectives is viewed more as aspirational than mandatory. Being held personally responsible for the success or failure in achieving express objectives can be very compelling.

Summary Findings/Conclusions

Commitment: It is not apparent to the panel that Army civilian and military leadership outside of the OASA(RDA) organization have sustained their commitment to the objectives and processes of acquisition reform. One compelling reason for this *apparent* lack of commitment is the burden placed on the most senior levels by forces above, namely the DoD and Congress. One can liken this situation to a corporate chief executive officer who must constantly see to the demands of board members and shareholders, and lacks the time to project leadership downward into the organization.

Notwithstanding the demands on Army leadership, without the regular, obvious, unwavering and articulated commitment by the Secretary and Chief of Staff to acquisition reform, two undesirable effects are evident: the workforce's perception that acquisition reform initiatives are passing whims; and the loss of the momentum initiated by OSD and OASA(RDA).

A review of vision statements, public speeches and other communications from the Secretary and Chief of Staff found little evidence of an unambiguous, continuing commitment to the principles and processes of acquisition reform. Without regular demonstrations of leadership commitment, the workforce is left to the management devices of the uncommitted.



Measurement:

Acquisition reform metrics are the numerical values by which the Army and other interested entities gauge progress toward meeting acquisition reform objectives. If the key acquisition reform objectives are to equip and sustain the soldier faster, better and cheaper (without diminishing warfighting capabilities), then the true metrics are those that enable the Army to assess *how much faster, how much better and how much cheaper*[2].

Members of the Army buying community with whom the panel spoke reported untold hours expended in pursuit not of valid measurements of progress but rather of measurements that reflect on successes in areas that have, at best, marginal relationships to acquisition reform. The panel has called these ill-conceived measurements "pseudo-metrics." It learned of organizations that met weekly to discuss metrics yet could produce no measure of achievement — no numerical value of progress or a lack of progress. Rather, it appears that disproportional amounts of time have been spent crafting seemingly complex but actually meaningless measurements.

Three reasons for these wasteful exercises became apparent: some of those assigned to craft metrics lack the understanding of acquisition reform and the acquisition process; attempts at baselining are inadequate due to data retrieval and reliability problems; and many managers require pseudo-metrics to make them and their organizations appear, at least superficially, successful.

What compounds the problem at the lower level is a lack of one or two simple, trans-Army metrics employed by the leadership.

[2] Selecting Effective Acquisition Reform Metrics, Aron Pinker, Charles G. Smith and Jack W. Booher. *Acquisition Review Quarterly*, Vol. 4, No. 2 (Spring 1997) at 192.

Summary Findings/Conclusions (Cont'd)

People:

The panelists, through focus groups and interviews, were struck by the amount of energy expended by segments of the workforce who, despite the expenditure of effort, produced little in the way of improvement to a buying system desperately in need of augmentation. While the tools to enhance the buying system have been provided in the form of process improvements and statutory/regulatory changes, institutionalization of the improvements are not forthcoming.

Several reasons for this became apparent: those most resistant to change in the acquisition process occupy management positions; too large a percentage of the civilian workforce is undereducated (26% lack undergraduate degrees); and the well-educated military workforce is too mobile.

Under the Defense Acquisition Workforce Improvement Act (DAWIA) undereducated workers were "grandfathered" into the system. While this tended to preserve the status of women and minorities, it gave promotional parity to those who generally lacked undergraduate degrees. It appears that these same workers were allowed to remain promotable without a requirement that they secure the requisite college-level education. Moreover, the Army appears not to have provided the same government-paid educational opportunities to this segment of the workforce as it has to the military. In contrast to the civilian workforce, the military are extremely well educated and at government expense. Approximately 70% have advanced degrees. Not only do they enter the acquisition workforce late in comparison to their Air Force peers (Army personnel enter as Captains and Majors in contrast to Air Force personnel who enter at the rank of second Lieutenant) but their rotations are generally three years—too short a time. The panel found that military contributors average only four to six years of acquisition experience in contrast to their civilian counterparts with six to ten years of experience. See Appendix C for a fuller treatment of personnel issues.

Ten Key Initiatives:

The panel, with concurrence from its sponsor, identified ten acquisition reform initiatives on which to focus:

Performance Specifications
Integrated Product Teams (IPTs)
Partnering
Single Process Initiative (SPI)
Consolidation of Contracting Activities
Electronic Commerce/Electronic Data Interchange (EC/EDI)
Credit Cards
Contractor Logistic Support
Bundling Buys
Outcome Based Metrics

Summary Findings/Conclusions (Cont'd)

The detailed observations of the panel on each of the ten initiatives are presented later in this report. See Slides 25 through 44. However, it is instructive to review some of the more noteworthy findings here.

The panel found evidence that many IPTs are unchartered and are merely renamed meetings. There is not a universal understanding that an IPT is a *tailored* business process.

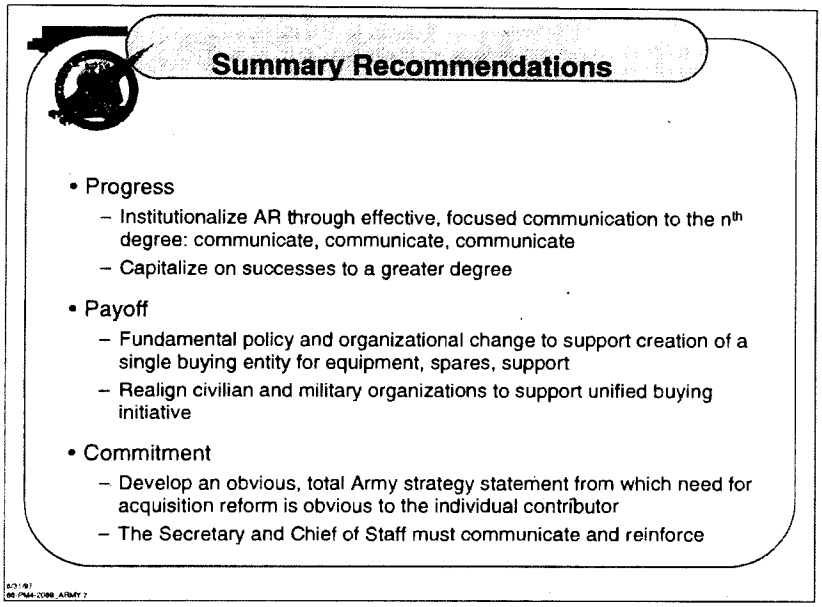
A number of initiatives, including partnering, bundled buying, SPI and Contractor Logistic Support are confusing and misunderstood.

Small business issues permeate a number of the initiatives including bundling buys, consolidation of contracting activities, EC/EDI and performance specifications.

The panel found three SPI perspectives, the vast majority of those with whom the panel discussed SPI have no real idea what it is. The other two perspectives are "it doesn't apply to my efforts because it has already been done" or "it doesn't apply to spares."

Certain initiatives, such as consolidation of contracting activities, require robust Management Information Systems (MIS). Such robust systems appear to be lacking and frustrate implementation of key initiatives.

If any one observation is to be communicated, it is the lack of *obvious* acquisition reform commitment by leadership from the Secretary and Chief of Staff. Their attention is directed upward. There are, however, select cases of outstanding acquisition reform leadership and demonstrated commitment from the OASA(RDA) organization and at select commands.



In light of the panel's finding and conclusions, it crafted numerous and focused recommendations and actions to promote acquisition reform and meet the objectives thereof. The panel's summary recommendations are keyed to the six areas of summary findings and conclusions.

Progress: Let there be no doubt that there have been numerous acquisition reform successes based on the commitment and effectiveness of some very talented people in the Army. However, those standard - bearers of acquisition reform can not institutionalize acquisition reform unaided.

The panel recommends that ASA(RDA) work closely with the Secretary and Chief of Staff to craft an *obvious* Army strategy statement linking achievement of objectives with personal commitment and accountability. Moreover, this message must be accompanied by an aggressive marketing strategy that emphasizes continuous, uniform communication of the Army strategy. Managers of buying organizations, particularly mid-level managers, must be the target of this communications effort.

Payoff: Spares/sustainment encompass more than 50% of acquisition dollars. The most formidable barrier to acquisition reform, culture, is most obvious in the spares/sustainment segment of the Army buying community. These considerations, taken together with the critical nature of the modernization through spares initiative and the common-sense economics associated with the vastly reduced acquisition budget, mandate the serious realignment of buying authority and buying policy.

Summary Recommendations

The panel recommends a fundamental acquisition policy change for the Army leading to the creation of a single buying command or entity in support of the sustainment requirements of the Army. Additionally, the panel recommends a re alignment of the policy and advisory functions and organizations of the Deputy Chief of Staff (Logistics) and the logistics responsibility of the Assistant Secretary of the Army (Installations, Logistics and Environment) to support a unified buying structure. As currently structured, the Deputy Chief of Staff (Logistics) (DSCLOG) and the logistics responsibility of the Assistant Secretary of the Army (Installations, Logistics and Environment) ASA(ILE) may not meet the requirements driven by such a fundamental policy and organizational change as the panel recommends. Re-alignment will likely entail identifying and segregating sustainment from war-time logistics functions. The former — sustainment — would be addressed by a different organization than either (DSCLOG) or ASA(ILE) as they are currently constituted. Consequently, implementation considerations may well entail downsizing of both entities and re-alignment of authority and responsibility.

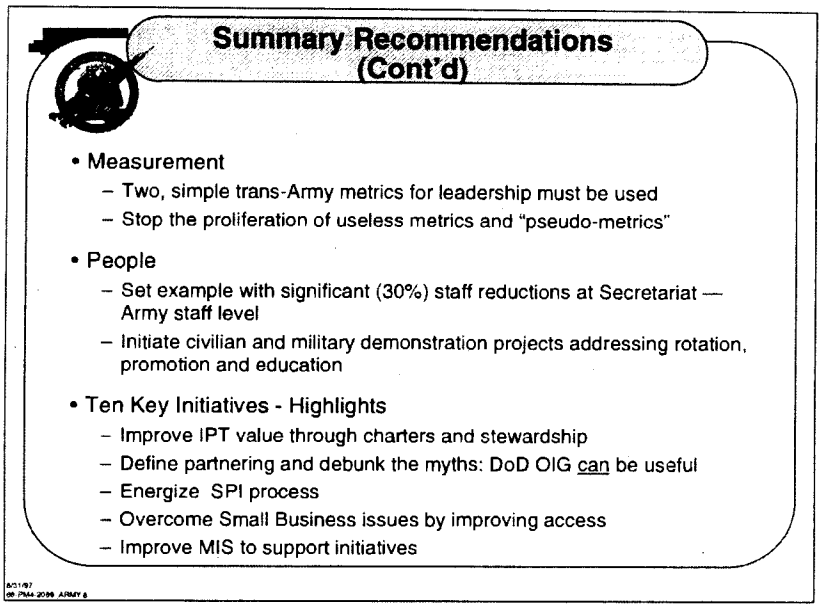
The panel does not have a specific organizational structure to recommend at this time, such as a recast AMC headquarters organization. However, its analyses suggest certain strategies: a business model, to be crafted, would drive the design and operational principles of the new, unified buying entity; the unified buying entity would focus on sustainment rather than wartime logistics; the recently-vested PEO responsibility for the life cycle costs of an ACAT system would not be diminished by this change, but rather the unified buying entity would treat PMs as customers; and customers of the unified buying entity would be given the authority to impose "price" reductions on the unified buying entity.

The panel fully recognizes that this is a bold step that will challenge some of the most entrenched interests and practices in the Army. However, without the leadership and foresight to implement such a fundamental re-alignment of the buying function, the Army is not likely to achieve the cost savings, time savings and quality objectives it must attain to equip and sustain the soldier in the 21st century.

Commitment:

The relationship between commitment and progress is incontrovertible.

The panel reiterates its recommendation that the Army develop a total Army acquisition reform strategy statement from which the need for acquisition reform is obvious and compelling to the individual contributor, and which the Secretary and Chief of Staff demonstrably support.



Measurement: It is the panel's observation that pseudo-metrics proliferate and that there is a dearth of simple, trans-Army metrics for leadership to use.

The panel recommends two simple, trans-Army metrics to be used by the Secretary and Chief of Staff. The first, the cost burden per dollar spent for acquiring goods and services gauges how much cheaper. A related metric, which is actually a management tool, is headcount. Headcount, by numbers of people or positions, while not an outcome-based metric *per se*, is recommended as a metric due to DoD (and the Army's) apparent inability to adequately marry the overhead costs of people into its acquisition cost evaluations. Thus, by using headcount (or number of positions), greater insight into cost reductions can be gained. Moreover, due to mandatory staffing reductions, headcount has heightened visibility. When measured quarterly, provide a means by which leadership can both calibrate and compel lower tier management progress.

The panel further recommends that steps be taken to stop the proliferation of pseudo-metrics and deterrents to such exercises be communicated and enforced.

People: The number and attributes of the workforce are the key to acquisition reform success. Honest resistance to downsizing can be partially mitigated by top-level examples. Issues of education, rotation, promotion and education can be addressed, despite the constraints of the civilian and military personnel structures, with policy and program changes, and pilot programs.

The panel recommends significant staffing reductions at the Secretariat and Army staff levels. Achieving a stretch goal — 30% — should create more effective organizations that focus on necessary functions. Some reductions may be achieved through the recommendation found under Payoff. To implement such drastic reductions will require securing nearly unprecedented relief from OSD reporting requirements. By initiating this as a pilot or demonstration program and securing the support of the National Performance Review and the Office of Management and Budget, the Army can take a leadership position by moving its warfighting role out from under the weight of an unwieldy bureaucracy.

Summary Recommendations (Cont'd)

The panel further recommends the initiation of a demonstration project addressing military rotation; implementing a civilian point system for promotion which borrows some of the better features of the Air Force system; and pursuing improved levels of government-paid education for civilian acquisition workers. Participation in the DoD Acquisition Workforce Demonstration Project, the National Technological University program and employment of other distance learning approaches may reduce the initial investment required to implement the last recommendation.

Ten Key Initiatives:

The detailed recommendations of the panel on each of the ten initiatives are presented later in this report. See Slides 25 through 44. However, it is instructive to review some of the more noteworthy recommendations here.

It is recommended that no IPT be established without a workable charter—no ersatz charters—and that those who attempt to do so be sanctioned. IPT outcomes require stewardship, and stewardship can not occur without realistic and well expressed charters.

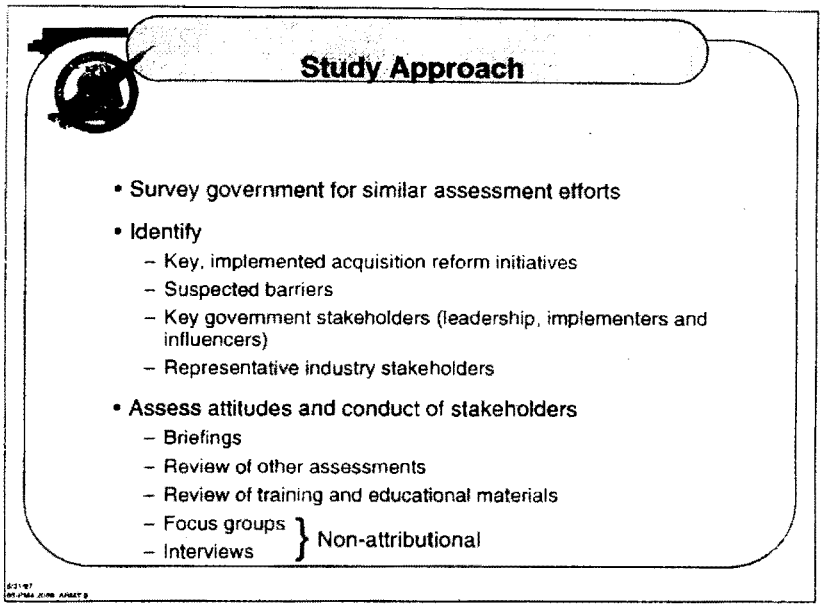
The panel recommends the development and broad communication of definitions for the terms partnering, bundled buying, SPI and Contractor Logistic Support. *The panel also recommends* that a joint approach be formed with the DoD Office of the Inspector General to define a workable approach to government-industry partnering, including fairly bright-line tests for discerning ethical and legal ramifications.

The small business issues that impact certain initiatives such as bundling buys, consolidation of contracting activities, EC/EDI and performance specifications can be mitigated by improving the access of small business to the system. Information technology (IT)—workstations, modems and software—and the knowledge to use the technology—can greatly improve the frequency and quality of small business access to the acquisition system. *It is recommended* that ASA(RDA) undertake the leadership of an initiative with the IT industry to form a coalition to support small business access to electronic-based government procurement systems. The coalition would provide hardware, software and training at little or no cost to eligible small business.

The panel recommends a concerted effort to energize adoption of SPIs. This requires training, communications and debunking the myth that all the good initiatives have been taken.

The panel recommends that the robustness of MIS systems to support consolidation of contracting activities be investigated by those who are MIS experts rather than solely by acquisition contributors. The panel found a strong capability in this area at CECOM and suggests that those resources be used on a consultative basis.

The panel recognizes that some of its recommendations will produce angst in many quarters of the Army. There is no silver bullet for achieving the success that the Army seeks. This will be hard, bitter and politically unpopular work that requires foresight, leadership and courage.

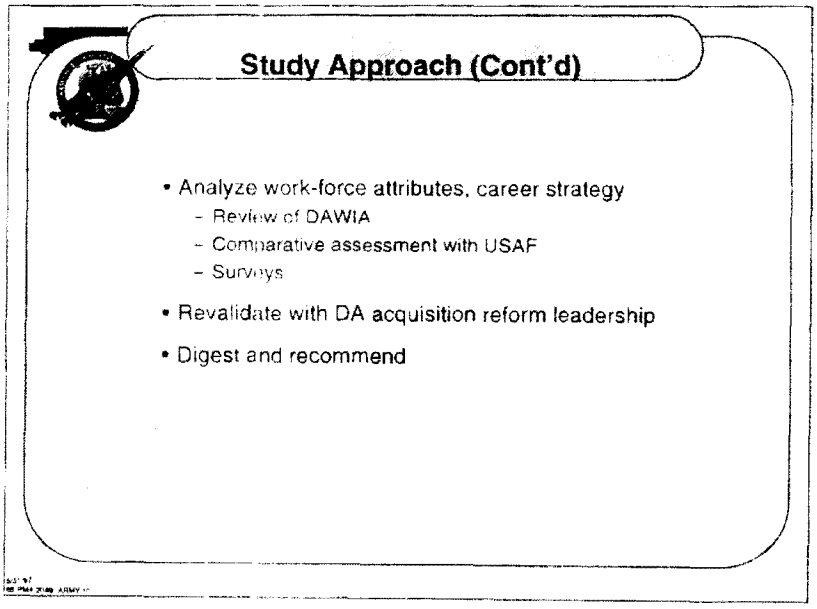


The panel surveyed government for similar assessments of barriers to acquisition reform. The panel found very few; only two were relevant to the Army and this study. The first was a study for the Army by the RAND Arroyo Center[3]. The second is the continuing compliance assessment by the Army Materiel Command (AMC) Acquisition Reform Assessment Team (ARIAT). The panel found the results of both studies very useful and compelling in some areas.

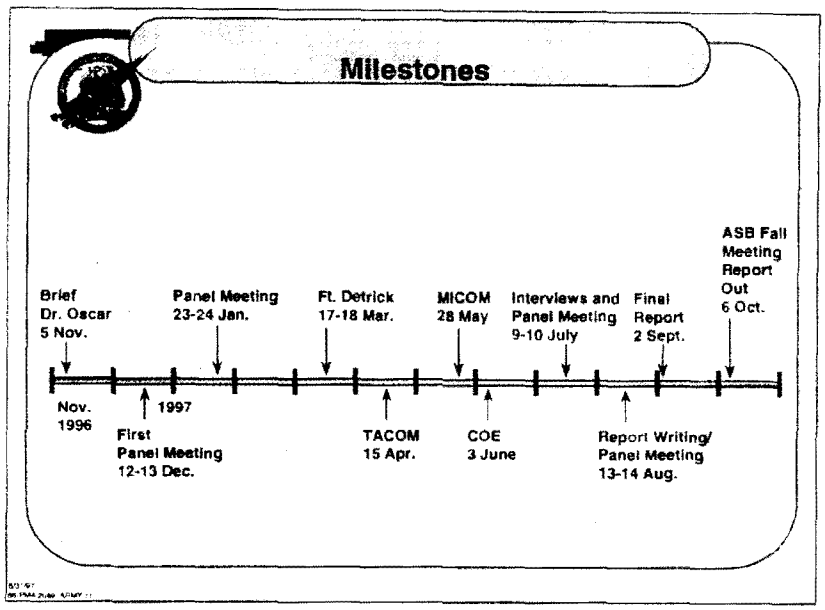
The panel elected to begin with identifying key players: it identified key acquisition reform initiatives that were in the implementation process; suspected barriers, key stakeholders and/or contributors within government (e.g. leadership, workforce, and influencers/watchdogs); and representative industry stakeholders.

The panel used non-attributional focus groups and interviews to gather information and assess the attitudes and conduct of the various stakeholders. Additionally, the panel or subparts thereof, reviewed training information, received briefings, conducted searches of Army and DoD documents and pursued research into DAWIA and the Air Force personnel system.

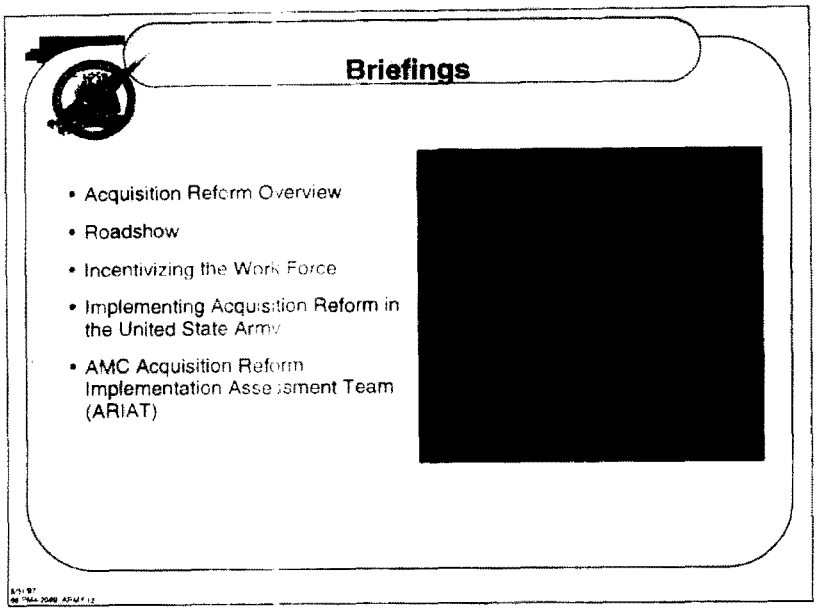
[3] Inquiries regarding this study should be directed to SARD-PR.



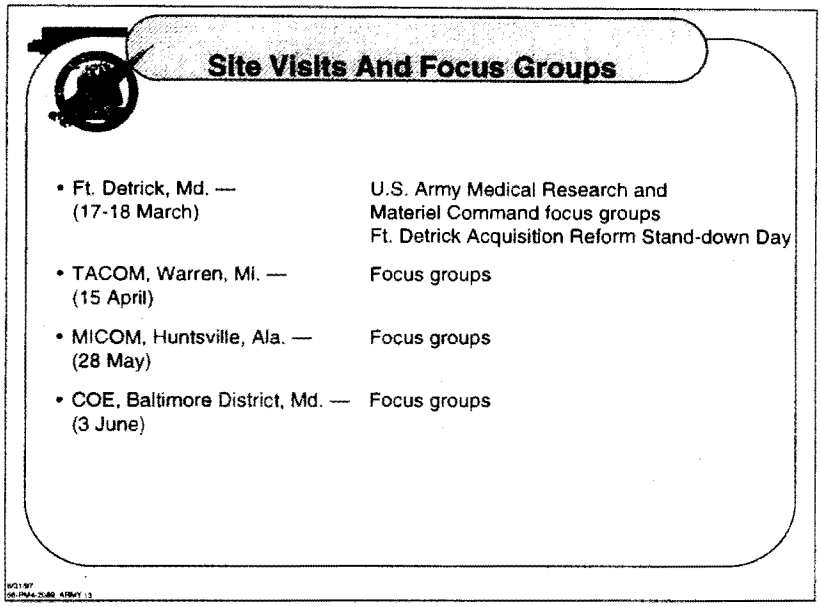
After nine months of effort, the panel re-calibrated its efforts with the Army acquisition reform leadership and management.



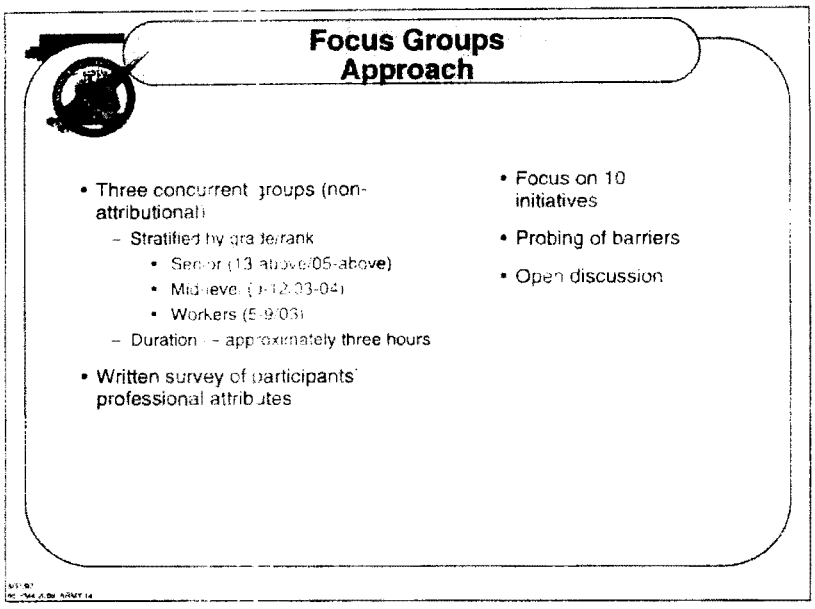
The effort of the panel took ten months.



Only five formal briefings were conducted. The panel relied on in-depth discussions after analyzing read-ahead materials.



The panel's emphasis was placed on site visits and focus groups. Four site visits and focus groups were conducted. The panelists visited the U.S. Army Medical Research and Materiel Command at Ft. Detrick, TACOM, MICOM (now AMCOM), and the Corps of Engineers, Baltimore District. In addition to other interviews, these site visits and focus groups gave the panel members an opportunity to view diverse buying organizations.

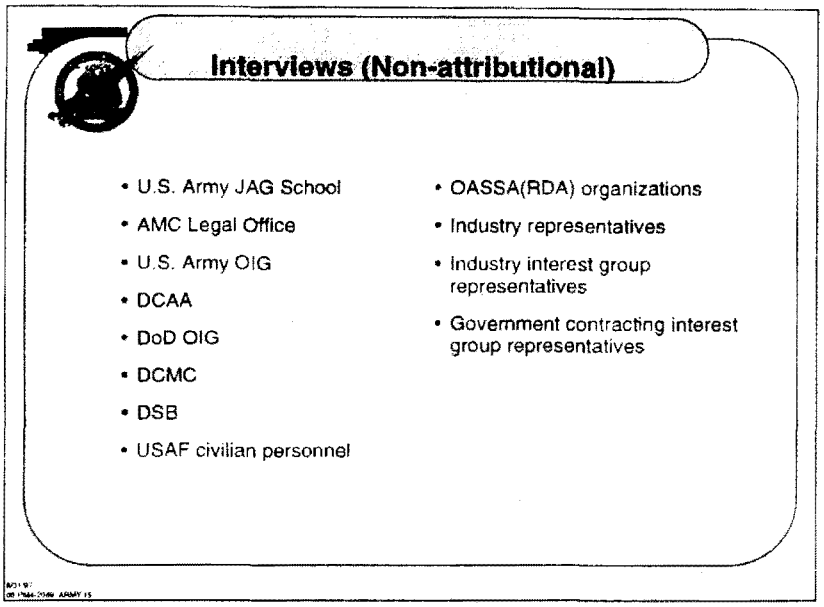


The panel's decision to employ the focus group technique was motivated in part by the presence on the panel of a member with expertise in this technique and the experience of other panel members in focus groups. Several of the members were highly experienced in other interview techniques.

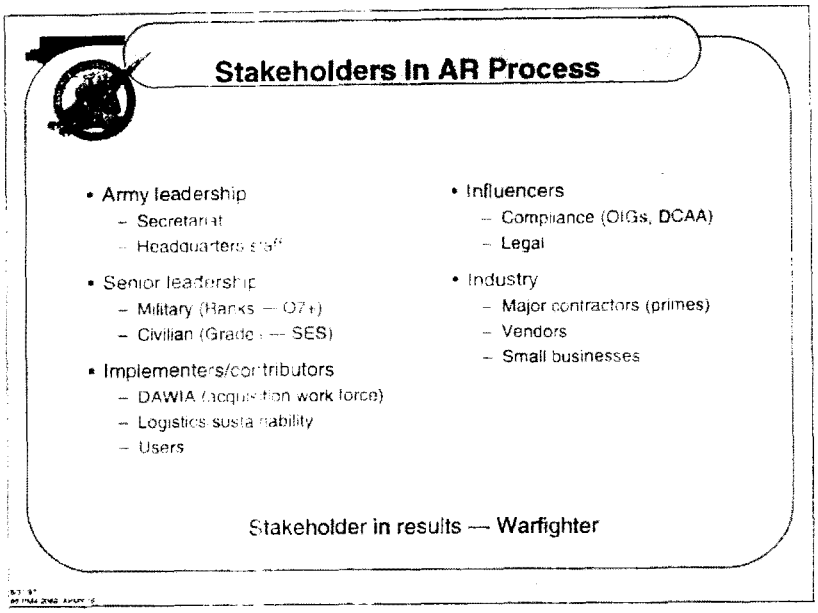
At each site the panel conducted three simultaneous focus groups stratified by grade and rank. The senior group was populated by grade 13 and above and military with the rank of Lieutenant Colonel and above. The mid-level group encompassed civilian grades 9 through 12 and Majors and Captains. The worker level covered civilian grades 5 to 9 and some Captains. Each focus group session lasted approximately three hours and was conducted on a non-attribution basis.

The focus groups were used to probe ten initiatives and explore barriers. The discussions were open and the participants appeared forthcoming.

Additionally, focus group participants and some OASA(RDA) organization interviewees completed questionnaires. A sample questionnaire is attached as Appendix D, as are the results. Eighty questionnaires were completed and returned.

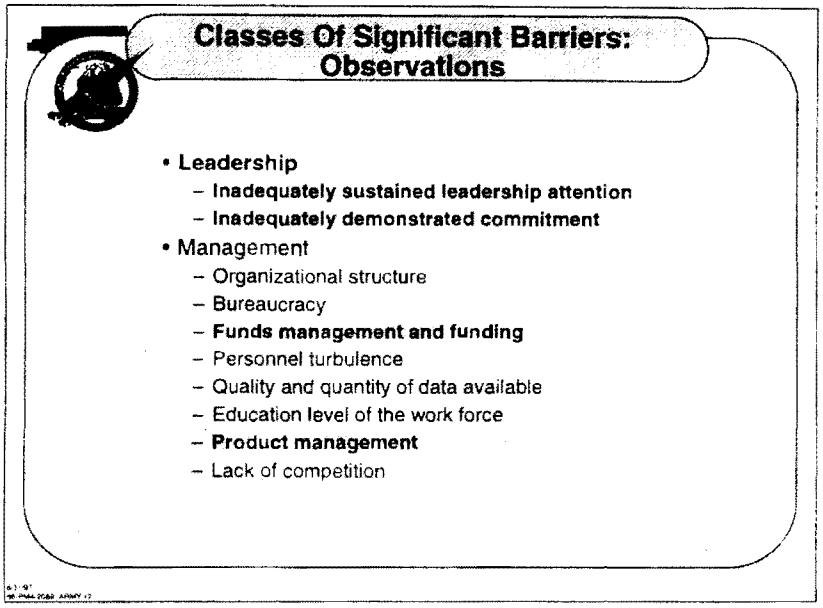


Non-attributional interviews were conducted with representatives from buying organizations; legal, audit and other compliance groups; the U.S. Air Force; the Defense Science Board; prime contractors, vendors, small businesses and their representative organizations; and OASA(RDA) organizations.



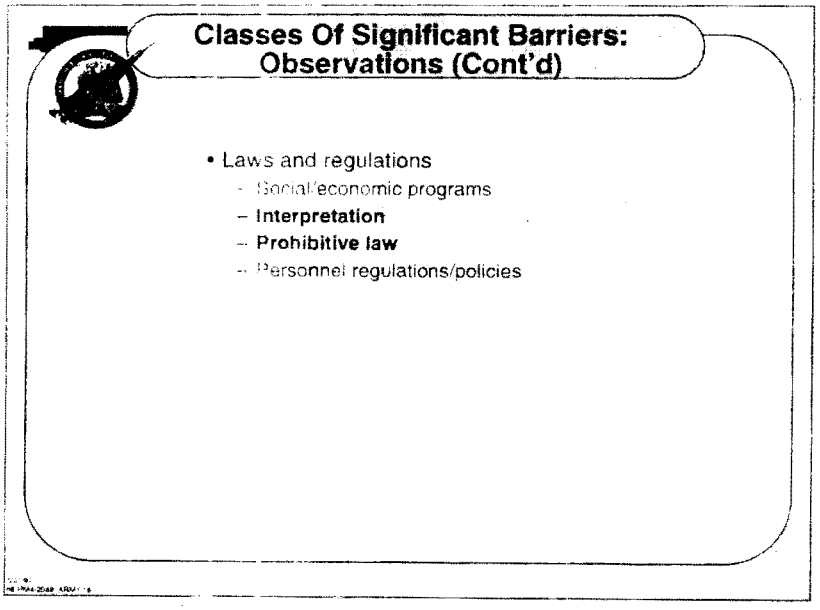
The panel identified five categories of stakeholders in the acquisition reform process: the Secretary and Chief of Staff; senior Army leadership at the general officer and Senior Executive Service (SES) levels; those who implement and contribute to acquisition reform, including those in the DAWIA workforce, the logistics/sustainment community and other users of the acquisition system; those who influence the acquisition reform process, specifically lawyers, auditors, inspectors general and other compliance groups; and industry.

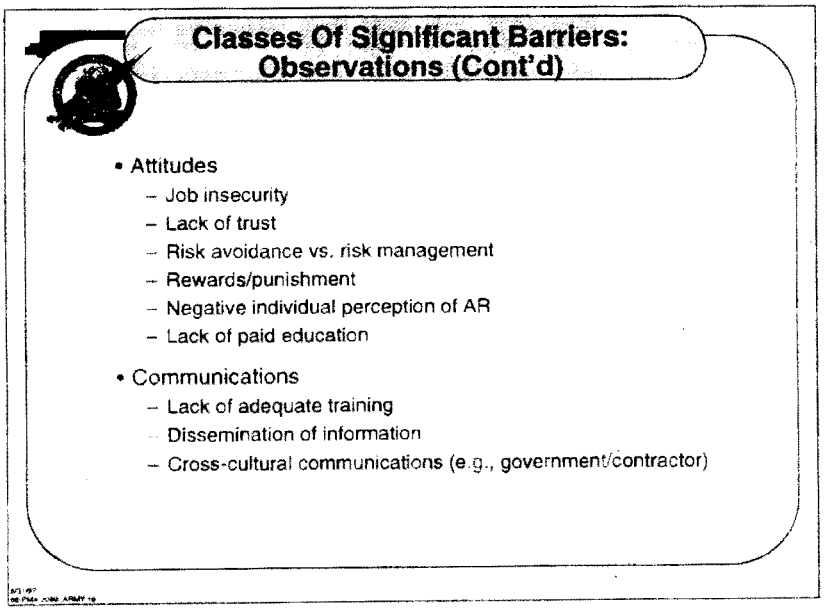
The panel feels that it is important to reiterate that there is but one stakeholder in the outcome of acquisition reform — the warfighter.

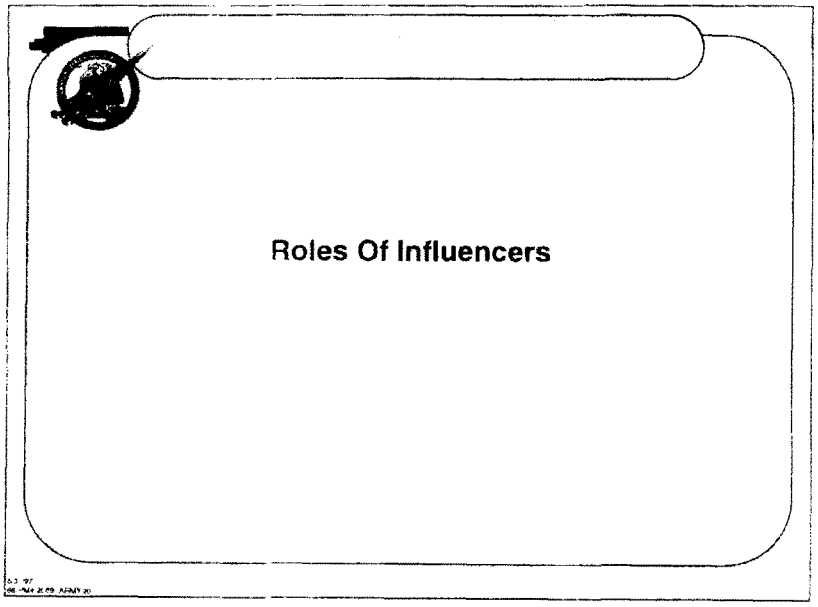


The panel started its efforts with a list detailing some 21 barriers divided among four classes: management; laws and regulations; attitudes; communications. As the panel neared the end of this study, the panel added a class of barriers—leadership—and deleted four barriers in other classes that the panel found to be pseudo-barriers. Those labeled pseudo-barriers by the panel are indicated by shaded lettering. It is telling that those earlier-defined barriers that the panel now classify as pseudo-barrier are funds management and funding, product management, legal and regulatory interpretation and prohibitive laws. Of those, funding issues and prohibitive laws have been endowed by the workforce with a nearly unprecedented weight.

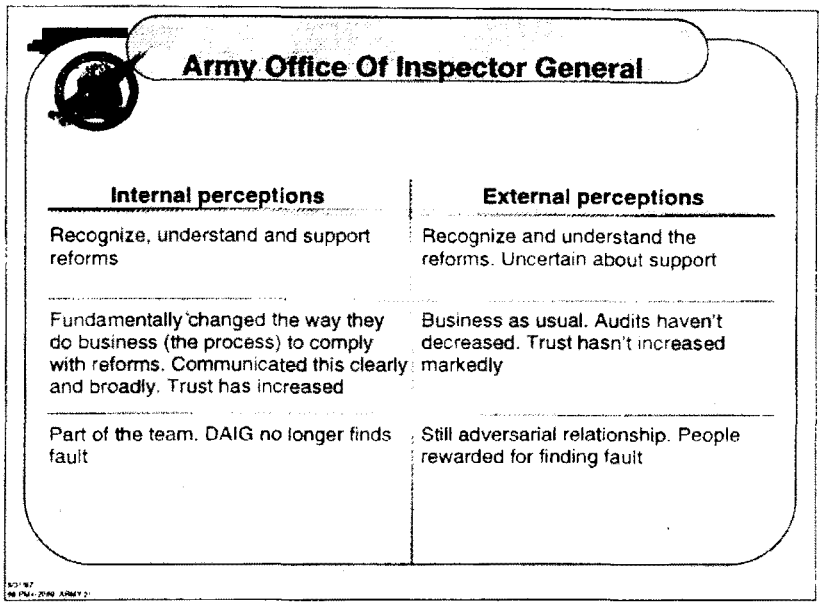
The panel's observations regarding the remaining 19 enumerated barriers are presented throughout this report.


Classes Of Significant Barriers:
Observations (Cont'd)
• Laws and regulations
– Social/economic programs
– Interpretation
– Prohibitive law
– Personnel regulations/policies

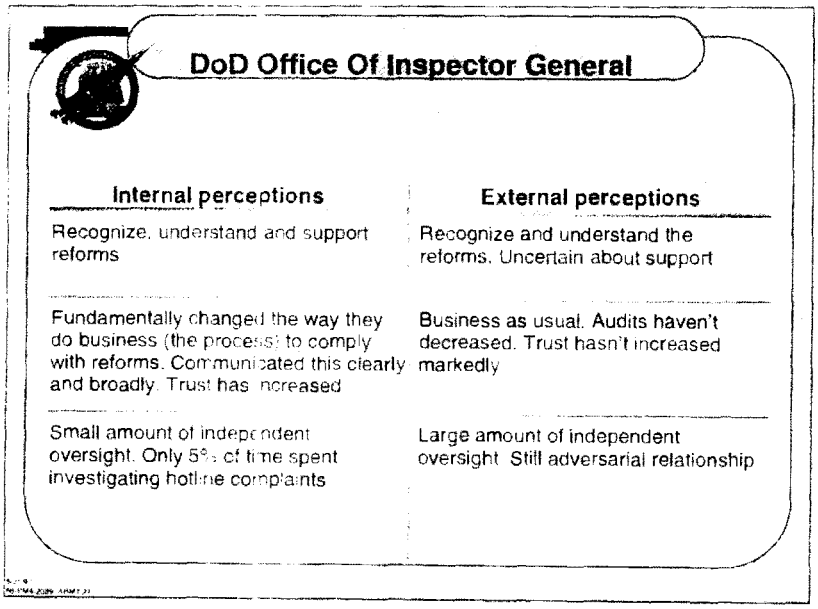

Classes Of Significant Barriers:
Observations (Cont'd)
• Attitudes
– Job insecurity
– Lack of trust
– Risk avoidance vs. risk management
– Rewards/punishment
– Negative individual perception of AR
– Lack of paid education
• Communications
– Lack of adequate training
– Dissemination of information
– Cross-cultural communications (e.g., government/contractor)

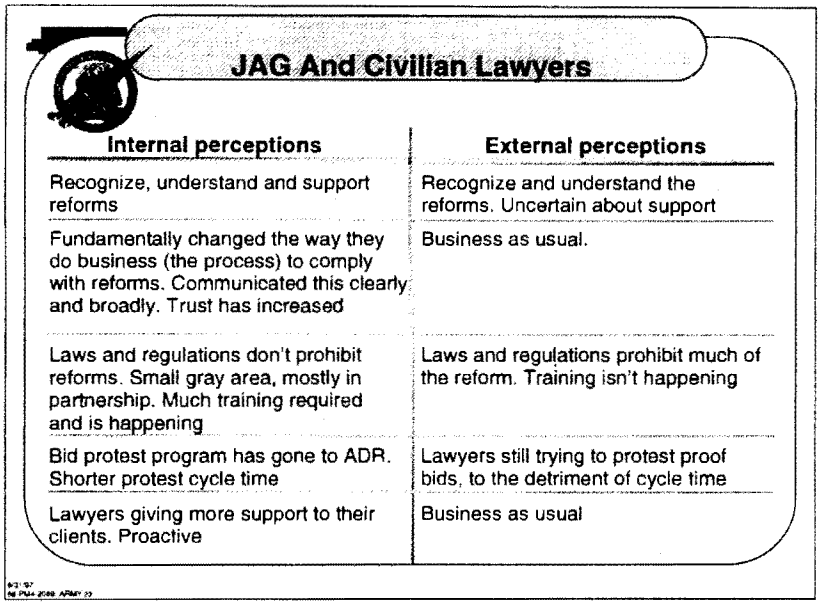


At the outset, the panel was prepared to consider the influence of auditors, lawyers, investigators and other compliance-types on institutionalization of various acquisition reform initiatives. To enhance its understanding, the panel elected to have interviews conducted with attorneys from the Judge Advocate General (JAG) School and Army Materiel Command (AMC), and with representatives of the Defense Contract Audit Agency, the DoD Office of Inspector General (DoDOIG), Department of the Army Office of Inspector General (DAOIG), and the Defense Contract Management Agency (DCMA) (collectively referred to as "influencers"). These interviews were conducted after the focus groups by a subset of the panel.

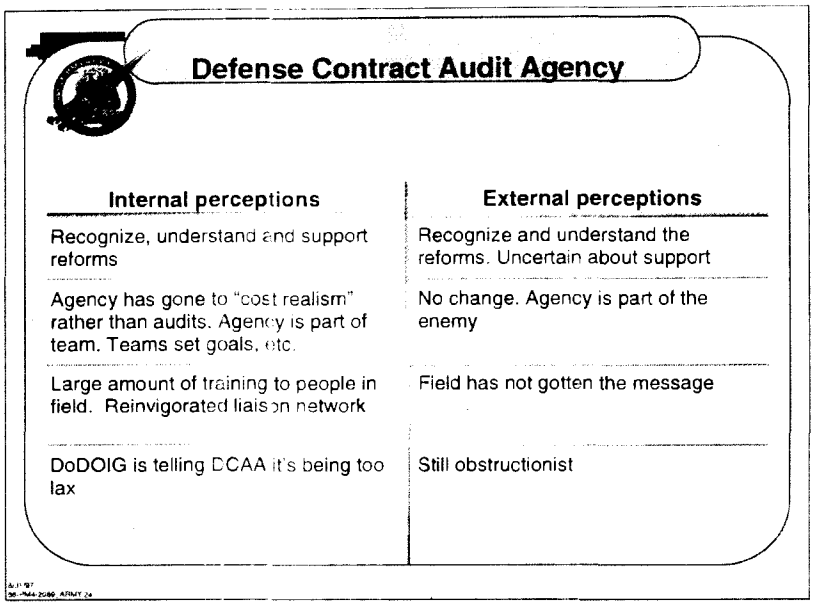


The panel had presented its findings in this regard by contrasting the internal perceptions of influencers with how they are perceived by those the panel interviewed or who participated in focus groups (external perceptions).


DoD Office Of Inspector General
Internal perceptions
External perceptions
Recognize, understand and support reforms
Recognize and understand the reforms. Uncertain about support
Fundamentally changed the way they do business (the process) to comply with reforms. Communicated this clearly and broadly. Trust has increased
Business as usual. Audits haven't decreased. Trust hasn't increased markedly
Small amount of independent oversight. Only 5% of time spent investigating hotline complaints
Large amount of independent oversight. Still adversarial relationship

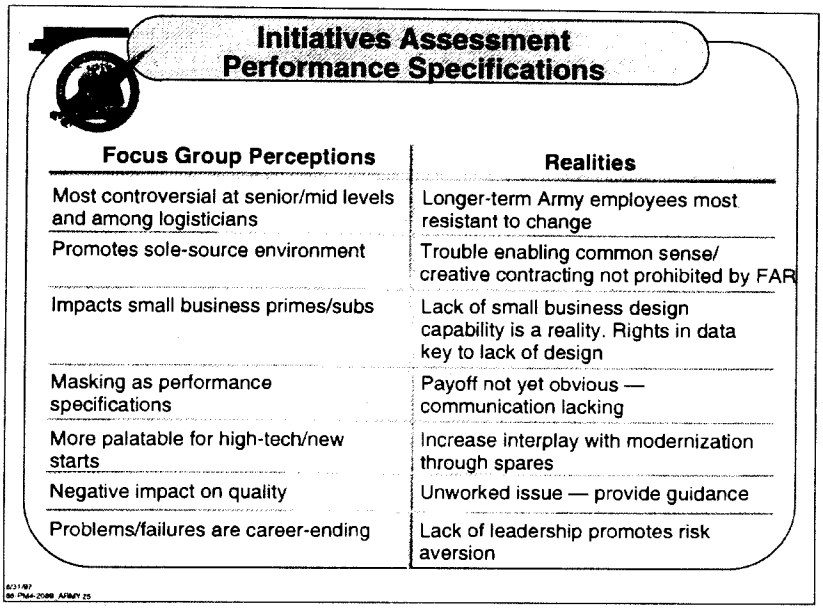


Among lawyers, the panel found a universally positive self perception. Yet it found hard evidence in the field that lawyers at the local level are having a significant impact on cycle time by attempting to "protest proof" procurements. This may be driven by the use of "number of protests" filed as a metric of acquisition reform success. This pseudo-metric should be banned.



From the senior level influencers the panel found a much different perspective — one of vigorous pursuit of acquisition reform and support of those who are attempting to implement reforms. There was a disparity between the message communicated by higher level influencers and their lower level field representatives, many of whom had not received the message of support and aid. It is this latter group who are likely responsible for the fears of the members of the buying community.

The panel has concluded that the degree of risk averse behavior of the workforce attributable to perceived actions by the influencers is, for the most part, overstated. The panel found that the workforce members at the mid and lower levels with whom it met had deep reservations regarding implementation of reforms that required a significant degree of discretion because of their fears of retribution from influencers. Fear of being thrown to the wolves for taking the initiative was voiced repeatedly.



The panel, with concurrence from its sponsor, identified ten acquisition reform initiative on which to focus:

Performance Specifications

Integrated Product Teams

Partnering

Single Process Initiative

Consolidation of Contracting Activities

EC/EDI

Credit Cards

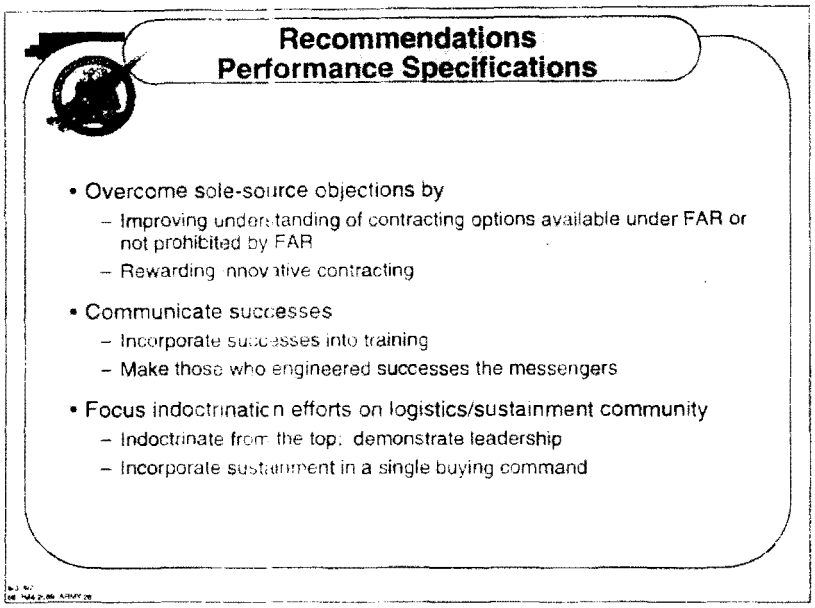
Contractor Logistic Support

Bundling Buys

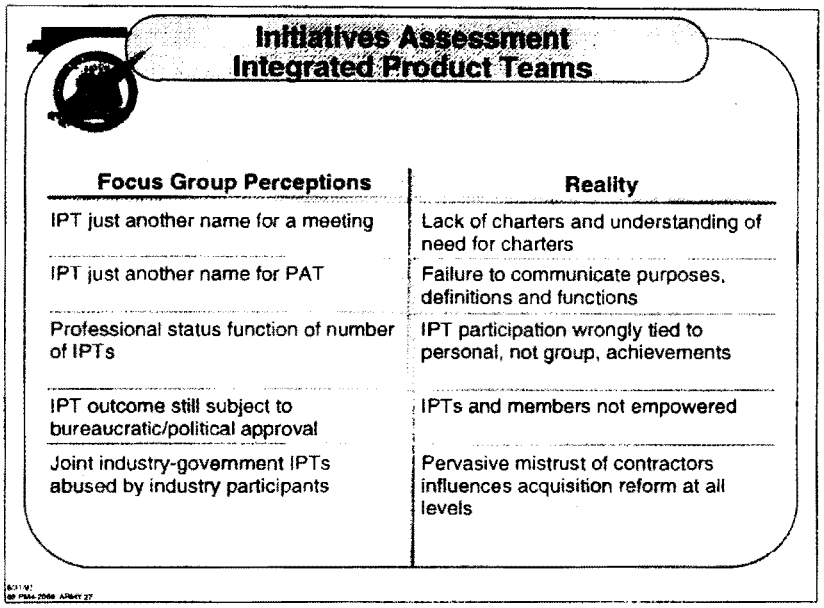
Outcome Based Metrics

These initiatives formed the basis for the focus groups, interviews and assessments. The panel has presented its observations on each of the ten initiatives by contrasting the perceptions of those with whom the panel spoke with the realities as perceived by the panel. In light of these observations, for each initiative, the panel has made recommendations, most of which can be carried out by OASA(RDA).

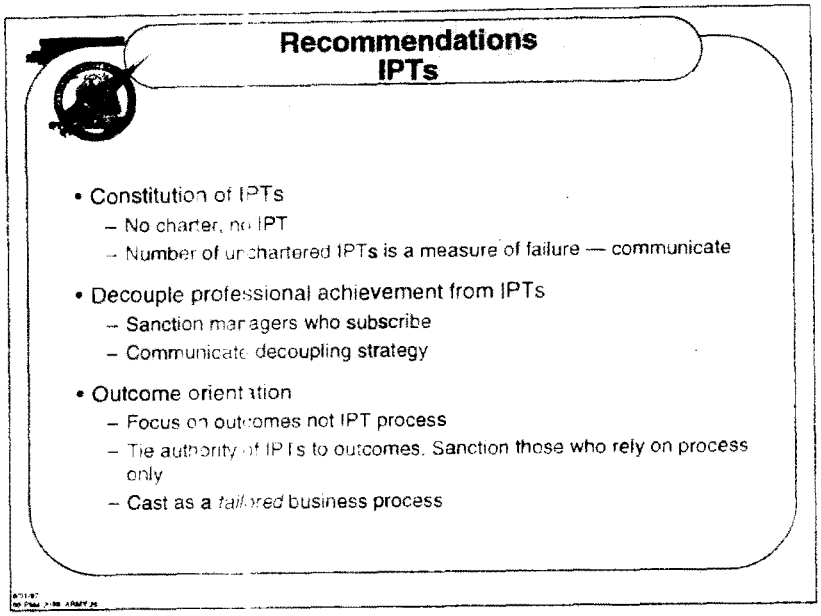
Participants, particularly in the spares buying community, voiced a high degree of concern that the use of performance specifications results in unacceptable sole source contracting, due, in large part, to the proprietary nature of drawings. Participants also feared the diminution in small business participation because small businesses lack the requisite design capability and access to proprietary drawing. The panel found a high degree of resistance to this initiative by focus group participants. However, from the panel's other assessments, it knows that there have been remarkable successes in this area.



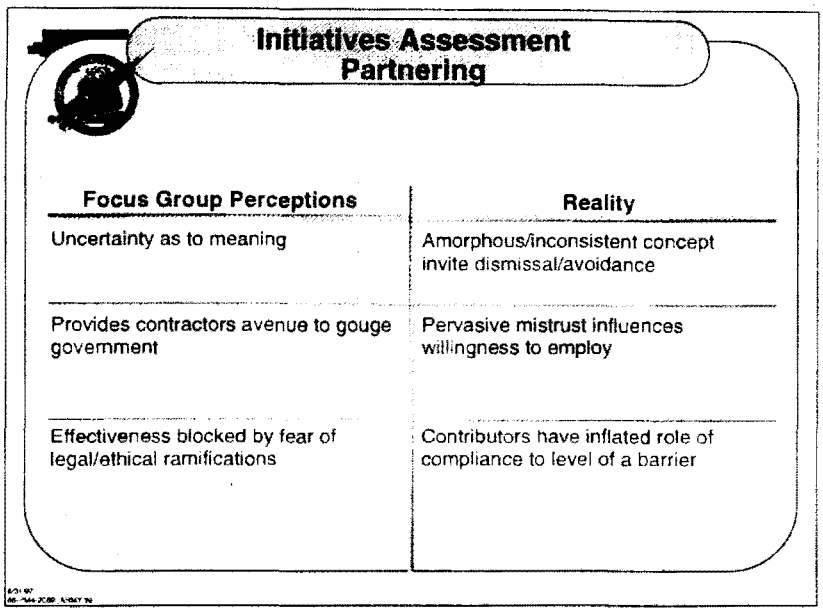
The panel's recommendations are three fold: educate the workforce and endow it with the necessary skill to avoid sole source environments; improve communication of successes in this area and let those who were successful carry the message; and target the spares buying community for heavy indoctrination in this initiative. Moreover, the panel *reiterates its recommendation* regarding the formation of a single buying entity. The panel believes that such restructuring will provide a formidable buying force with a clear vision for use of performance specifications.



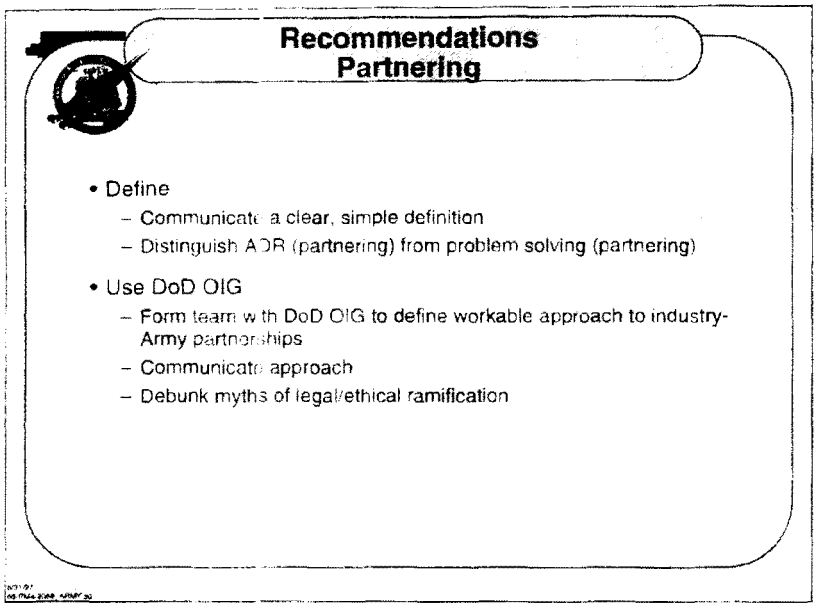
The panel was rather surprised to find such diverse opinions regarding IPTs in light of the emphasis on them throughout DoD and the Army. However, it soon became clear that many IPTs are unchartered and are merely renamed meetings. There is not a universal understanding that an IPT is a tailored business process. The panel found it remarkable that, in many quarters, participation in IPTs is a measure of professional responsibility and worth. Contributors to the acquisition process can find themselves spending untold hours in many pseudo-IPTs merely to meet management evaluation goals. Thus, it appears that the problem is two-fold: managers who use the frequency of IPT participation as an evaluative tool and IPT leaders who allow participation by those who are merely seeking to "have their tickets punched."



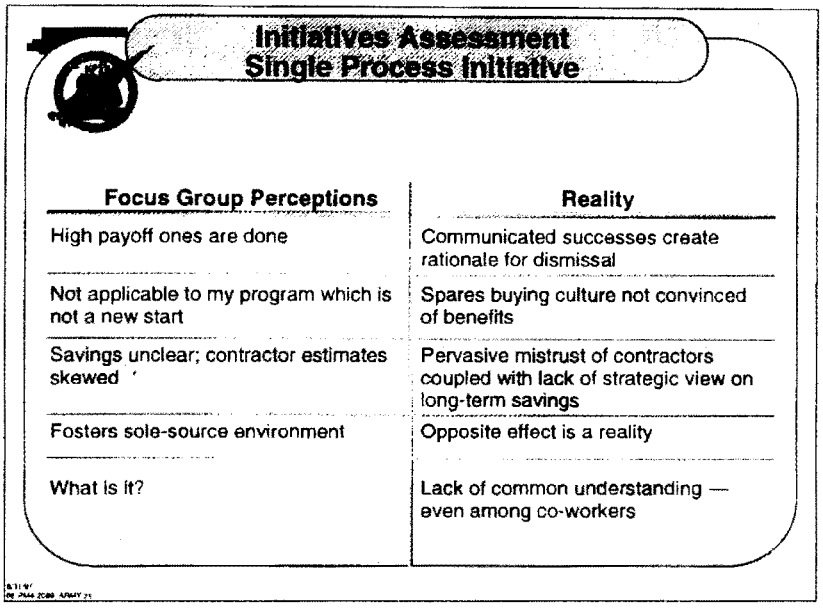
The panel recommends that no IPT be established without a workable charter—no pseudo-charters—and that those who attempt to do so be sanctioned; a decoupling of professional development from IPT attendance—IPT outcomes should be the evaluation factor; and an overall greater focus on outcomes rather than process.



There appear to be three, distinct "partnering" perspectives: partnering as a formal alternate dispute resolution process; partnering as a collaborative problem-solving process employed between contractors and government; confusion as to what it is. All three perspectives share a common perception—partnering is a process by which the contractor wins and government loses.

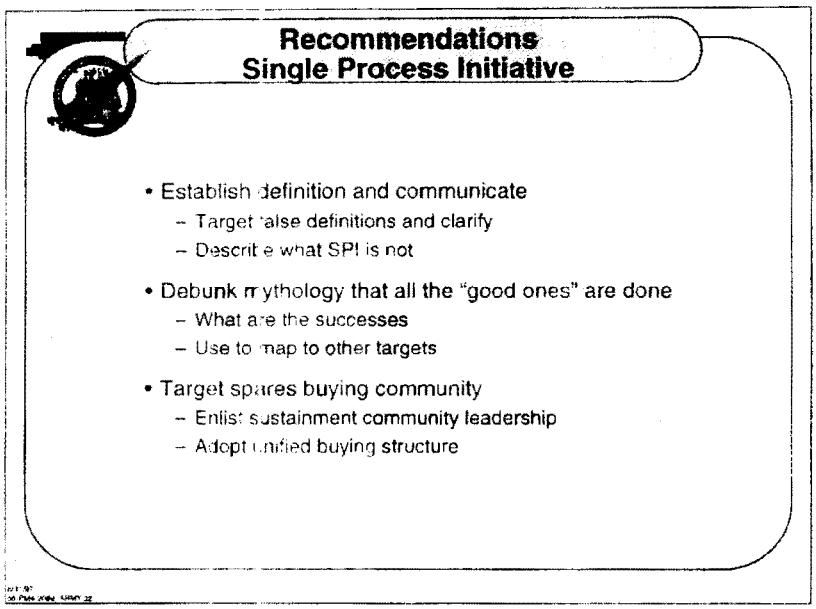


The panel recommends a single, unambiguous, broadly communicated definition of the concept of partnering. *It further recommends* that a joint approach be formed with the DoD Office of Inspector General to define a workable approach to government-industry partnering, including fairly bright-line tests for discerning ethical and legal ramifications. This team would be responsible for communicating the approach across the Army.

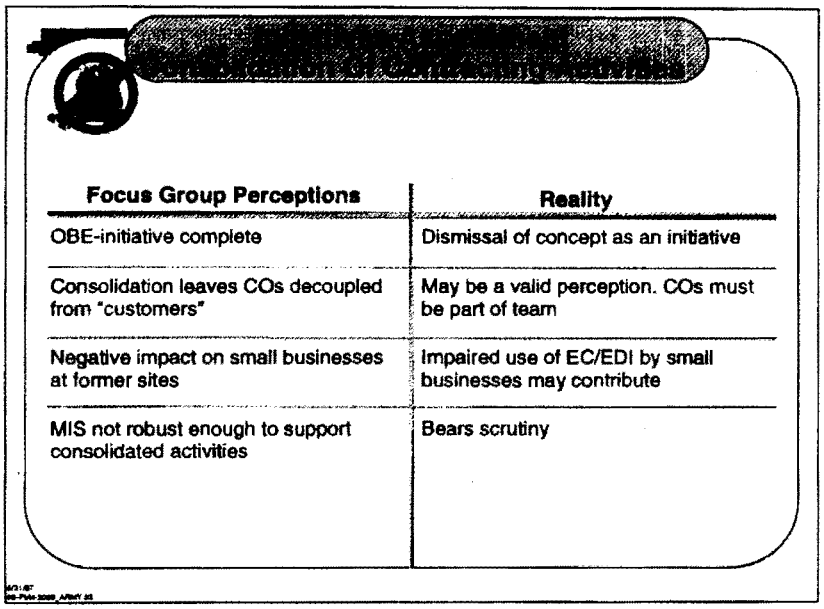


SPI allows contractors to adopt common processes/commercial practices on a facility-wide basis capable of meeting each customer's requirements. The Administrative Contracting Officer (ACO) issues a block change modification to incorporate the single process into all existing contracts at the contractor's facility. The objective is to allow contractors to use the best commercial practices; thereby eliminating multiple, redundant, and non-value added requirements and reducing costs.

The panel found three SPI perspectives: the vast majority of those with whom the panel discussed SPI have no real idea what it is. The other two perspectives are "it doesn't apply to my efforts because it has already been done" or "it doesn't apply to spares."

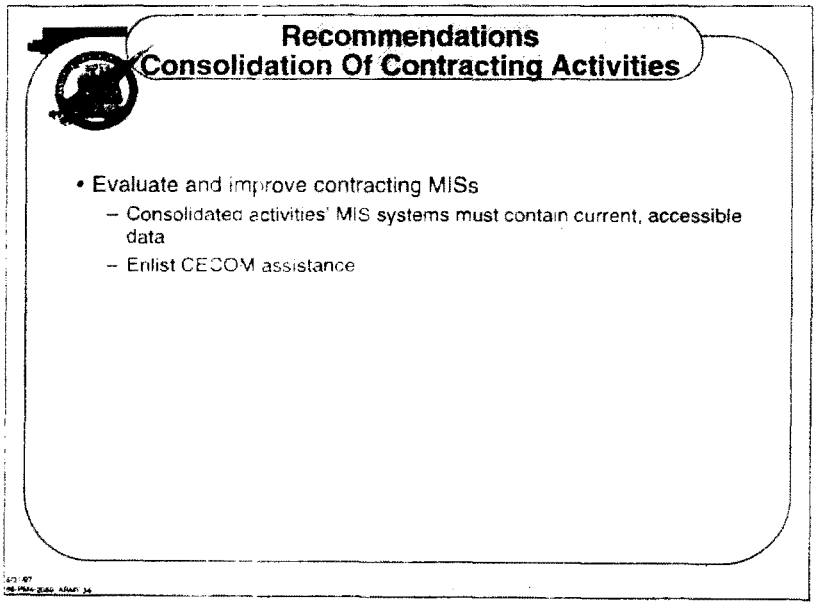


The panel recommends a further attempt at communicating the definition and a concerted effort to debunk the myth that all the good SPI initiatives have been taken. Notwithstanding the efforts of the road shows and other training, SPI is far from institutionalized. Once again, the panel must point out that the greatest barrier here is the spares culture. The panel finds that the only viable approach to overcoming this barrier is a total restructuring of sustainment policy and organizations, and an attendant top-down recasting of the culture.

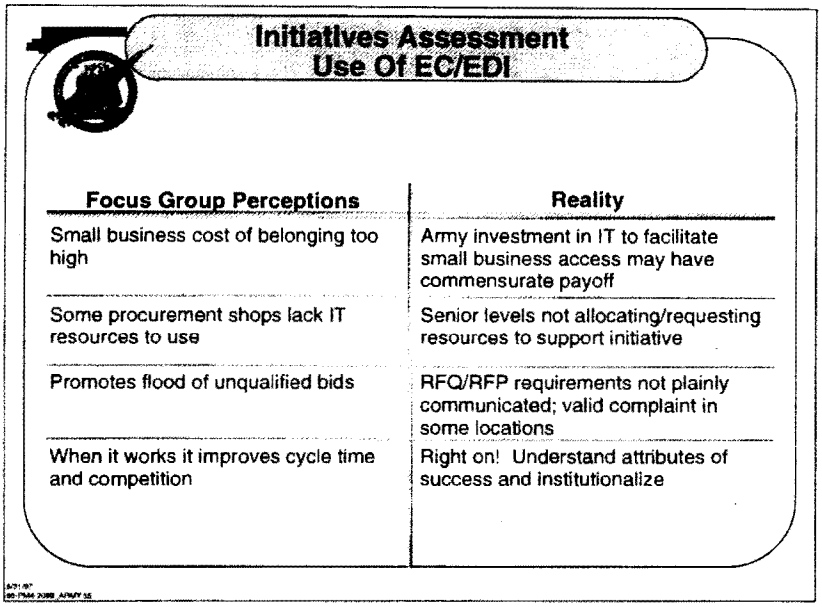


Focus Group Perceptions	Reality
OBE-initiative complete	Dismissal of concept as an initiative
Consolidation leaves COs decoupled from "customers"	May be a valid perception. COs must be part of team
Negative impact on small businesses at former sites	Impaired use of EC/EDI by small businesses may contribute
MIS not robust enough to support consolidated activities	Bears scrutiny

The panel found one complaint in this area that bears scrutiny: the lack of management information systems (MISs) to support consolidated activities. The key issue seems to be the robustness of the consolidated MIS system(s).



The panel recommends that the MIS issue be further investigated by those who are MIS experts rather than solely by acquisition contributors. The panel found a strong capability in this area at CECOM and suggest that those resources be used on a consultative basis.

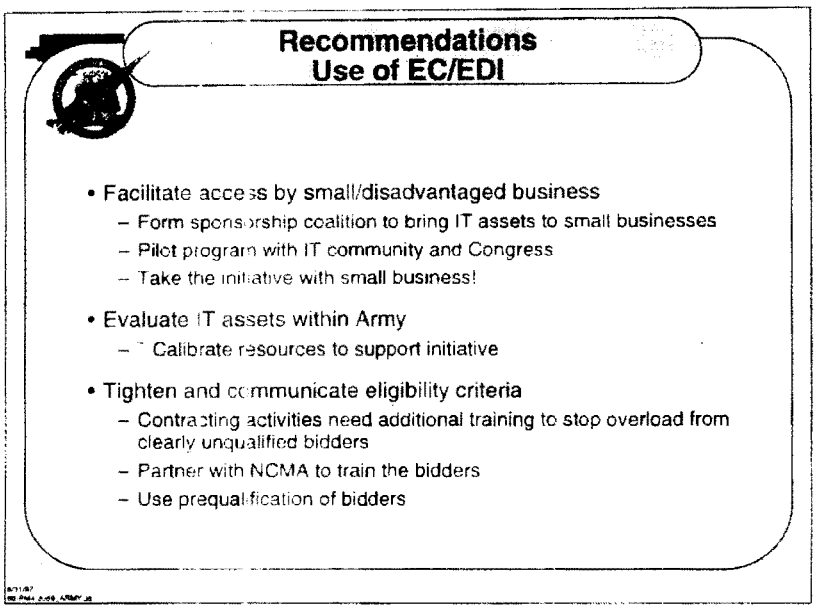


EC is the use of any electronic means to conduct contracting activities (e.g. facsimile, telephonic solicitation, e-mail, computer diskettes, etc.). EDI is a subset of EC and utilized electronic solicitation via either the Internet or the Federal Acquisition Computer Network (FACNET).

Problems with compatibility between legacy automated contracting systems and the FACNET remain a continuing barrier according to those with whom the panel spoke; however, work is being done to make those systems compatible. The fielding, in the near future, of the DOD-wide Standard Procurement System (SPS) should alleviate most of these problems.

In some quarters the panel heard that Army IT assets were too limited to support EC/EDI; however, the panel did not investigate this.

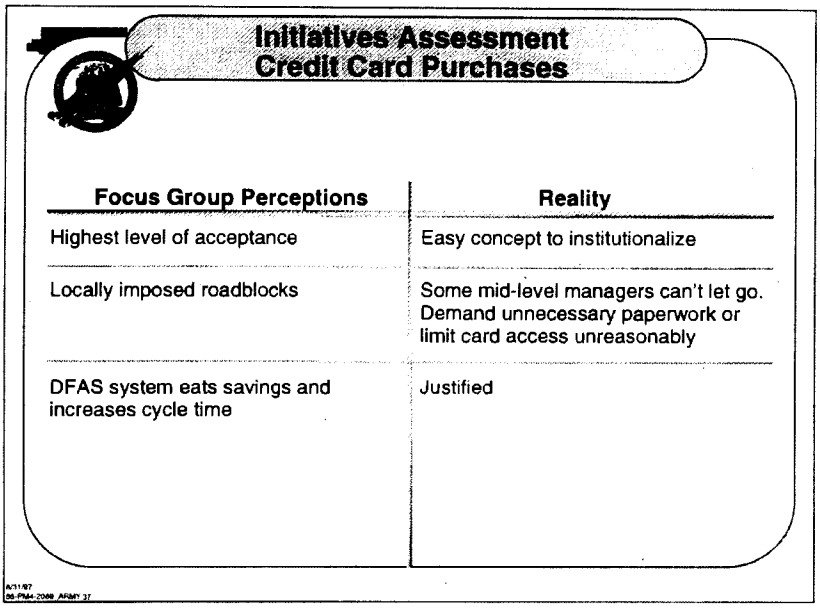
The problems raised regarding small business access, both in terms of under-utilization due to lack of information technology resources and over utilization by ineligible offerors, are amenable to correction.



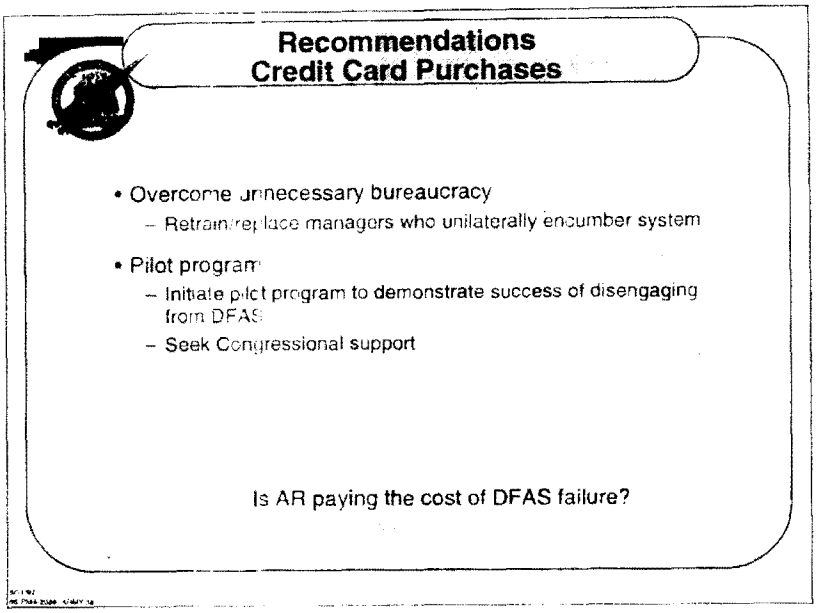
The panel recommends that ASA(RDA) undertake leadership of an initiative with the information technology (IT) industry to form a coalition to support small business access to electronic-based government procurement systems. The coalition would provide hardware, software and training at little or no cost to eligible small business.

There may be a need to calibrate IT resources within the Army to support EC/EDI. However, the panel makes no specific recommendation in this regard.

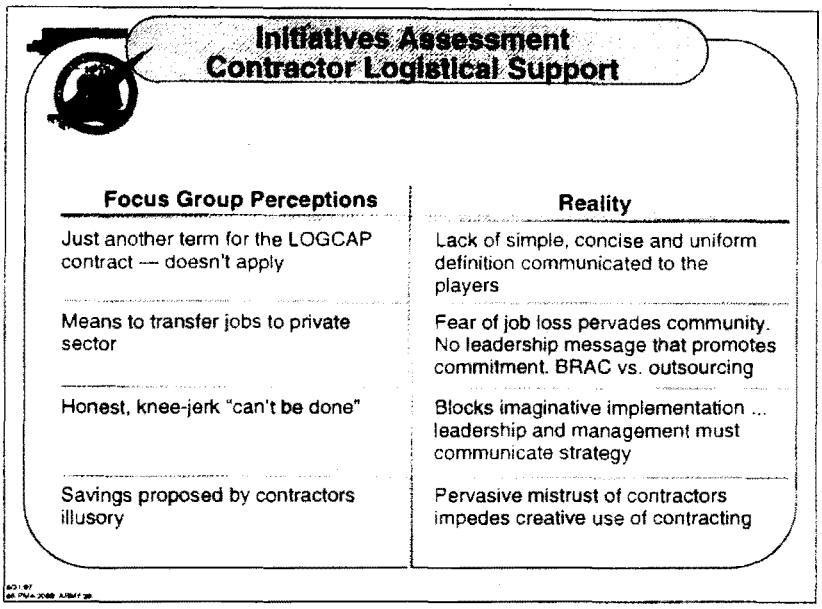
To address the over-utilization issue, the panel recommends additional training of contracting officers and specialists. The Army may wish to work with an organization such as the National Contract Managers Association (NCMA) to hold training sessions for small business offerors.



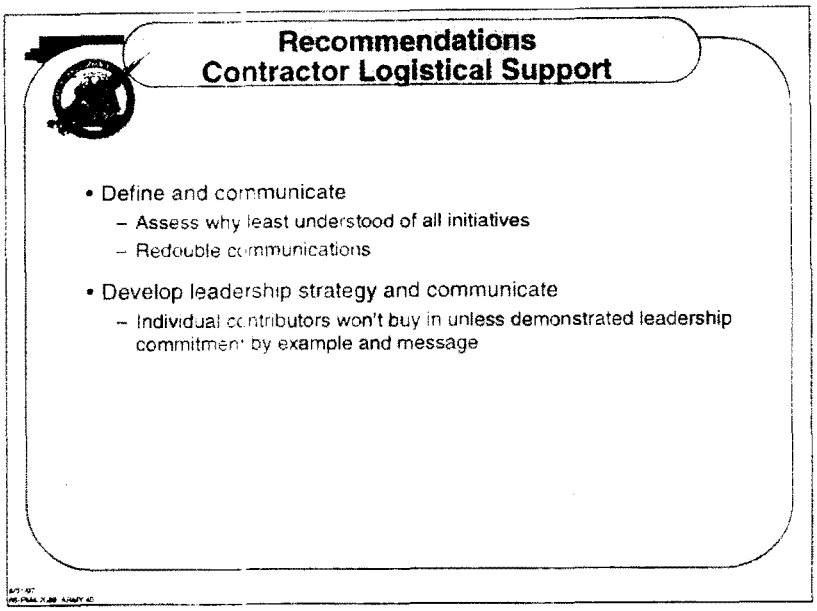
This has been and continues to be the most embraced and least resisted acquisition reform initiative. The significant problem in realizing cost savings comes from outside the Army according to those with whom the panel met. Vociferous complaints regarding the savings consumed by DFAS and the increase in cycle time were expressed. The underlying reasons for some of these complaints about DFAS are reflected in the General Accounting Office report, Contract Management: Fixing DoD's Payment Problems is Imperative, GAO/NSIAD-97-37 (April 1997).



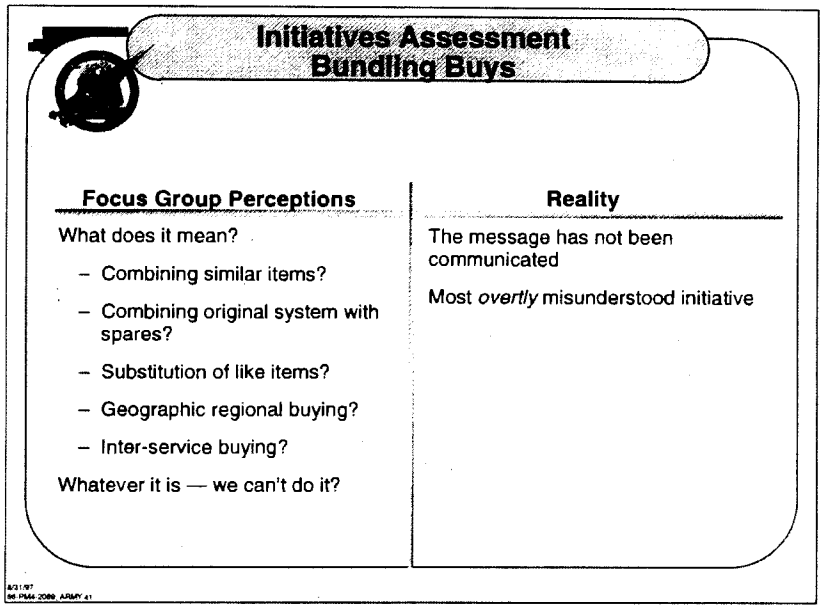
Assuming the validity of these complaints, *the panel recommends* a pilot program to explore disengaging from DFAS, notwithstanding DoD imperatives regarding use of the DFAS system.



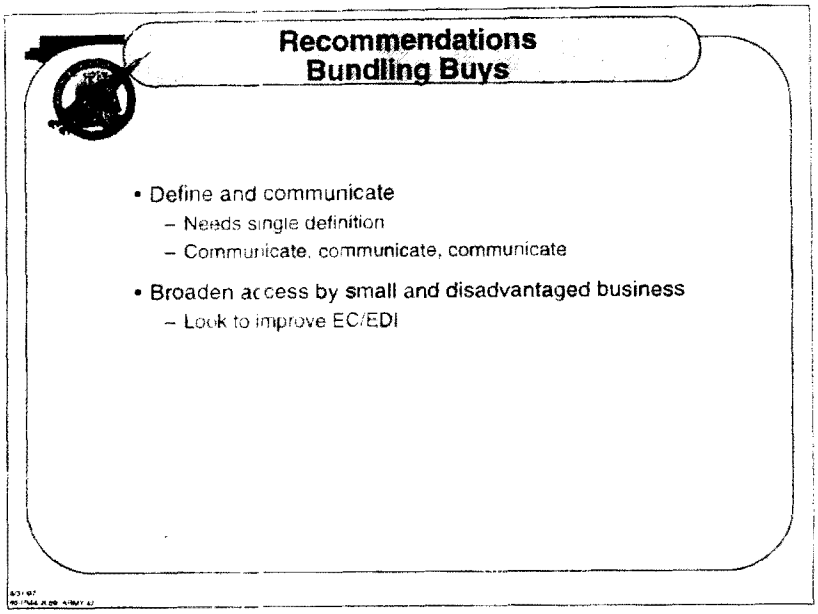
Notwithstanding its status as one of the most misunderstood initiatives, contractor logistical support is broadly criticized as a major contributor to job instability. This concern is founded upon the pervasive mistrust of contractors the panel observed and the lack of a clear understanding of the concept.



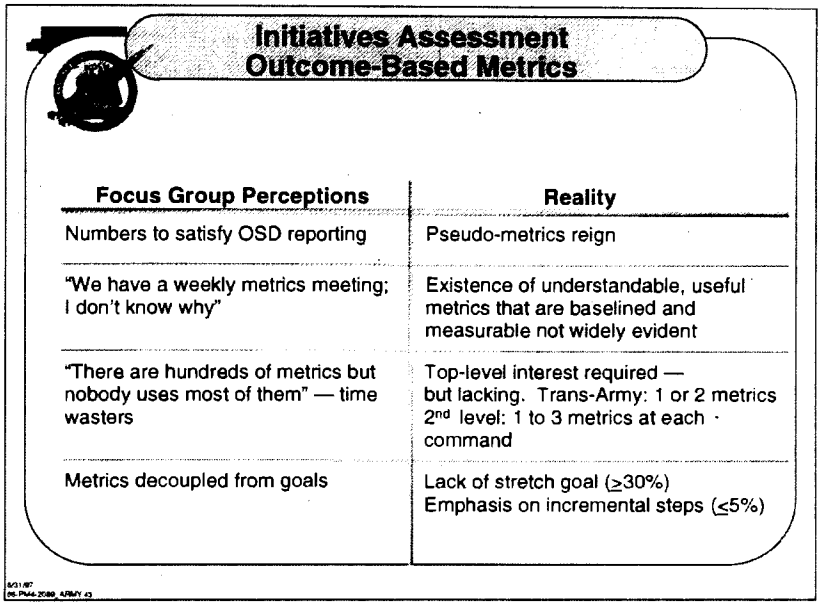
The panel recommends a concerted effort to communicate a simple and obvious definition of this initiative by Army leadership with a strategy that compels buy-in by individual contributors.



The Department of the Army encourages consolidation or bundling of requirements and the use of multiyear contracting where it makes sense and does not lead to higher costs or less efficient requirement satisfaction. Pooling requirements regionally may provide a benefit to all concerned by taking advantage of economies of scale while still providing responsive service by the contractor to several locations. This also allows other locations to take advantage of a strong contractual instrument located at another activity or installation. The panel found this to be the most *overtly* misunderstood initiative. The few who did understand it voiced concerns regarding its impact on small businesses: namely, reducing opportunities for small and disadvantaged businesses.



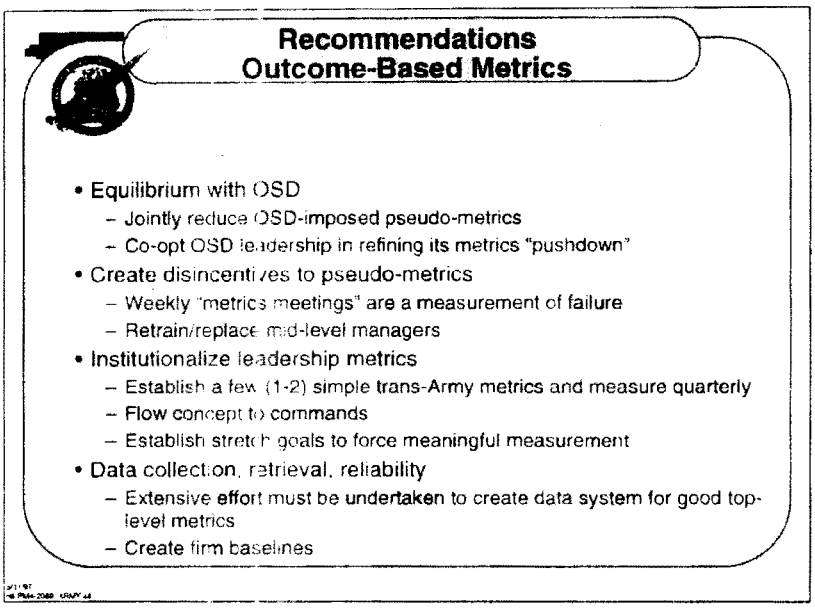
The panel recommends a stronger communication of this initiative. Moreover, the panel feels that the joint IT industry-Army coalition to address small and disadvantaged business access to EC/EDI can assist in addressing concerns regarding access to centralized systems.



Acquisition reform metrics are the numerical values by which the Army and other interested entities gauge progress toward meeting acquisition reform objectives. If the objectives are to equip and sustain the soldier faster, better and cheaper, then the true metrics are those that enable the Army to assess *how much faster, how much better and how much cheaper.*

Thousands of hours are being expended in pursuit not of valid measurements of progress but of pseudo-metrics or surrogate metrics that reflect on successes in areas that have at best a tentative relationship to acquisition reform. The panel found organizations that met weekly to discuss metrics yet could produce no measure of achievement — no numerical value of progress or a lack of progress. Rather, huge amounts of time have been spend crafting seemingly complex but actually meaningless measurements.

Three reasons for these wasteful exercises became apparent: those assigned to craft metrics lack the understanding of acquisition reform and the acquisition process; attempts at baselining are inadequate due in large part to data retrieval and validity problems; and many managers seek pseudo-metrics that make them and their organizations appear, at least superficially, successful.

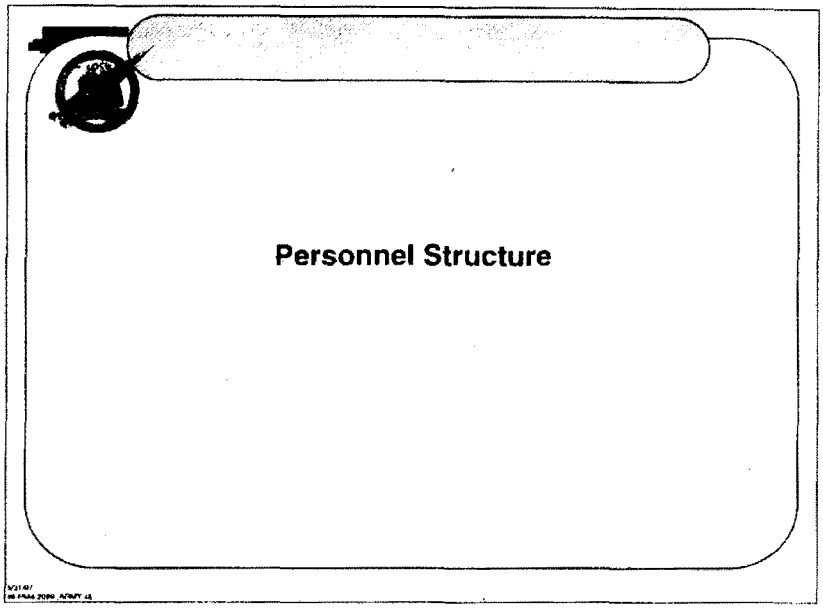


The panel recommends two simple, trans Army metrics to be used by the Secretary and Chief of Staff. The first, the cost burden per dollar spent for acquiring goods and services gauges how much cheaper. A related metric, which is actually a management tool, is headcount. Headcount, by numbers of people or positions, while not an outcome-based metric *per se*, is recommended as a metric due to DoD (and the Army's) apparent inability to adequately marry the overhead costs of people into its acquisition cost evaluations. Thus, by using headcount (or number of positions), greater insight into cost reductions can be gained. Moreover, due to mandatory staffing reductions, headcount has heightened visibility. When measured quarterly, provide a means by which leadership can both calibrate and compel lower tier management progress.

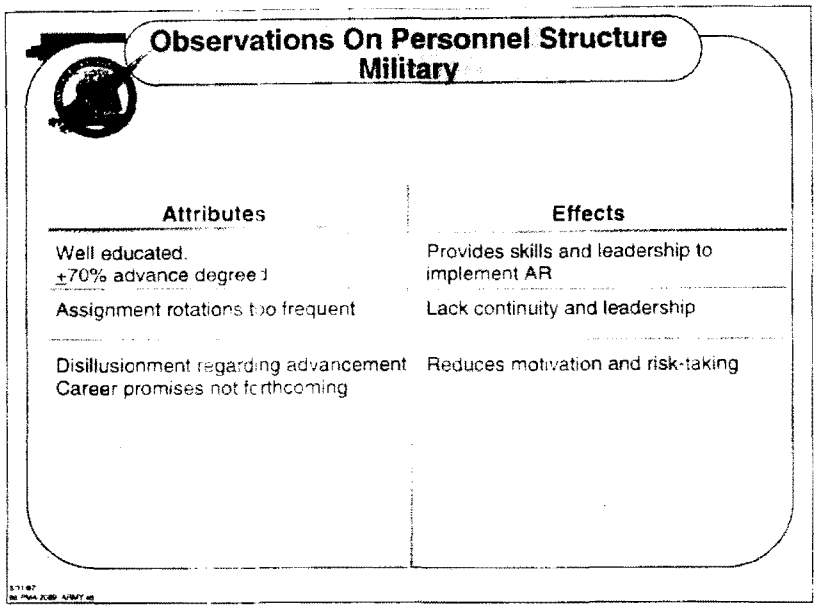
Recognizing that metrics alone will not necessarily guide the improvements in process and organization to optimize the acquisition process, the *Panel recommends* that their use be tied into the implementation of other Panel recommendations. In particular, the civilian personnel recommendations are intended to motivate the workforce, improve its skills and training, and encourage the use of judgment and risk-taking. It is critical that the measurement of headcount not be perceived as a threat to risk-takers, but rather that the use of judgment is seen as adding value to the procurement process, and rewarded appropriately. Given that the Panel's recommendations on personnel are implemented, the Panel believes that headcount can be an effective metric for demonstrating progress in Acquisition reform

The panel further recommends that steps be taken to stop the proliferation of pseudo-metrics and deterrents to such exercises be communicated and enforced. One culprit in the pseudo-metrics proliferation is OSD. The Army must work to jointly reduce OSD-imposed pseudo-metrics and co-opt OSD leadership to refine its metrics pushdown.

One panelist had experience with the quality and reliability of data used in a previous ASB study that would also be used by the leadership to support two trans-Army metrics. In light of that experience, the panel also recommends review of the collection, retrieval and reliability of data used to support trans-Army measurement efforts.



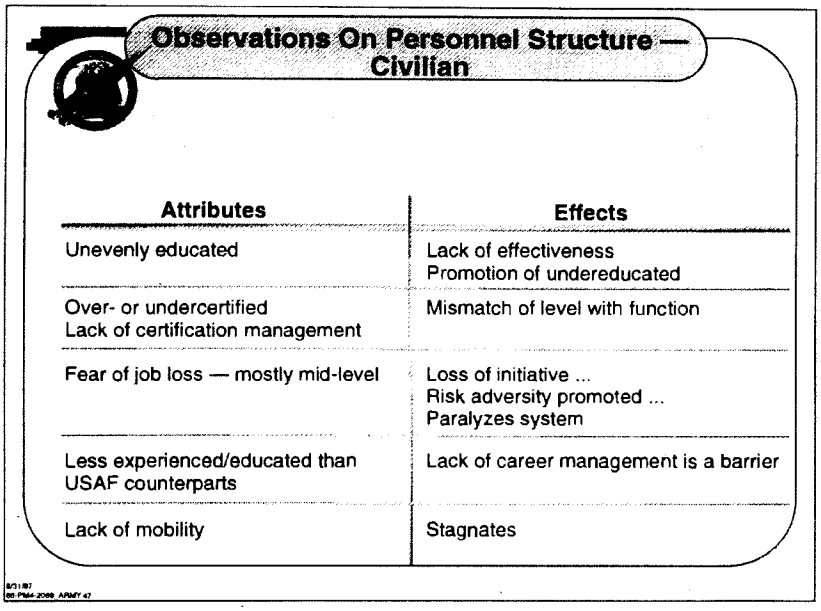
The panel assessed material attributes of the military and civilian members of the acquisition workforce and drew several conclusions from interviews and empirical data.



The military in the acquisition workforce are well educated. All have baccalaureates and 70% have masters degrees. Of those interviewed in the focus groups who possess masters degrees, all obtained them with Government support. However, they come to the acquisition workforce late—as Captains or Majors, and they do not remain long — either in a current assignment or in the workforce. They only have an average of four to six years of acquisition experience, where civilians have an average of six to ten years.

Alternatively, Air Force military enter the acquisition workforce as second lieutenants, and can remain for a full career.

Since the Army commits so few officers to the acquisition workforce, it should be expected that they be hand-picked, high quality, well and appropriately educated, and with *substantial* experience.



The civilian workforce is, in general, under-educated. Twenty-six percent have no college degree and only 25% have a masters or above. If the Army wishes to improve the educational level of civilians, it is necessary to only hire those with baccalaureates and to provide more aid, including full-time scholarships, to employees to obtain advanced degrees.

For those now in the acquisition workforce who are under-educated, it is also necessary to provide educational assistance, and to promote only those who are educationally qualified (as does the Air Force). If opportunities are available for self-improvement of employees, then charges of discrimination can be avoided if these employees are not promoted.

Army civilians, on average, have surprisingly less experience than their Air Force counterparts. Army civilians have six to ten years of experience, while Air Force civilians have 21 to 25 years of experience. This is both worrisome and indicative of serious flaws in the personnel management system. This is a *significant difference.*

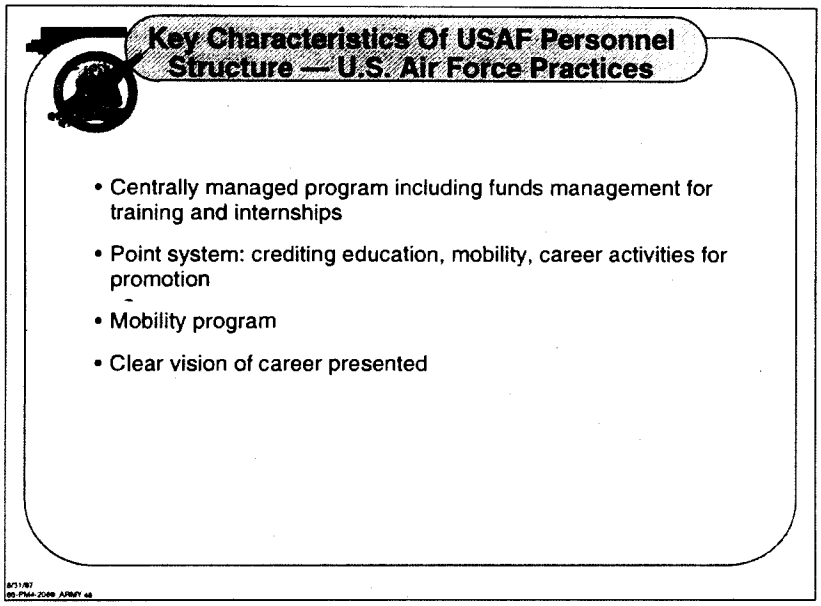
The panel finds that one plausible reason for this difference is that the Air Force vigorously manages its employees, while the Army does not. This panel observed that, despite efforts in select quarters, there is no apparent institutional drive within the Army to manage the acquisition workforce as a career group and make sure each employee is properly educated, trained, selected, moved for experience, and promoted. The employees the panel met did not have good things to say about their career opportunities or plans. They appeared to lack a vision of their career paths or their potential for growth and promotion.

If the Army expects this workforce to show initiatives and institute new reforms in acquisition, then a vision must be provided so that personnel see where they fit in the system and how they might benefit by doing a good job and by taking risks.

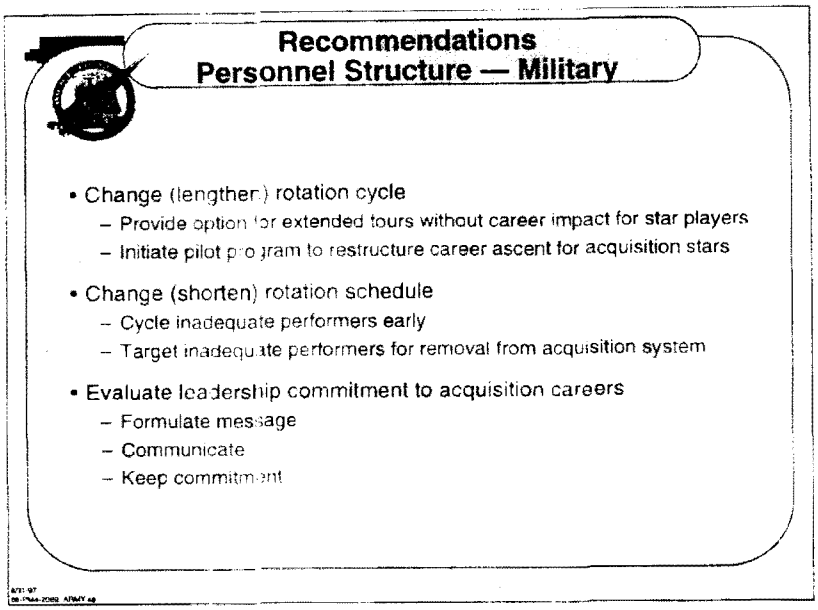
Observations On Personnel Structure — Cilivian (Cont'd)

The panel found considerable evidence that the Army does not manage its certification levels correctly. There were employees who did not know whether they were certified or not, and others who were either over- or under-certified for the position they held. Good management would argue that employees should be placed in positions for which they are qualified. If anything, employees should be under-certified for a particular position then given some time to meet the certification level required, if they are the best candidates. This is possible since they can be hired into positions without meeting the certification requirements at the time.

See Appendices C and E for detailed presentations on the Army and Air Force personnel systems.

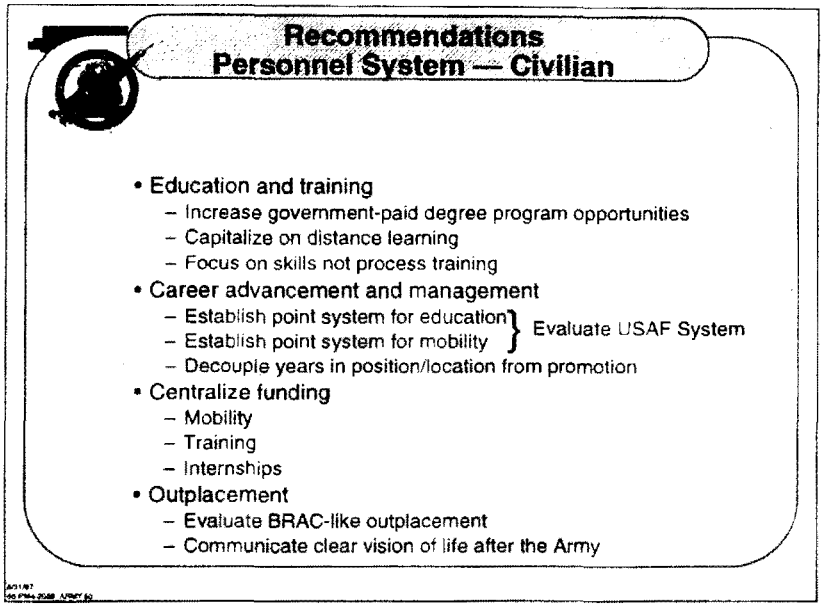


The panel does not expect the Army to completely adopt the Air Force system, for both cultural and practical reasons. However, the panel observed that it is practical and effective that once officers enter the acquisition workforce, that they not only stay in acquisition positions for the rest of their careers, but are stabilized in the assignments so they can obtain more experience on the job. It is not productive that military, many of whom are in supervisory positions over civilians and over acquisition programs, have less experience than their civilian counterparts.



In light of the panel's observations regarding military personnel in the acquisition workforce, *the panel makes the following recommendations:*

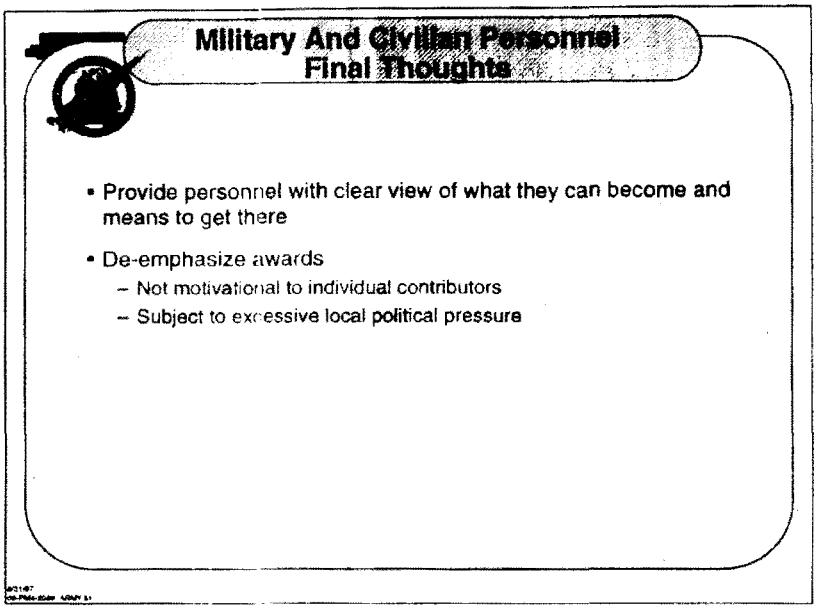
1. Lengthen the rotation cycle for leading acquisition officers without a negative career impact.
2. Shorten the rotation cycle for inadequate officers and remove them from the acquisition workforce.
3. Initiate a pilot program to restructure career ascent for leading acquisition corps officers.
4. Initiate a plan to recover from the negative impact of career promises not kept: communicate and commit.



Considering the foregoing observations regarding civilian personnel, *the panel makes the following recommendations:*

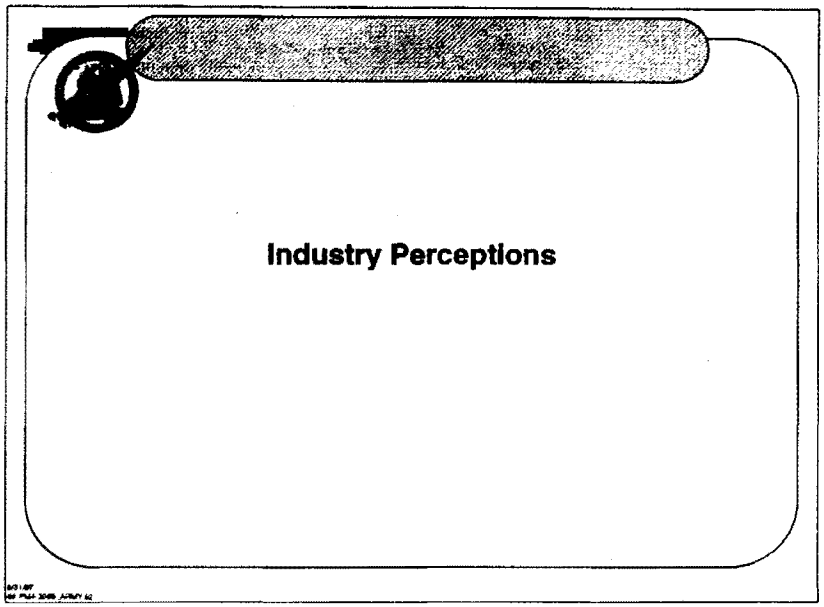
1. Increase government-paid undergraduate education until 100% of the DAWIA workforce has baccalaureate degrees (attrition can also play a role in attaining this figure).
2. Capitalize on advanced training techniques such as distance learning to increase skills and knowledge of workforce.
3. Stimulate the acceleration for curriculum revisions to accommodate cultural and attitudinal changes; make training an instrument for achieving cultural adjustments.
4. Target those with *more* experience for refresher training.
5. Focus training on skills and outcome, not processes.
6. Establish a promotion point system based on education and mobility; one that decouples years in position/location from promotability.
7. Centralize funding of mobility, internship and selected training to avoid parochial interests and leverage of global strategy.
8. Focus on outplacement strategies and a vision of "life after the Army" to reduce well-founded fears of downsizing.

Finally, the Army must take an active role in DoD's new effort to establish its own civilian personnel system. This new start must reflect the Army's requirements, particularly with respect to acquisition work force career development needs.

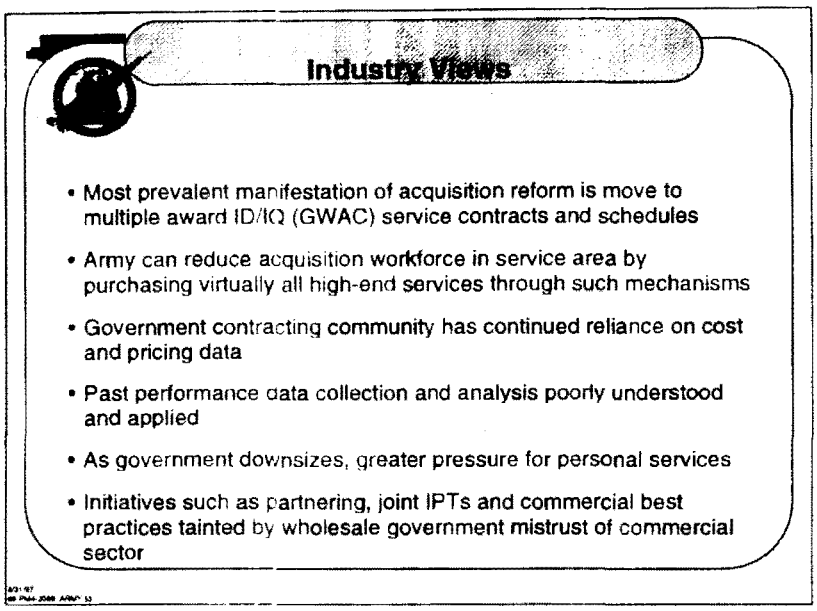


The panel spent considerable time with the issues that both military and civilian acquisition personnel consider to be barriers in achieving the objective of reform. In its review, the panel evaluated incentives for adopting acquisition reform and found, for the most part, that the current system of individual and group awards is perceived as *not* an important incentive. Indeed, numerous civilians voiced their perceptions that incentives are political tools of local managers and do not truly reflect achievement. While this perception may differ greatly from reality, nonetheless, it is fairly widely expressed.

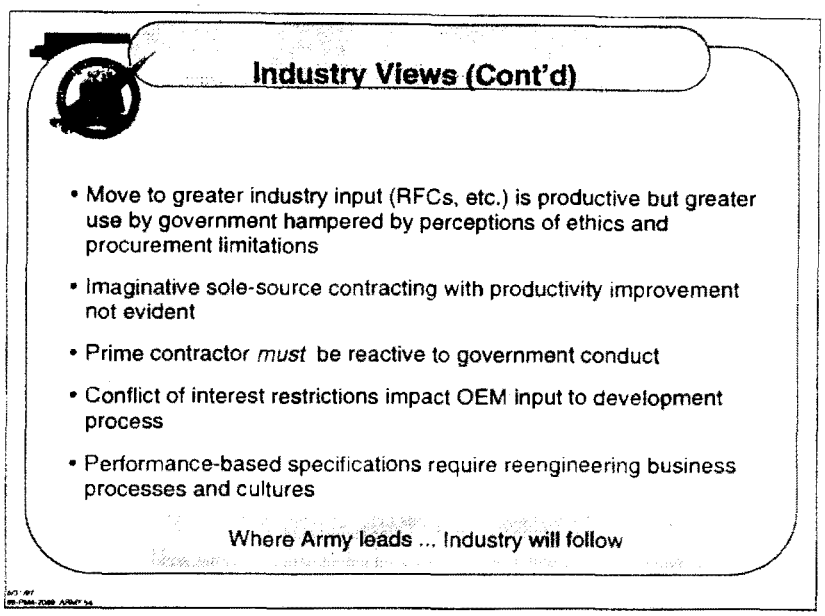
Rather than focus on incentives, the panel recommends that the Army's energy be directed to providing personnel with a clear view of what they can become and the means to get there. Once personnel have acted upon that, incentives may become more meaningful in all quarters.



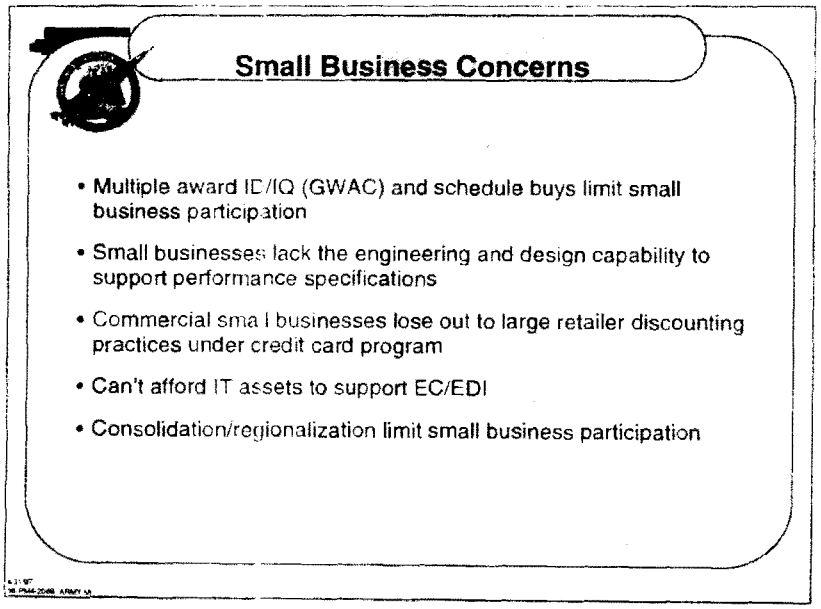
The panel questioned representatives of service industries, hardware and system manufacturers, and vendors. Of the many comments received by non-small business representatives, one message was clearly communicated: where the Army goes (in the acquisition process) industry will follow. After all, for those contractors with little or no commercial business, there is not much choice.



All contractors strongly feel the sting of the acquisition workforce's mistrust of contractors. They attribute this pervasive mistrust to government workers' mistaken beliefs about private industry culture, business practices and compensation. It is noteworthy that those members of the acquisition workforce with the most exposure to the business side of industry — contracting officers — display the least amount of animosity toward contractors.

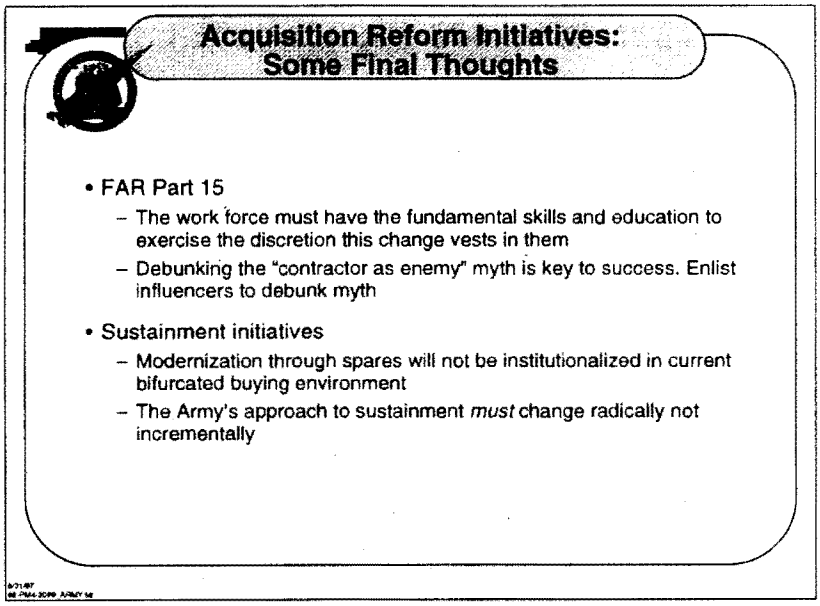


The panel has no specific recommendations in this area. Rather, it finds the observations instructive. Those acquisition reform initiatives that require a strong cooperative relationship between industry and government will continue to linger unfulfilled until the mistrust problem has been mitigated.



Throughout this report the panel has raised issues about and the concerns of small and disadvantaged business in light of the acquisition reform movement. Some are valid and subject to remedial action. Others are not. The panel has made several recommendations.

The role and capacity of small business can not be ignored. Rather than viewing it as a barrier, the Army must creatively invest in small business to provide improved access to the system as opportunities for participation decline. To ignore small business now will later result in distractions to Army leadership.



The panel was also given the task of looking forward to impending initiatives, particularly the rewrite of Federal Acquisition Regulation (FAR) Part 15, Contract By Negotiations. Additionally, the panel wishes to express some final thoughts regarding changes to the Army's approach to sustainment — both those underway and those to come.

FAR Part 15: After nearly two years of writing and comments, the revisions to FAR Part 15 are soon to be issued. The new rule revises fundamental concepts and processes in the current FAR Part 15 and introduces new policies. Most notably, the new rules regarding negotiated procurements expand the application of a procuring agency's discretion by increasing the instances when such discretion may be exercised; hence making procurement more "efficient."

As noted in Appendix A, the Section 800 panel crafted ten objectives as an amplification of the basic goals established in Section 800 of the implementing statute. The ninth objective is particularly relevant to the problem of implementing acquisition reform.

> (9) Acquisition laws [and regulations] should encourage the exercise of sound judgment on the part of acquisition personnel.

In light of this objective, a subset of the panel contemplated whether these new Part 15 rules meet the ninth enunciated objective of the Section 800 panel — encouraging the exercise of sound judgment on the part of acquisition personnel. Can regulatory changes alone contribute to efficiency, or must there be a cultural revolution in order to implement efficiency.

The panel subgroup that reviewed this issue concluded that while the new FAR Part 15 rules meet the fundamental objective of encouraging the exercise of sound judgment by acquisition personnel, the cultural and training barriers extant in many quarters of the Army acquisition system will impede the implementation of Part 15 procurement initiatives. To fully implement these changes, the workforce must possess the education and experience to exercise "sound

Acquisition Reform Initiatives: Some Final Thoughts (Cont'd)

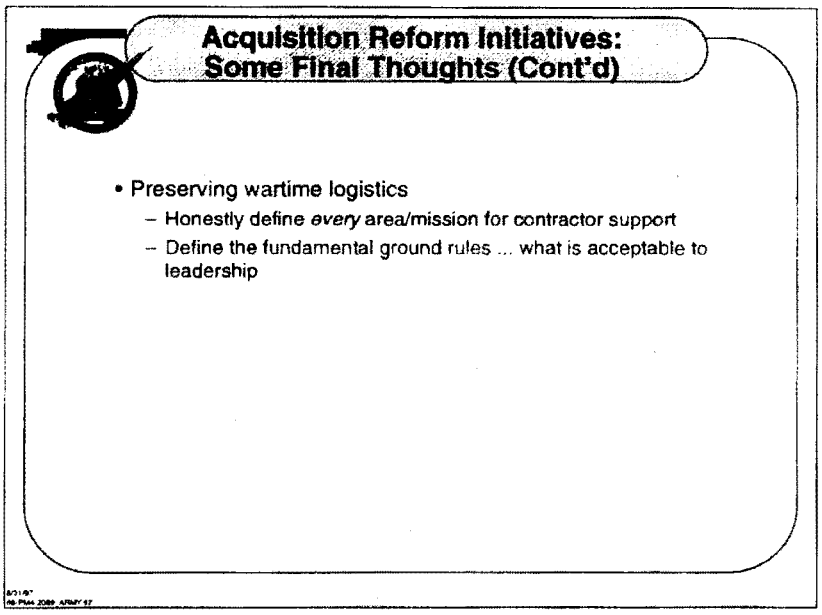
judgment" and avoid risk averse behaviors. Moreover, the new rules require more than a modicum of trust between buyers and vendors.

The panel, therefore, recommends that the training employed for the new Part 15 emphasize team building skills, bridging the cultural barrier between government and contractor, and risk management. Rather than train to the process enunciated in the new regulations, the Army must look at skill development tied to the outcomes (goals) envisioned by the regulations.

Sustainment initiative:

Tremendous excitement has been generated by the Modernization Through Spares initiative. Concomitantly, a phalanx of cultural barriers is being mustered based on some honest and aggravated fears regarding the changes this initiative will wreak. Not until the cultural barriers inherent to the bifurcated buying systems are adequately removed will this initiative enjoy the institutionalization it requires.

In light of this, *the panel reiterates its recommendations* to initiate a fundamental acquisition policy change for the Army leading to the creation of a single buying entity in support of the sustainment requirements of the Army. An incremental approach will not create the level of institutionalization needed.



Preserving wartime logistics:

The panel's recommendation regarding a fundamental acquisition policy change leading to the creation of a single buying entity suggests a concurrent effort to isolate discrete wartime logistical functions that must be supported and conducted by the military.

The panel recommends, therefore, that as part of the effort to define a new policy for a unified sustainment buying structure, every mission/area amenable to contractor support be rigorously assessed and defined against fundamental ground rules generated by the leadership. This exercise must be conducted without the cultural biases inherent in the current system.

be identified by various means including, for instance, organization or function.

b. Investigate barriers to implementation of acquisition reform. Barriers may be attitudinal, behavioral, political, organizational or cultural. Express the underlying cause or causes of the barriers.

c. Seek and analyze government (DoD and non-DoD) and industry views regarding barriers. What are the experiences in industry?

d. Recommend approaches to overcoming impediments. Make specific recommendations in the areas of training, personnel, and organizations.

e. Recommend approaches for introducing new reform initiatives that foster implementation.

III. **Study Support**. I will sponsor the study. The Staff Assistant will be LTC Lee Rosenberg (SARD-PPR).

IV. **Schedule**. The study panel will begin its work immediately. The panel chair will provide a study plan briefing by 30 November 1996 and periodic in-process reviews as required by the plan. A final report will be provided by 31 August 1997.

V. **Special Provisions**. It is not anticipated that this inquiry will go into any "particular matters" within the meaning of Section 208, Title 18 of the United States Code.

Sincerely,

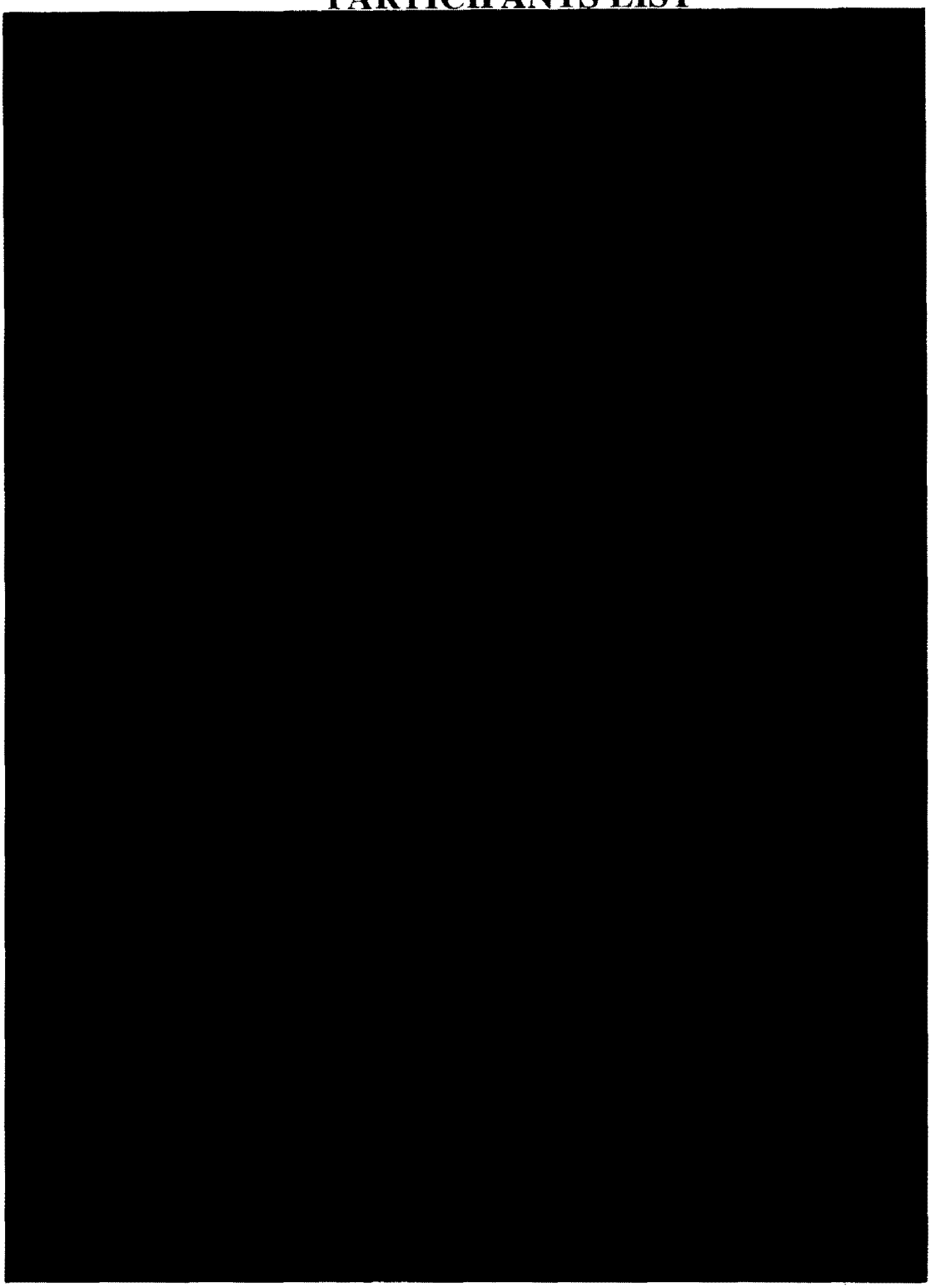
[redacted]

Deputy Assistant Secretary of the Army
(Procurement)

APPENDIX B

PARTICIPANTS LIST

PARTICIPANTS LIST



APPENDIX C

ACRONYM LIST

Acronym/Glossary

AASA(RDA)	Acting Assistant Secretary of the Army (Research, Development and Acquisition
ACAT	Acquisition Category
ACO	Administrative Contracting Officer
AMC	Army Materiel Command
AMC	Army Materiel Command
ARIAT	Acquisition Reform Assessment Team
ASA(ILE)	Assistant Secretary of the Army (Installations, Logistics and Environment
DAOIG	Department of the Army Office of Inspector General
DASA(P)	Deputy Assistant Secretary of the Army for Procurement
DAWIA	Defense Acquisition Workforce Improvement Act
DCMA	Defense Contract Management Agency
DoD	Department of Defense
DoDOIG	Department of Defense Office of Inspector General
DSCLOG	Deputy Chief of Staff (Logistics)
FACNET	Federal Acquisition Computer Network
FAR	Federal Acquisition Regulation
IT	Information Technology
JAG	Judge Advocate General
MACOM	Major Commands
MIS	Management Information Systems
NCMA	National Contract Managers Association
PEO	Program Executive Officer
SARD-PR	Army Acquisition Reform Office
SES	Senior Executive Service
SPS	Standard Procurement System

APPENDIX D

BASE-LINE ARMY ACQUISITION WORKFORCE

APPENDIX D
BASE-LINE ARMY ACQUISITION WORKFORCE

At the end of September, 1996, the Army Acquisition Workforce consisted of 2,418 military and 24,051 civilian members.[1]

Military:

The military portion of the workforce consists of officers from the grade of Captain through General. The average grade is Major, with 198 full Colonels and 23 General Officers. These officers are concentrated in five career fields: Program Management (919), Contracting (487), Communications/Computer Systems (276), SPRDE (464), and Test & Evaluation (220).

The average officer has between four and six years experience in acquisition functions. Approximately one-half of the officers are certified at either Level II (501) or Level III (687). Very few are at Level I (167), with the balance not certified.

The military workforce is highly educated, with all officers having a college degree, and over 70% (1,699) of the officers having a master's degree or higher.

Civilian:

The civilian portion of the workforce consists of employees from the grade of GS-2 through Senior Executive Service (SES). The average grade is GS-12, with 725 GS-15 and 91 SES employees. These employees are spread throughout all of the Acquisition Workforce career fields, with major concentrations in four career fields: Contracting (5,634), Purchasing (1,763), SPRDE (8,464), and Test & Evaluation (1,810).

The average civilian employee has between six and ten years experience in acquisition functions. Approximately 73% of the employees are certified at either Level II (8,831) or Level III (8,740). Very few are at Level I (522), with the balance not certified.

[1] All data as of September 30, 1997, Source: DAWIA MIS Personnel File (military and civilian), and DMDC Civilian and Military Master Files. See note at end of paper.

The civilian workforce is unevenly educated, 26% of all employees having less than a college degree, and only 25% (5,980) having a master's degree or higher. This is significantly different than the military educational levels noted above.

Comparison With the Air Force Acquisition Workforce:

As can be seen from the Army-Air Force comparison below, there are relatively few significant differences between the Army and Air Force Acquisition Workforce. One significant difference, however, is that the Air Force brings officers at the Second Lieutenant level into the workforce and retains them there for a full career. The Army only starts bringing officers into the Acquisition Workforce at the Captain level. A second is that the Air Force utilizes many more military officers in the Acquisition Workforce than the Army (43% versus 9%). A final difference is that the average Air Force civilian employee has much more experience in acquisition functions than the Army civilians (21-25 years of experience, versus 6-10 years of experience).

ARMY AND AIR FORCE DATA ON ACQUISITION WORKFORCE EMPLOYEES

Total Army and Air Force Acquisition Workforce:

	Army	Air Force
Military	2,418	9,590
Civilian	24,051	22,408
Total	26,469	31,998

Military:

Grade Distribution

	Army	Air Force
0-1	0	868
0-2	0	1,144
0-3	613	3,181
0-4	958	2,100
0-5	626	1,690
0-6	198	563
0-7/9	23	44
Total	2,418	9,590

Career Field

	Army	Air Force
Program Management	919	2,859
Contracting	487	924
Manufacturing & Prod.	1	43
Quality Assurance	3	16
Ind. Property Mgt.	0	1
Purchasing	0	4
Bus., Cost Est., & Fin Mgt.	3	407
Acquisition Logistics	45	572
Comm./Computer Syst.	276	632
SPRDE	464	2,129
T & E	220	1,018
Unkn./Blank	0	177
Total	2,418	9,590

Acquisition Experience (months)

	Army	Air Force
0-12	516	1,405
13-24	156	1,374
25-48	349	2,023
49-72	380	987
73-96	392	915
97-120	295	874
over 120	330	2,012
Total	2,418	9,590

Special Acquisition Assignments

	Army	Air Force
Program Exec. Officer	6	Blank
Program Manager	147	(no data)
Deputy PM	6	
Senior Contr. Official	11	
Ed., Trng., & Career Off	46	
Contracting Officer	131	
Senior Contr. Off (wrntd)	15	
Non specialized assign.	2,056	
Total	2,418	

Career Levels

	Army	Air Force
Level I	167	1,886
Level II	501	1,279
Level III	687	2,499
N/A (or not achieved)	1,063	3,926
Total	2,418	9,590

Race

	Army	Air Force
White (non-Hispanic)	1,954	8,063
Black	321	572
Hispanic	55	228
Am. Indian/Alaska	30	284
Asian/Pacific Is.	40	201
Other/Unkn.	18	242
Total	2,418	9,590

Gender

	Army	Air Force
Male	2,227	8,417
Female	168	922
Unkn.	23	251
Total	2,418	9,590

Education Level

	Army	Air Force
Bachelor's Degree	695	3,003
Master's Degree	1,637	5,995
Ph.D.	62	288
Unkn./Other	24	304
Total	2,418	9,590

Civilians:

Grade Distribution

	Army	Air Force
GS-2/3/4	244	66
GS-5	649	699
GS-6	416	294
GS-7	718	605
GS-8	64	10
GS-9	1,118	1,454
GS-10	22	5
GS-11	2,397	3,433
GS-12	7,701	8,359
GS-13	6,785	4,924
GS-14	2,623	1,704
GS-15	1,207	725
SES	88	91
Other (AD/ST)	9	39
Total	24,051	22,408

Occupation Groups (Series in Parens)

	Army	Air Force
Miscellaneous Group (0xx)	6	129
Social Science, Psychology, and Welfare Group (1xx)	116	115
Personnel Mgt. and Industrial Relations Group (2xx)	3	7
Gen. Admin., Clerical, and Office Services Group (3xx)	2,279	3,727
Logistics Management (0346)	(1,106)	(1,823)
Biological Sciences Group (4xx)	193	20
Accounting and Auditing Group (5xx)	246	1,224
Medical, Hospital, Dental, and Public Health Group (6xx)	24	1
Engineering and Architecture Group (8xx)	10,317	6,718
Legal and Kindred Group (9xx)	2	5
Information and Arts Group (10xx)	1	24
Business and Industry Group (11xx)	7,312	7,015
Contracting (1102)	(5,297)	(4,784)
Physical Sciences Group (13xx)	1,077	473
Mathematics and Statistics Group (O/R 1515)	1,216	55
M & S Group (Computer Science) (1550)	0	227
Equipment, Facilities, and Services Group (16xx)	60	1,046
Education Group (17xx)	4	18
Quality Assurance (1910)	641	303
Supply Group (20xx)	52	997

Career Field

	Army	Air Force
Program Management	1,187	1,443
Contracting	5,634	4,802
Ind. Prop. Mgt.	91	58
Purchasing	1,763	1,237
Manufacturing & Prod.	625	117
Quality Assurance	1,185	352
Bus.,Cost Est., & Fin. Mgt.	1,102	1,272
Acquisition Logistics	1,120	4,320
Comm/Computer Syst.	247	885
SPRDE	8,464	6,100
T & E	1,810	1,067
Auditing	4	3
Other, Blank, Unknown	819	752
Total	24,051	22,408

Acquisition Experience (years)

	Army	Air Force
0-1	5,842	161
2-5	3,061	272
6-10	3,648	1,701
11-15	4,660	3,485
16-20	3,046	4,358
21-25	1,677	4,701
26-30	1,147	4,257
over 30	970	3,473
Total	24,051	22,408

Special Acquisition Assignments

	Army	Air Force
Program Exec. Officer	23	2
Program Manager	148	85
Deputy PM	88	49
Senior Contr. Official	78	6
Ed., Trng., & Career Off	194	22
Contracting Officer	1,420	1,804
Prog. Exec/Contracting Off	6	0
Prog. Mgr./Contracting Off	20	0
Senior Contr. Off (warranted)	104	0
Senior Contr. Off (warranted)	3	0
Blank	21,967	20,440
Total	24,051	22,408

Career Levels

	Army	Air Force
Level I	522	3,991
Level II	8,831	6,153
Level III	8,740	5,362
N/A Not Achieved	5,958	6,902
Total	24,051	22,408

Race

	Army	Air Force
White (non-Hispanic)	19,311	17,854
Black	2,237	1,780
Hispanic	921	1,833
Am. Indian/Alaska	222	187
Asian/Pacific Is.	1,327	750
Other/Unkn.	33	4
Total	24,051	22,408

Gender

	Army	Air Force
Male	16,261	14,624
Female	7,753	7,648
Blank or Unkn.	37	136
Total	24,051	22,408

Education Level

	Army	Air Force
Less than H.S.	32	21
High School	2,747	1,944
1-4 Yrs. Of College	3,450	4,670
Bachelor's Degree	9,364	7,393
Professional Degree	57	35
Post Bach./Prof.	2,421	1,687
Master's Degree	4,443	5,536
Post Master's	681	325
Ph.D. and Post	819	661
Blank and Unknown	37	136
Total	24,051	22,408

Assignments

Major Commands--Army (selected)

Corps of Engineers	2,007
Information Systems	293
Special Operations	35
Europe	247
Forces Command	596
Medical Command	578
Space and Strat. Def.	644
TRADOC	549
C&B Def. Command	777
Aviation & Troop	1,251
Research Lab. Cmd.	1,220
T & E Command	1,346
Arm., Mun., & Chem.	1,082
AMC	509
Missile Command	2,129
Tank Auto. Cmd.	4,004
Comm./Electr. Cmd.	2,904

States (largest)

	Army	Air Force
Alabama	3,602	n/r
California	307	2,221
Colorado		460
Florida	451	1,585
Georgia	n/r	2,441
Illinois	837	n/r
Maryland	2,812	n/r
Massachusetts	453	933
Michigan	1,743	n/r
Missouri	1,417	n/r
New Jersey	4,850	n/r
New Mexico	742	696
New York	n/r	492
Ohio	n/r	5,293
Oklahoma	n/r	1,293
Pennsylvania	n/r	359
Texas	672	3,205
Virginia	2,328	n/r

Notes:
The DAWIA MIS is a data base of the Acquisition Workforce established by DoD Instruction 5000.55, "Reporting Management Information on DoD Military and Civilian Acquisition Personnel and Positions." This instruction explains the data fields and provides instructions for each Service to submit data to DMDC where it is managed These data pertain specifically to the management of the acquisition workforce..

The DMDC Civilian Master File contains personnel records on all DoD civilians, and as such, has much more demographic data pertaining to each civilian than included in the DAWIA MIS.

APPENDIX E

FOCUS GROUPS AT ARMY SITES AND MEETING AT HEADQUARTERS, DEPARTMENT OF THE ARMY

APPENDIX E
FOCUS GROUPS AT ARMY SITES AND MEETING AT HEADQUARTERS, DEPARTMENT OF THE ARMY

Summary:

The panel made four site visits to Army installations followed by a meeting at HQDA (RDA).

The data below shows that the panel interviewed a wide range of acquisition personnel at various levels of responsibility, occupational series, and levels of certification. An examination of these data confirm that civilians have significantly more experience on the job than their military counterparts, but more than half of the civilians do not have advanced degrees (masters or above), while all of the military are well educated.

It appears that most personnel receive the necessary training for them to become certified for their jobs. Based on this, there should be little or no lack of understanding of the DAWIA reforms as well as the Army's acquisition reform initiatives.

There is some relationship between government support of education and both civilians and military obtaining advanced degrees. All of the military have been educated by government help, while 17 of the civilians have also received aid. One half of the civilians with master's degrees received government aid.

One point that comes out of these data is that if the civilian workforce is under-educated for their career positions, it may be necessary for the government to provide increased educational assistance as well as career incentives for them to achieve higher educational levels.

These data show that what the panel learned in the focus groups should be representative of the Army Acquisition Workforce as a whole. The following data reflects the findings of the panel during these visits.

Focus Group Sessions at Army Installations[1]:

The panel interviewed a total of 71 persons at four §Army installations.

Certification levels of these employees are distributed as follows:

	Certification Levels of Employees			
Location	Level 1	Level 2	Level 3	Total
Ft. Detrick	5	7	5	17
TACOM	6	8	8	22
MICOM	6	7	5	18
COE Baltimore	5	5	4	14
Totals	22	27	22	71

Meeting at Headquarters, Department of the Army:

Personnel Interviewed in OASA(RDA) 9

Analysis of the Focus Group and Interview Findings:

Of the 80 persons interviewed, 14 were military. Their grades were:

1 O-7 5 O-6 6 O-5 2 O-4.

The remaining 66 of those interviewed were civilians. Their grades were:

SES	2	GS-15	12	GS-14	14
GS-13	13	GS-12	18	GS-11	2
GS-8	1	GS-7	2	GS-6	1
Blank	1				

The military officers had the following functional area codes:

51	Research, Development, and Acquisition	5
63	Dental Corps	1
66	Army Nurse	1
70	Health Services	2
97	Contracting and Industrial Management	5

[1] The following data were collected through the use of a short, anonymous, questionnaire filled out by all of the employees interviewed prior to the start of the focus group sessions.

The civilians had the following occupational series:

301	Misc. Administration and Programs	2
303	Misc. Clerk and Assistant	1
318	Secretary	1
343	Management and Program Analysis	3
346	Logistics Management	11
403	Microbiology	3
505	Financial Management	1
510	Accounting	1
560	Budget Analysis	1
801	General Engineering	9
802	Engineering Technician	1
810	Civil Engineering	4
819	Environmental Engineering	1
830	Mechanical Engineering	1
850	Electrical Engineering	1
855	Electronics Engineering	1
1102	Contracting	17
1105	Purchasing	1
1106	Procurement Clerical and Assistance	1
1910	Quality Assurance	2
2003	Supply Program Management	1
Blank		2

The average years of acquisition experience of those interviewed were as follows:

Civilians	17 years	Military	7.7 years

The maximum number of years of acquisition experience was:

Civilian	8 years	Military	15 years

The average years in the current job was:

Civilians	6.25 years	Military	1.4 years

The maximum number of years in the current job was:

Civilian	27 years	Military	3 years

The certified acquisition level of the personnel interviewed was:

Level	Civilians	Military
1	3	0
2	14	0
3	28	9
None	11	3
Not Applicable	9	2

The personnel responded as follows as to whether they were provided the necessary training to become certified at their level:

Response	Civilians	Military
Yes	47	9
No	10	1
No answer	9	4

The comparative education level of the personnel was as follows:

Level	Civilians	Military
Some College	9	--
Bachelor's Degree	21	--
Post Bachelor's Degree	7	--
Master's Degree	18	12
Post Master's Degree	6	--
Post Professional Degree	--	1
Ph.D. or Post Ph.D.	4	1
Blank	1	--

The following persons received Government assistance in obtaining their education:

Level	Civilians	Military
Bachelor's Degree	4	--
Post Bachelor's Degree	1	--
Master's Degree	9	10
Post Master's Degree	2	--
Ph.D. or Post Ph.D.	1	4
Blank or No Assistance	49	--

APPENDIX F

AIR FORCE CIVILIAN CAREER MANAGEMENT

APPENDIX F
AIR FORCE CIVILIAN CAREER MANAGEMENT

Air Force Civilian Career Management is characterized by "life cycle" management of its employees, from accession, development, utilization, sustainment, and separation. This appendix discusses its major characteristics.

Objectives of Air Force Civilian Career Management:

- To meet today's personnel needs with a well-qualified, highly motivated, broad-gauged workforce;
- To identify high potential employees;
- To develop leadership/managerial competencies;
- To centrally manage the workforce with a "corporate" approach; and
- To grow a trained and competent workforce for the future.

Scope of the Programs:

The Air Force has 19 civilian career programs managed centrally at the Air Force Personnel Center at Randolph AFB, Texas. Six of these career programs contain employees in the Acquisition Workforce. Only two of the programs consist of 100% of Acquisition Workforce employees: Contracting and Manufacturing, and Program Management. The other programs contain from 25% to 80% of employees from the Acquisition Workforce. (Note: This means that the Air Force does not manage the Acquisition Workforce entirely separate from the rest of its employees.)

Centralized Management Functions:

- Intake programs assure new entrants into the careers are continued. Current objectives are to bring 12% new employees in at the intern level each year. These employees are centrally funded to ensure their hiring and training.
- Personnel attending management and leadership training are centrally selected.
- Personnel attending The Air Force's Professional Military Education programs are centrally selected.Personnel moved from one location to another under the Air Force Mobility Programs are centrally managed, as are the funds to pay for these moves.
- Personnel who are in the Mobility Program are given more weight when considered for promotions.
- Personnel to be promoted to GS-15 will be centrally selected commencing next year (1998). Other personnel promotions are made from lists of candidates developed by scoring processes maintained centrally.
- Qualified personnel considered for promotion are selected on the basis of points earned through all aspects of the career plan, including professional education, technical training, mobility, professional growth, supervisors evaluations, etc.

- Funds are managed centrally for personnel selected for sabbatical assignments, such as education with industry, and under the Inter-Agency Personnel Act.
- Every effort is made by the Air Force retain RIF'ed employees within the Acquisition Workforce by aggressively utilizing all vacancies.
- The Air Force's Civilian Personnel Decision Support System is used for employee support and career management.

The Acquisition Workforce as a Part of Civilian Career Management:

- Employees in the Acquisition Workforce at its activation were grandfathered in their positions. However, they cannot be considered for promotion to other positions in the career area unless they can meet the published requirements for those positions as to education, training, and experience.
- Significant tuition assistance and technical training were provided for all employees, and especially those grandfathered, in order for them to have the opportunity for self-improvement and to meet requirements for future career growth.
- Tuition assistance was also provided to those employees in occupational series 1105, Purchasing (this series stops at the GS-9 level) and 1106, Procurement Technician (this series is not officially in the Acquisition Workforce). Both of these series provide a flow of trained entrants into the Acquisition Workforce, but need additional educational assistance to meet the qualification requirements.

Strategic Planning:

The Air Force has developed a comprehensive strategic plan for future management of its workforce, including the nitty-gritty problems of personnel management with business sense.

The Army, although having some career programs, is not as committed to career management as the Air Force, and has not institutionalized its plans as an integral part of Army management.

APPENDIX G

PRÉCIS OF PROCUREMENT REFORM INITIATIVES

APPENDIX G
PRÉCIS OF PROCUREMENT REFORM INITIATIVES

Maintaining a fair, efficient, and open system of defense procurement has been a fundamental public policy since the earliest days of the Republic, as well as a specific congressional goal since Department of Defense (DoD) was created by the National Security Act of 1947. Over time, the increasingly complex statutory and regulatory regime with which the acquisition and sustainment elements of the Defense workforce attempted to manage defense acquisition and by which it was managed frustrated this fundamental public policy. The pre-1995 framework increased acquisition cycle time and drove management and operating costs to an unprecedented share of each acquisition dollar. When coupled with formidable compliance mechanisms composed of auditors, investigators and lawyers the pre-reform regime fostered a rigid and risk averse acquisition culture.

In the decades that followed creation of the DoD, six major executive branch commissions separately examined the perennial problems of defense acquisition management. One of them, the President's Blue Ribbon Commission on Defense Management headed by David Packard, from whom it took its popular name, provided a comprehensive analysis of the major problem areas affecting defense acquisition management. It also made a specific recommendation to recodify the federal laws governing procurement.

Although the Packard Commission's recommendations attracted wide public attention, they failed to prompt sweeping legislative changes. A 1988 congressional report noted that the Packard Commission's status as the sixth major study of defense acquisition in four decades meant that it was merely the latest to address continuing problems in defense procurement. In the report's forward, House Armed Services Committee Chairman Les Aspin stated, , "Perhaps the next executive commission on acquisition should be created, not to propose the reforms, but to implement them."[1] In June 1989, Secretary of Defense Cheney set forth such a plan in his Defense Management Review, an effort to not only implement the recommendations of the Packard Commission, but also to provide a framework for continuing improvements in DoD acquisition practices.[2]

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[1] Defense Policy Panel and Acquisition Policy Panel of the H.R. Comm. On Armed Services, 100th Cong., 2d Sess., *Defense Acquisition: Major U.S. Commission Reports* (1949-1988) (Comm. Print 1988). vii.

[2] U.S. Dept. Of Defense, *Defense Management Report to the President by the Secretary of Defense Dick Cheney* (1989).

Building upon the efforts of the Packard Commission and Secretary Cheney's Defense Management Review, Congress, through Section 800 of the National Defense Authorization Act for FY 1991, directed the official responsible for administering DoD acquisition law and regulation – the Under Secretary of Defense for Acquisition – to appoint an advisory panel (known as the "800 Panel") of government and private sector experts to review all laws affecting DoD procurement with a view toward streamlining the defense acquisition process. The panel was to issue a report in early 1993 that contained a practical plan of action for moving away from present law to an understandable code and was to contain specific recommendations to Congress to: eliminate any laws unnecessary for the establishment of the buyer-seller relationships in procurement; ensure the continuing financial and ethical integrity of defense procurement programs; and, protect the best interests of the DoD.

Under the chairmanship of RADM Vincent, Commandant of the Defense Systems Management College, the 13 member panel[3] transmitted its report to Congress on January 14, 1993. Entitled *Streamlining Defense Acquisition Laws*, the Report consisted of nearly 2000 pages reflecting the panel's over 16 months of effort, including its review of over 600 statutes that affected the defense acquisition process. In the early months of the panel's activities, it crafted ten objectives as an amplification of the basic goals established in Section 800 of the implementing statute. The ninth objective is particularly relevant to the problem addressed in this study by the Acquisition Reform Issue Group of the Army Science Board (ASB).

> (9) Acquisition laws should encourage the exercise of sound judgment on the part of acquisition personnel.

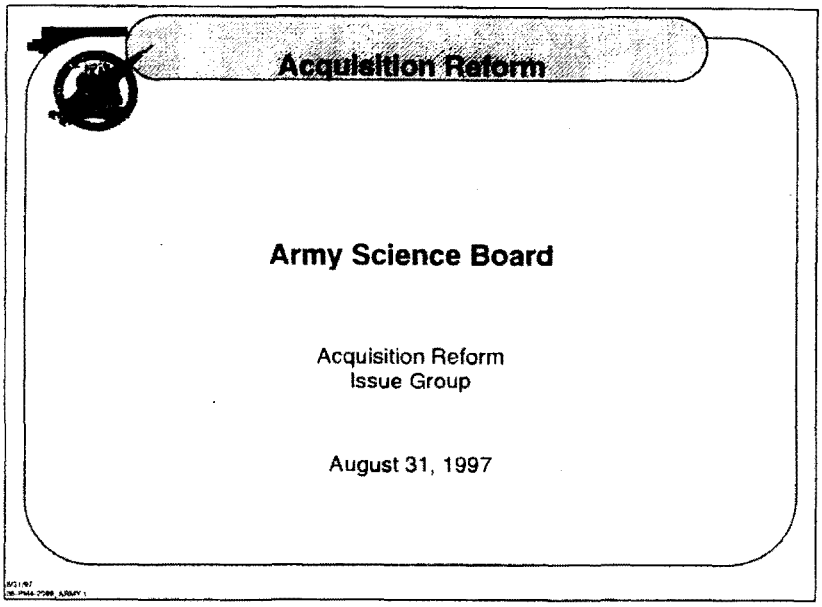
According to its own report, the panel concentrated on changes that would streamline the defense procurement process for an environment characterized by fewer dollars, a shrinking work force and a less compelling superpower threat. The panel's report reflected initiatives in three areas of particular importance: streamlining; commercial items; and simplified acquisition.

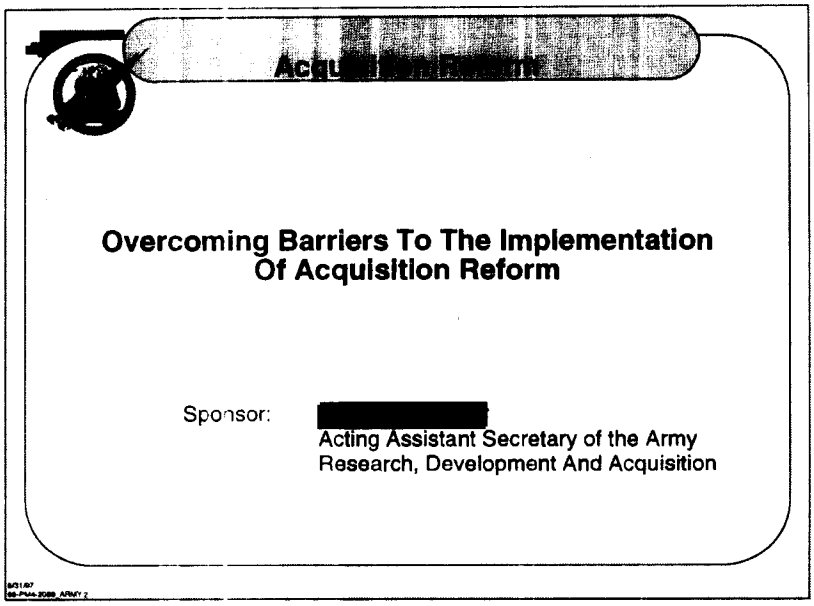
The panel's report was transmitted to Congress a week before the new, Democratic administration took office. Changes in both legislative and executive leadership did nothing to slow the momentum. The sweeping legislative changes envisioned by the Packard Commission in 1986 were enacted, beginning with the Federal Acquisition Streamlining Act of 1994 (FASA). In less than two years the three-pronged recommendations of the 800 Panel – streamlining, commercial items and simplified acquisition – were bestowed with statutory legitimization. Congress then enacted the Federal Acquisition Reform Act of 1996 (FARA) which further legitimized the panel's recommendations and smoothed some of FASA's rough edges.

[3] [redacted] then Deputy General Counsel of the Army, was a member of the panel.

APPENDIX H

DISTRIBUTION LIST


Acquisition Reform
Army Science Board
Acquisition Reform
Issue Group
August 31, 1997



To successfully implement acquisition reform[1], Army leadership, acquisition leadership and all buying elements of the Army must have varying degrees of understanding of the revised acquisition laws and regulations, including their policy objectives; recognize opportunities for exercising judgment and discretion; exercise judgment and discretion with competent assistance from the elements that influence the acquisition process—auditing, compliance and legal—without fear of unwarranted criticism and scrutiny from those elements; and take personal responsibility for furtherance of the goals to be achieved by the reforms.

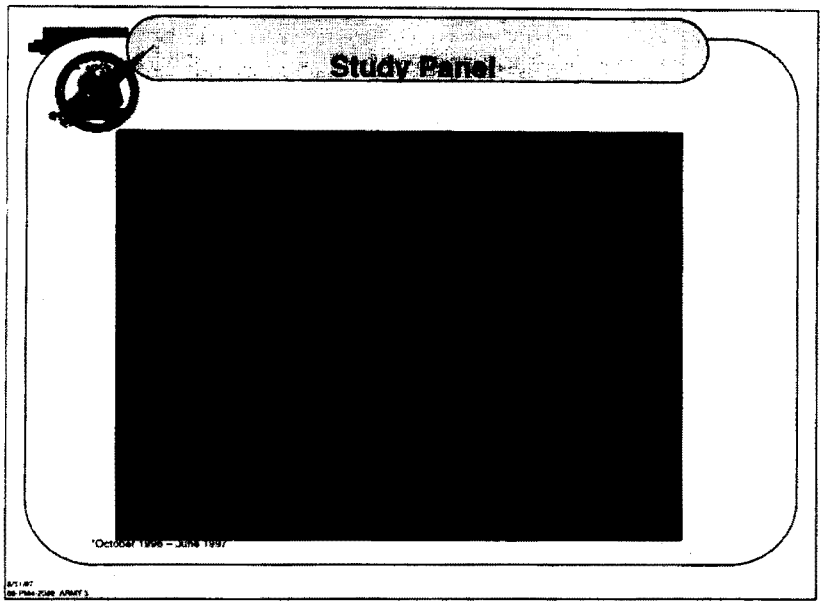
Frustration in achieving the savings and efficiencies promised by acquisition reformers has emphasized the barriers that are impeding and will impede successful implementation of acquisition reform. Some barriers, such as lack of training funds and mandated workforce reductions, cannot be overcome within the Army or Department of Defense (DoD); changes in legislative attitudes and statutory expressions of those changes are required. There are, however, cultural, organizational, political and behavioral barriers that can be overcome from within and need no legislative fixes.

In addition to government-wide initiatives, the DoD and the Department of the Army have also undertaken reforms to streamline military acquisitions. The Army has taken major steps, not only to implement and adapt over-arching federal policy, but also to use its own authority to initiate both savings and efficiencies. The purpose of Army acquisition is to equip and sustain the soldier. The purpose of acquisition reform is to do it faster, at a reasonable price, and with affordable ownership costs. This is Army policy in support of Army XXI.

In the fall of 1996, the then-Deputy Assistant Secretary of the Army for Procurement (DASA(P)), now Acting Assistant Secretary of the Army (Research, Development and Acquisition (AASA(RDA)), [redacted] charged the Army Science Board Acquisition Reform Issue Group to assess the barriers to achieving the levels of acquisition reform the Army must realize to meet its objectives in the areas of readiness and sustainment, and recommend means by which to robustly meet the objectives of Army acquisition reform in light of the identified barriers.

A ASA(RDA)

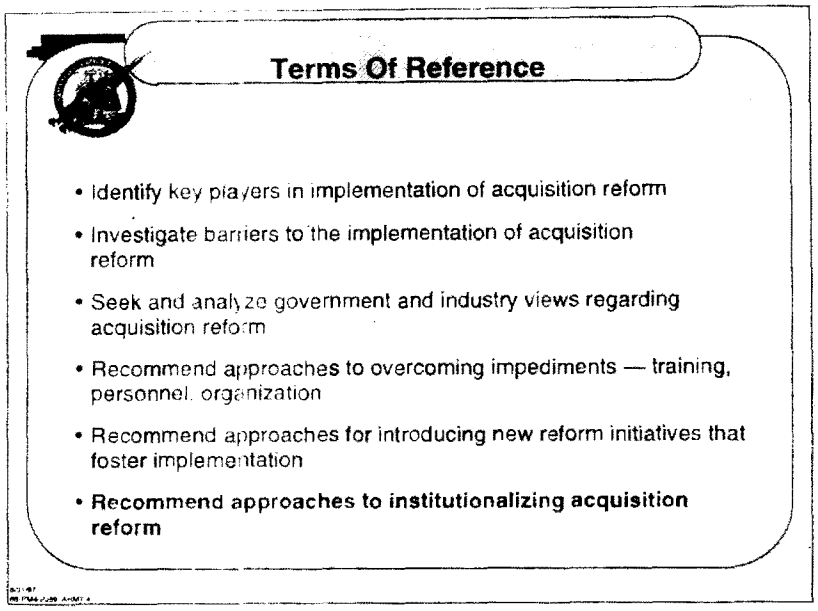
[1] Appendix A contains a précis of acquisition reform at the macro level.



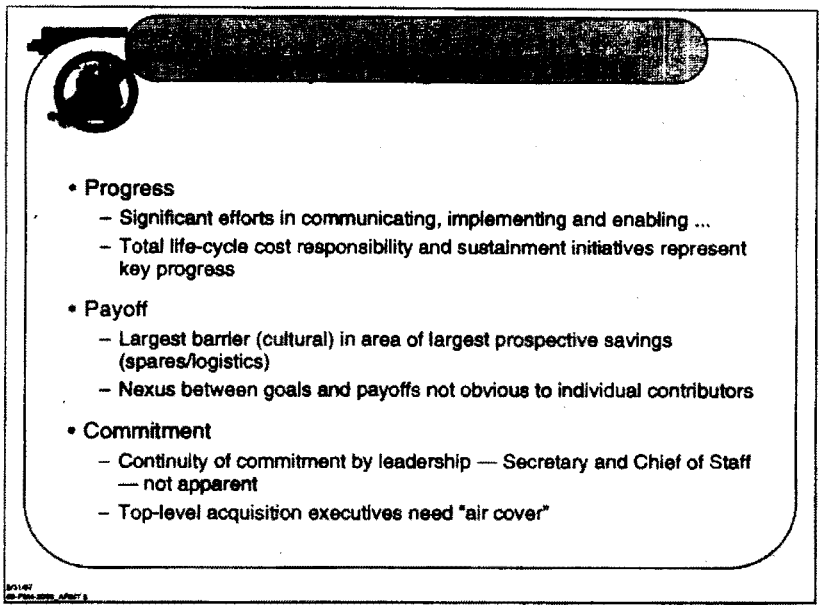
A subset of the ASB Acquisition Reform Issue Group membership participated along with several consultants. The panelists brought to the study expertise in military acquisition practices and organizations, military operational requirements, law, civilian and military personnel systems, operations research, metrics, and commercial practices.

The panel was supported by [redacted] with the Army Acquisition Reform Office (SARD-PR) and, after his retirement, by [redacted] of that same organization.

[redacted] was particularly instrumental in supporting the development of the study approach and organizing site visits and briefings.



The Terms of Reference are attached as Appendix B to this report. The panel expanded its efforts to include approaches to institutionalizing acquisition reform.



At the outset it is critical to know and keep in mind while reviewing this report that the panel was not charged with dwelling upon the successes achieved by the Army in acquisition reform, unless success could be used as a paradigm on which to base remedial actions. Rather, the panel was charged with ferreting out inadequacies and suggesting remedies. Thus, those who review this report may find it overly critical and, at times, harsh. That is to be expected given the panel's charge. This report should in no way be interpreted as diminishing the accomplishments of the Army in implementing reforms to the acquisition process.

The panel's findings and conclusions, broadly reflective of all facets of Army implementation of acquisition reform, may be reduced to five significant areas: the progress made by the Army to date; where the largest payoffs are and why they are not realized; the degree of commitment by the leadership to acquisition reform and its significance to successful reform initiatives; attempts to measure the effects of acquisition reform and the quality of the metrics employed; and the contributors to acquisition reform and the resources with which they are to achieve success. These summary conclusions also address some of the more noteworthy findings of the panel with respect to the ten key acquisition reform initiatives on which it focused.

Progress: The Army has achieved credible success in implementing certain acquisition reform initiatives, communicating new processes to some contributors and enabling those who actively seek a meaningful role in the acquisition process. Moreover, Army acquisition leadership has demonstrated innovation through its creative vision of total life cycle cost responsibility and management for Acquisition Category (ACAT) systems under DoD Directive 5000.1 whereby Program Executive Officers (PEOs) and Major Commands (MACOMs) that manage ACAT systems are now responsible for the management of the total life cycle costs for such systems. Additionally, the acquisition leadership's vision for sustainment and modernization through spares reflects a comprehensive understanding of the political and budgetary environment in which the acquisition mission — to equip and sustain the soldier — is realized.

Summary Findings/Conclusions

Notwithstanding the progress noted above, the Army has yet to *institutionalize* acquisition reform. Indeed, with the exception of credit card purchasing, the panel's analysis suggests that there is no evidence of a wholesale buy-in of any single acquisition reform initiative, let alone the very core concepts of simplification, commercialization and streamlining. It is this institutionalization of acquisition reform that will move the Army to a point where by it can, given selection and use of proper metrics, ~~demonstrate~~ actualize the savings in time and dollars.

Payoff: Culture is routinely defined as the totality of socially transmitted behavior patterns, beliefs, institutions and other by-products of human work and thought characteristics. The culture evident in many large segments of the Army buying community is variably characterized by rigidity; fear of commercial practices; personnel actions; job loss; the misapplication of power by some in authority; and mistrust. There are, of course, exceptions both organizationally and individually. However, the culture of the Army buying community has been identified by this panel as the single greatest barrier to institutionalization of acquisition reform.

Nowhere is that culture more formidable than in the area of highest payoff — spares/logistics/sustainment. The panel found an almost universally negative (or lack of positive) response to acquisition reform amongst those members of this subset of the buying community with which it spoke. In contrast, panelists found the new-starts subculture to be fairly responsive, at least during interviews, to embracing acquisition reform. However, as noted, where the greatest percent of acquisition dollars are expended — the purchase of spares/ sustainment — there appears the greatest resistance to change.

The panel attributes the negative characteristics of the culture and its impact on acquisition reform institutionalization in large part to the lack of an obvious nexus between acquisition reform goals and payoffs. Contributors have not been made responsible for achieving acquisition reform goals. This ties to other observations regarding commitment of the leadership and metrics discussed below. Notwithstanding the efforts at communications through road shows and other training media, achieving acquisition reform objectives is viewed more as aspirational than mandatory. Being held personally responsible for the success or failure in achieving express objectives can be very compelling.

to laud ... courage ~~aggressive~~ in Command more willing risk mgmt. over final results — at least during a transition period.

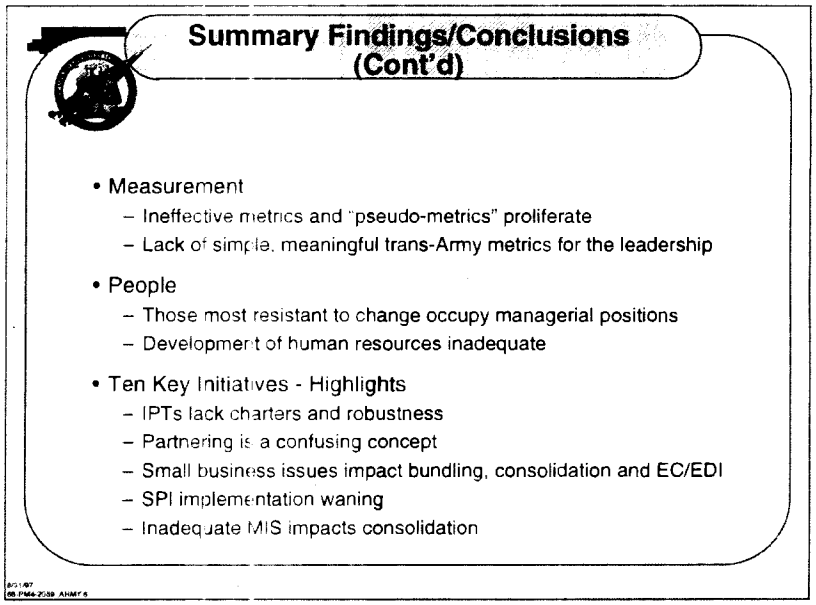
while ... experience/... to next generation, care ... refrain from maintaining ~~restrain~~ a tradition of resist... to ... reform.

Summary Findings/Conclusions

Commitment: It is not apparent to the panel that Army civilian and military leadership outside of the OASA(RDA) organization have sustained their commitment to the objectives and processes of acquisition reform. One compelling reason for this *apparent* lack of commitment is the burden placed on the most senior levels by forces above, namely the DoD and Congress. One can liken this situation to a corporate chief executive officer who must constantly see to the demands of board members and shareholders, and lacks the time to project leadership downward into the organization.

Notwithstanding the demands on Army leadership, without the regular, obvious, unwavering and articulated commitment by the Secretary and Chief of Staff to acquisition reform, two undesirable effects are evident: the workforce's perception that acquisition reform initiatives are passing whims; and the loss of the momentum initiated by OSD and OASA(RDA).

A review of vision statements, public speeches and other communications from the Secretary and Chief of Staff found little evidence of an unambiguous, continuing commitment to the principles and processes of acquisition reform. Without regular demonstrations of leadership commitment, the workforce is left to the management devices of the uncommitted.



Measurement:

Acquisition reform metrics are the numerical values by which the Army and other interested entities gauge progress toward meeting acquisition reform objectives. If the key acquisition reform objectives are to equip and sustain the soldier faster, better and cheaper (without diminishing warfighting capabilities), then the true metrics are those that enable the Army to assess *how much faster, how much better and how much cheaper*[2].

Members of the Army buying community with whom the panel spoke reported untold hours expended in pursuit not of valid measurements of progress but rather of measurements that reflect on successes in areas that have, at best, marginal relationships to acquisition reform. The panel has called these ill-conceived measurements "pseudo-metrics." It learned of organizations that met weekly to discuss metrics yet could produce no measure of achievement — no numerical value of progress or a lack of progress. Rather, it appears that disproportional amounts of time have been spent crafting seemingly complex but actually meaningless measurements.

Three reasons for these wasteful exercises became apparent: some of those assigned to craft metrics lack the understanding of acquisition reform and the acquisition process; attempts at baselining are inadequate due to data retrieval and reliability problems; and many managers require pseudo-metrics to make them and their organizations appear, at least superficially, successful.

What compounds the problem at the lower level is a lack of one or two simple, trans-Army metrics employed by the leadership.

[2] Selecting Effective Acquisition Reform Metrics, Aron Pinker, Charles G. Smith and Jack W. Booher, *Acquisition Review Quarterly*, Vol. 4, No. 2 (Spring 1997) at 192.