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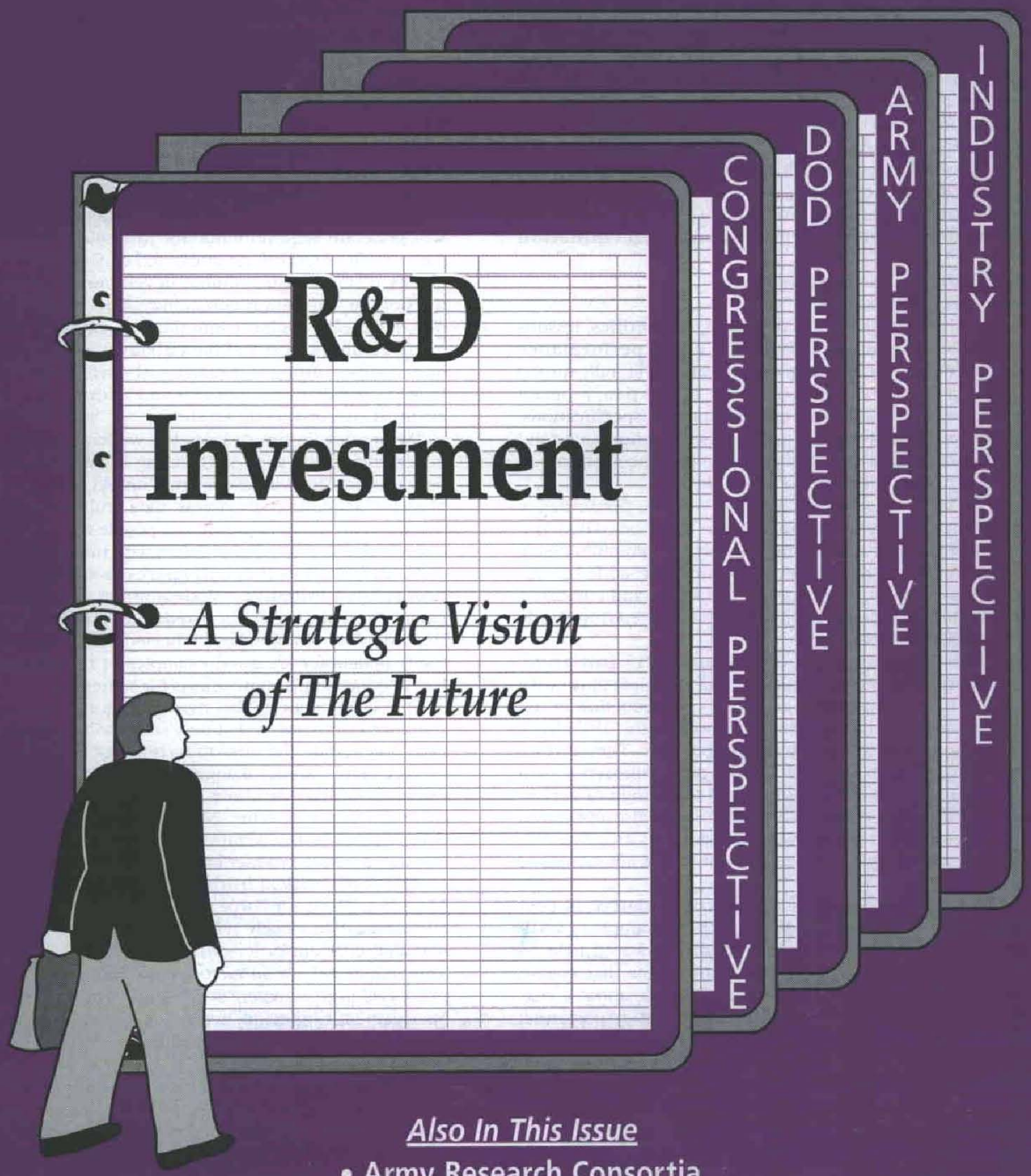
NOVEMBER - DECEMBER 1996



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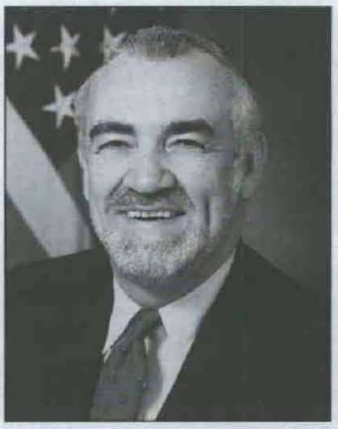
From The Army Acquisition Executive. . .

CRITICAL ACQUISITION REFORM INITIATIVES



The Army has reached the "end of the beginning" in its acquisition reform program. We have made real and visible progress in our procurement processes, and we now have a solid foundation in place as we move toward the 21st century. Teamwork has been the key to our success.

While the good news comes from many areas, I consider the following six critical initiatives as landmark achievements.

1. **Reform of military specifications and standards.**
2. **Integrated product teams.**
3. **Cost as an independent variable.**
4. **Restructuring of the requirements determination process.**
5. **Modernization through spares.**
6. **Single process initiative.**

Let me briefly highlight some of our success stories, lessons learned, or problems in each area. **First, the use of performance specifications in lieu of military specifications** literally turned the entire acquisition process on its head. In the past, program managers had to seek waivers to use commercial specifications. Today, it is just the opposite. Moving to the use of performance and commercial specifications and standards is one of the most important acquisition reform initiatives we have taken.

The lessons we learned are that when you use performance specs without specifying what the solution must be, when you streamline the request for quotes and ask only for minimum essential data, and when you remove as many non-value-added terms and conditions as you can, you get more innovative and cost-effective designs, including reduced production costs. The Army clearly gets a better product at less cost.

Second, the integrated product team (IPT) initiative. There are numerous examples of success, but the most illustrative one is the IPT that was formed to focus on cost reduction in the Javelin missile program. In less than four months, this IPT identified simpler designs and less complex components. They investigated restructuring the program schedule and proposed a plan which shortened the buy-out and improved the design of certain components of the missile and its launcher. They also optimized production so that the schedule was shortened by two years to produce the total quantity of missiles needed with a net savings of more than $1 billion.

Another important acquisition reform initiative is cost as an independent variable (CAIV). The best example of CAIV is a painful one, and it relates to our Crusader advanced field artillery system. The major propellant technology for that system was to be a liquid propellant formulation. We were about a year into demonstration/validation when we evaluated a substantial amount of analyses, Army Science Board reviews, and related processes that revealed we had a number of difficulties in realizing the liquid propellant solution implementation.

We brought in the user to find out what we could do relative to requirements that would enable us to implement an alternate design and still have the world's finest artillery howitzer. The key driver of that exercise by the user and program industry team was trade-offs to keep us from an unaffordable cost envelope. We were able to trade off a couple of cost driving requirements and meet real Army needs with an alternate solid propellant solution.

One lesson learned is that we need to apply CAIV very early in the requirements determination process.

The fourth area that offers great promise is the restructured Army requirements determination process. This was an outgrowth of about a year long study and set of discussions between the Army Training and Doctrine Command (TRADOC), which has the responsibility to generate Mission Need Statements (MNS) and Operational Requirements Documents (ORD), and my organization which is responsible for acquisition. The Army now will generate requirements not just solely based on the doctrinaires at TRADOC but an integrated concept team (ICT), which includes technologists, combat developers, and other representatives of the acquisition community. This team will use IPT principles to get early visibility into the implication of candidate requirements regarding cost and the viability of systems to meet those requirements. During this effort, CAIV will be introduced. We will look at candidate requirements and analyze them in terms of their eventual cost drivers down stream.

We are new in this process, but we have several MNS and ORDs under preparation at TRADOC using ICT and treating CAIV. We believe this process will save us from untold costs in re-dos later in the phases of acquisition of systems. One problem with this approach is that it requires investing time and people to participate on the ICTs, but we have to work that problem with the manpower we have.

Modernization through spares is another critical acquisition reform initiative. Modernization through spares began last January, and our experience to date is limited; however, the Army's High Mobility Multipurpose Wheeled Vehicle and the UH-60 Black Hawk helicopter are good examples of the success the Army has had in doing similar type efforts for some time.

One of the reasons that modernization through spares is so important to the Army is that new starts will continue to be very limited. Meanwhile, the rates of technological advancement continue to accelerate. Modernizing through spares provides us a way to leverage normal operations and support expenditures to improve existing weapon systems. New technology is captured in a manner that will allow the Army to incrementally modernize systems through iterative product improvements made to spares.

The sixth critical initiative is the single process initiative. The Army, Navy, Air Force, and Office of the Secretary of Defense, communicating closely with industry, found that we all were demanding different processes in our contracts for the *same* items. This required that contractors train people and maintain multiple processes at great expense. Working through the Defense Contract Management Command, we are changing contracts to a single initiative for similar tasks and items. The future potential savings in overhead costs are significant.

We have clearly changed things for the better, and it demonstrates what we in the acquisition community can do when we work together as a team dedicated to a common goal. We have made great progress, but much work remains to be done.

Gilbert F. Decker

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Research Development Acquisition ARMY RD&A

Professional Publication of the RD&A Community

FEATURES

DEPARTMENTS

COVER

The effectiveness of the Services' investment in research and development is highly dependent on the interface of a number of players involved in the acquisition process. These players include the Army, Congress, DOD and industry.

AN ARMY PERSPECTIVE AND STRATEGIC VISION OF THE FUTURE

By The Honorable Gilbert F. Decker
Assistant Secretary of the Army
(Research, Development and Acquisition)

"We are not the only nation with competence in defense science and technology. To sustain the lead which brought us victory during Desert Storm . . . recognizing that over time other nations will develop comparable capabilities, we must . . . invest in the next generation of defense technologies."

—William J. Perry, Secretary of Defense

We are working today to build a force to meet the challenges of the 21st century. It is a formidable task. In this post-Cold War era, our planning must cope with increased uncertainty. Who will our future adversaries be? What technology will we face? We do know that in today's global economy, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base. The military advantage will go to the nation with the best cycle time to capture technologies that are commercially available, incorporate them in weapon systems, and field new operational capabilities.

Since the Korean War, fielding technologically superior forces has been the cornerstone of our national military strategy. Our predecessors invested wisely in technology in the 1960s and 1970s, and provided us with the Army's Big Five heroes of Desert Storm—Apache, Black Hawk, Patriot, Abrams, and Bradley. These systems were instrumental in delivering overwhelming, swift, decisive victory with minimum casualties. Today, they provide a continuing deterrence of our potential adversaries.

It is imperative that we maintain the Army's technological advantage on the battlefield. Continuous modernization is one of the keys to dominance on the future battlefield and the key to readiness for unexpected challenges of the 21st century. We cannot afford technological surprise.

Our modernization strategy in the near-term is to buy a limited number of new systems, while extending the lives, improving the performance, and adding new capabilities to our existing systems. But ultimately, the Army will reach the point where additional technological improvements to today's systems will provide only marginal benefits. We must invest now in new types of systems and capabilities for the Army of 2010 and beyond. Today's modernization program is tomorrow's readiness.

In government as in industry, a healthy, vibrant research and development (R&D) base is key to competitiveness and long-term survival. There are abundant studies to demonstrate that when R&D is curtailed in the short-term, companies or organizations suffer in the long-term. It is just not possible to wait until advanced technology is needed in a product or a weapon system to begin investment because by then it is already too late.

For all these reasons, we have strived mightily to keep our science and technology (S&T) investment budgets at a significant percentage of the overall Army research, development and acquisition (RDA) budget. While there have been reductions in science and technology (S&T), they have been far smaller than the other elements of Army RDA.

I am convinced that it is absolutely necessary to have technology domi-

Highly motivated, competent people who are well-trained and educated in their various disciplines are the single most important investment made.

nance on the battlefield of the future. I am further convinced that in five, eight, 10 years from now, our successors will be grateful.

These investments fall into critical areas. First, is the investment in people. Highly motivated, competent people who are well-trained and educated in their various disciplines are the single most important investment made. It was expressed to me once that the four most important elements of a successful enterprise are people, people, people, and I've forgotten what the fourth one is. This advice has proven the test of time. Under continuing budget pressures, I am concerned by the tendency to rationalize reductions in training and education investments to sustain top quality people. We must never lose sight of the fact that top quality R&D people in our research institutions and contractor base are critical.

Investments in our training and education base for quality R&D people is absolutely vital, but that alone is not enough. To maintain a world-class technical staff requires that they have R&D work to do. Our strategic plan calls for stable funding in our S&T base. Now, this should not be translated to suggest that we will pick R&D investments and projects for the sake of having R&D work to do. The selection of and management of specific R&D efforts within this overall commitment to maintain a stable base should be relevant and linked clearly to the overall mission of the Army and its ultimate vision.

To the extent that we can have a high degree of success in identifying projects relevant to the long-range needs of the Army, we actually accomplish two critical objectives. One, we maintain the vitality and criticality of the R&D people base and two, we eventually produce a needed capability for the soldier.

So, let's step back for a moment and reflect on the Army's mission, and our vision for the future within which lies the critical R&D investment element. Today, as in the past, America's Army is prepared, trained, and ready to fight and win the nation's wars. This role has expanded to include defense of U.S. national interests on a global scale. Our vision is a full spectrum force with a unique ability to compel or deter any adversary, reassure allies and friends, and support domestic authorities. We are changing to meet the challenges of today, tomorrow, and the 21st century.

During the Cold War, America's military strategy was clearly defined as one of deterrence and containment. In today's environment, we must be prepared to confront a wide-range of scenarios. The world today, in a security sense, is confusing. There is great turbulence and unrest. The specific kinds of operations that we must be prepared to face in the coming years are far more diverse.

It is within this framework that we must select the R&D areas in which we make major investments to meet the test of relevancy. This is not an easy process because, at the same time that we are searching for relevancy related to statements of Army mission and vision, we also must look at where technology is evolving. We must, when possible, intersect the relevancy requirements of the Army with the technology capabilities that we see evolving rapidly in technology around the world.

Our R&D framework is sound. In order to keep up with technology progress, we must invest a reasonable percentage of our available R&D resources into basic research. The test of relevancy in basic research need not be quite as stringent as in applied development or demonstration projects, but some test of relevancy should be made even in these early phases of research. Outside of basic research, is applied research. Here we focus on specific military needs and develop the concepts and components to enable a variety of weapon systems applications. These need a slightly more stringent test of relevancy. Still within the R&D domain, we try to pull together real designs of systems into testable demonstrations. It is here that a substantial amount of resources are allocated and much harder criteria are used to test relevancy.

Again, this framework is sound, but it must continuously be improved. We, in the R&D community, must continuously keep an open mind and allow the interjection of new thoughts and ideas. We must be adaptable, take on new projects as the future becomes more clear and not be stuck along one line of R&D just because we got it started. We must be willing to start new projects when we see the need and curtail or abandon existing projects if they appear less relevant than originally perceived.

In my opinion, the main principle of successful R&D programs is the principle of flexibility without sloppy management. If too flexible, we lose focus and end up with sloppy management. If too rigid, we will often eliminate promising ideas that should be pursued.

Technology has revolutionized the battlefield time and time again. The message is clear. We must maintain a stable investment in R&D, maintain a world-class base of people and facilities, and maintain the flexibility to match changing R&D needs in order to maintain our decisive advantage on the battlefield.

R&D IN CONGRESS

Vision of the Future and R&D

By MG Morris J. Boyd,
LTC Kevin J. Meade
and MAJ Camille Nichols

In 1991, with the Berlin Wall down, the Soviet Union rapidly disintegrating, and the guns still smoking from the U.S. forces' overwhelming success in Operation Desert Storm, U.S. national security strategists turned their focus toward the future. Much thought has gone into an assessment of the strategic environment, the threats, and the national security strategy to deal with them. U.S. doctrine has evolved to better accommodate that strategy.

At the Joint Chiefs of Staff level, Joint Vision 2010 is the conceptual template for how America's armed forces will channel the vitality and innovation of our people and leverage technological opportunities to achieve new levels of effectiveness in joint warfighting. The Army vision for the future, Army XXI, represents the transformation of the operational and institutional Army across the domains of doctrine, training, leader development, organization, materiel, and soldiers to exploit information technology to provide a more capable future force, according to the *U.S. Army 1995 Modernization Plan.* The strategy of Joint Vision 2010 and Army XXI is not based on predicting the future, but setting in motion the processes that will allow us to deal with the future, regardless of what it holds.

The Role Of R&D

The research and development (R&D) process is the linchpin in ensuring that strategy and doctrine appropriately drive the technology and materiel solution—modernization. To be successful, it requires public and private partnership and, within government, it requires a complex partnership between the branches, agencies, and departments. A key player in this process is the U.S. Congress. How Congress views R&D and its role in the process is critical.

Role Of Congress

Article 1, Section 8, of the Constitution of the United States of America has empowered Congress to: "provide for the common defense ... raise and support armies ... provide and maintain a Navy ... make rules for the government and regulation of the land and naval forces ... declare war ... and make laws which shall be necessary and proper for carrying out the foregoing powers." Congress exercises its authority and responsibilities through legislation oversight and investigations. In our system, no matter how good the program or idea is, it must be authorized and appropriated. To survive over time, it must withstand close scrutiny by a host of committees and congressional members.

Congress And Federal R&D

Congress governs through a committee system. Many committees and subcommittees are involved in the creation of policy with respect to R&D investment in the United States. The House of Representatives has the following committees that play a significant role in how federal R&D funds will be spent:

- Appropriations;
- National Security;
- Government Reform and Oversight; and
- Science.

The Senate has these committees:

- Appropriations;
- Armed Services;
- Commerce, Science, and Transportation; and
- Judiciary.

It is obvious that these committees are directly responsible for federal R&D investment. However, a review of the charters of the other congressional committees coupled with an understanding of technology's influences in daily activities quickly reveals that almost every congressional committee has a role in directing the federal government's R&D investment. The committees on banking, economics, transportation, foreign relations and education are some of the more obvious ones.

This fragmentation of R&D interests among the various committees and subcommittees makes the task of management and direction of federal R&D investment extremely difficult. Congress utilizes many sources to assist in the formulation of the R&D program including: the Office of Technology Assessment, the Congressional Research Service of the Library of Congress, the General Accounting Office, Office of Management and Budget, the National Academy of Sciences, and the President's Science Advisory Committee. In general, Congress is empowered to be an architect of the R&D system. To implement or guide initiatives in the U.S. research system, Congress can adjust the research budget, craft legislation, or monitor and influence federal agencies through the oversight function.

At the beginning of World War II, the federal government mobilized the scientific community to assist in the war effort. By the end of the war, 30,000 scientists, doctors, and engineers were working on new weapons and new medicine. Congress appropriated money for their research in lump sums, and trusted them to decide how to spend the money. The success of these researchers in the development of radar, electronic counter-measures, the proximity fuse, and other scientific military equipment, and of course, the atom bomb was the critical determinant of the favorable outcome for the United States and its allies. (David Packard, *Science and Technology Advice to the President, Congress, and Judiciary,* editor William T. Golden, Transaction Publishers, New Brunswick, 1995, p. 246.)

Since World War II, there has been an increase in the degree to which science and technology permeates every aspect of our

Figure 1.

existence. The effects of technology influence our lives from national security to the food we eat, from the national economy to the clothes we wear. Science and technology will also determine the quality of our future way of life. It is obvious that federal government support is required to develop a strong national program to ensure America's socioeconomic well-being, maybe even its very survival. This means that a balance must be found between funding other socially required and necessary programs, such as health care and Defense, and the need to reverse the deficit trends in the federal budget.

In the 1960s, the mastery of space and space science drove the U.S. federal research and development program; this culminated in attainment of the goal to put a man on the moon. The 1970s found the U.S. government investing in energy research in an attempt to develop alternative fuel sources. During the 1980s, economic recovery, competitiveness, and leadership were the areas of focus. Research funds were spent on the space station, Strategic Defense Initiative, the superconducting super collider and military weapons. The 1990s' R&D program has remained focused on economic recovery and competitiveness. Information technology, environmental technology and medical research have been the major investment areas.

Congress And DOD R&D

The U.S. DOD R&D program has for decades been the best in the world. The technology base investments for Defense in the 1970s and the 1980s produced the superior weaponry of the 1990s. The overwhelming victory in the Gulf War could not have been achieved without those investments. But, the U.S. cannot afford to become complacent in believing that today's weapons will suffice tomorrow. The technological revolution is upon us—technology is changing so quickly that we must continue to invest in R&D so that on the 21st century battlefield we are not fighting a technologically superior enemy.

Within the Senate and House of Representatives, numerous oversight committees impact directly and indirectly on the DOD budget. These include: the Authorization Committees of the Senate Armed Services Committee (SASC) and the House National Security Committee (HNSC); the Appropriations Committees of the Senate (SAC), which incorporates the Defense and the Military Construction Subcommittees, and the House (HAC), which has the National Security and the Military Construction Subcommittees; the Budget Committees of the Senate (SBC) and the House Budget Committee (HBC); the Intelligence Committees of the Senate Select Committee on Intelligence (SSCI) and the House Permanent Select Committee on Intelligence (HPSCI); and the Foreign Relations Committees of the Senate Foreign Relations Committee (SFRC) and the House International Relations Committee (HIRC) (See Figure 1). Of these committees, the major Defense Oversight Committees that have direct impact on DOD R&D investments are the SASC and the HNSC, which authorize service programs, and the SAC and HAC which allocate funds for those programs.

Together, there are approximately 96 congressional members that have seats on the Defense oversight subcommittees directly influencing DOD and Army R&D funding. These members must balance the needs of the country, various departments', agencies', and Services' requirements, to include fellow congressional members, and constituent home and district interests to provide for the "common defense." In dealing with congressional members, it is instructive to remember, that you are working with two facets of Congress. One is the duly-elected representative who is elected by the people of his/her state or

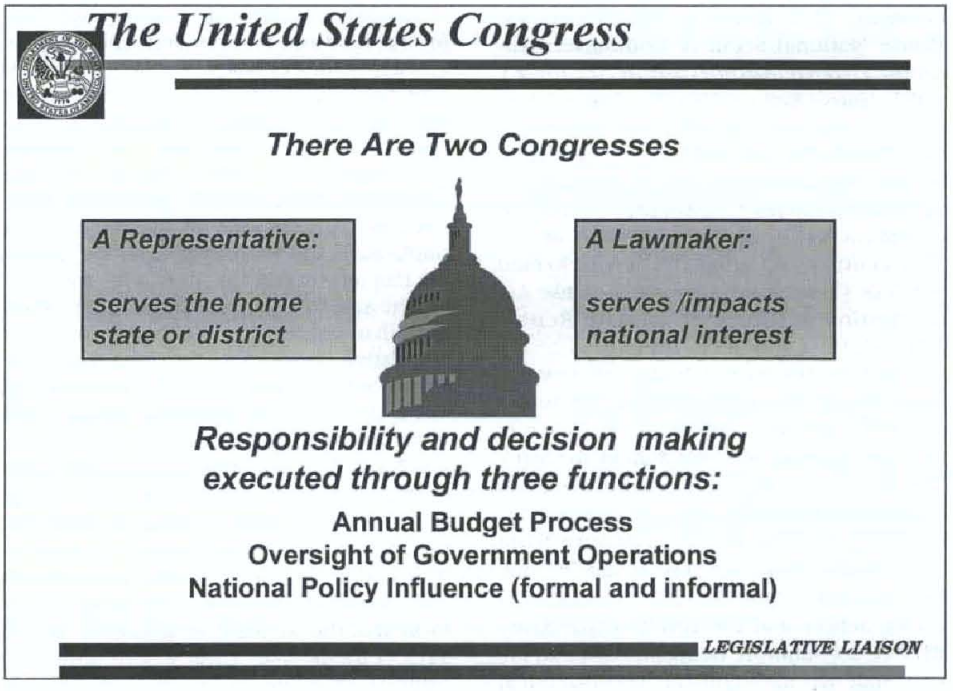

Figure 2.

district, and the other is the same member who is expected to serve the national interest of the country as a whole—the legislator (Figure 2). When dealing with members, it is also essential that the Army, to include the acquisition and R&D community, speak with one voice. Army personnel interfacing with Congress must be thoroughly knowledgeable on their systems, be able to clearly articulate the strategies and requirements that drive their particular systems, and they must understand the congressional process and players in order to garner the resources required by their program.

Where We Are Today

At the time of this writing, the House and Senate conferees have reached an agreement on the conference report for the FY97 Defense Authorization Bill. The HNSC Committee Chairman, Rep. Floyd Spence (R-SC), issued a statement that stated the conferees "... produced a conference report that continues our commitment to revitalizing our national defenses ... it once again makes great strides in addressing many of the serious problems plaguing the modernization program to ensure that our troops of tomorrow maintain the technological edge they enjoy on the battlefield today." The HNSC further stated, "The committee believes that maintaining American military supremacy is a key to the United States standing as the world's sole super power. The military's supremacy rests on the technological edge U.S. soldiers, sailors, airmen, and Marines enjoy in any battlefield, and the innovative ways which they employ advanced technologies." (U.S. House of Representatives, House National Security Committee, *National Defense Authorization Act for FY 1997, House Report 104-563,* 7 May 1996, p. 16.) The SASC, in turn, has stated that they must, "ensure that emerging operational concepts result in adequately leveraged technologies to guarantee battlefield dominance through the first half of the 21st century." (U.S. Senate, Senate Armed Services Committee, National Defense Authorization Act for FY97, Senate Report 104-267, 13 May 1996, p. 109.)

The total president's budget request for Army RDT&E is $4,321 million. The authorization conferees authorized $4,781 million, an increase of $460 million for Army RDT&E alone. When the appropriations conferees meet, the range of increase for Army RDT&E could be anywhere from $554 million from the HAC to a $787 million increase from the SAC. Congress is taking action, and the result is that Army RDT&E accounts are being increased to ensure that we maintain our technological edge in the future.

Outlook

Developing the concepts of Joint Vision 2010 and Army XXI are just the beginnings to ensure that America's Army is, "trained and ready, serving the nation at home and abroad, a strategic force, capable of decisive victory ... into the 21st Century." We must now be able to sell those concepts and work with the Congress of the United States and the Defense oversight committees, in order to garner the resources necessary to fulfill our vision.

American society is now highly technological, and is becoming more so every day, especially in the area of information management. We farm, cook, communicate, manufacture, travel, clothe, entertain, educate, research, manage, cure and kill by highly technological means. Congress must take into account the interdependence of all facets of society on technology as it makes resourcing decisions in the future. Technological advance is seen as critical to economic growth, standard of living and national security. The U.S. has limited resources and has a mixture of free enterprise and government control; both the civilian and governmental sectors must optimize their efforts in science and technology. Cooperation between the government and private concerns is now essential for setting goals, priorities, and strategies.

There is less spin-off today from Defense-oriented R&D to the civilian sector than there was in the 1950s. In fact, U.S. military R&D now substantially depends on civilian technology especially in the area of computing technology. The trends now will be away from Defense-unique R&D investments. Congress is pursuing greater international cooperative programs, dual-use technology programs, and manufacturing technology programs in an attempt to cross-level federal and civil research efforts in the U.S. and with our allies. The way ahead for Congress is going to be a difficult one as it fights to maintain R&D investment and a vision for a better tomorrow. The military must work closely with Congress and other federal agencies as well as prepare R&D budgets to ensure that what is funded is not duplicative and is truly focused on providing that advanced capability in the future.

The Army legislative team is here to assist with that mission. The Office of the Chief of Legislative Liaison (OCLL) can facilitate the interface with Capitol Hill by assisting with visits, providing information, helping with hearings, and the confirmation process. OCLL can help the Army and the R&D community ensure that modernization of our armed forces and the technology efforts to ensure our capabilities remain unmatched now and in the future. DOD and Congress have an enormous task; both must be informed of the strategic environment and desires of the people. Clearly, both must continue to dialogue and work with one another. OCLL is here to do just that.

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DOD PERSPECTIVE ON STRATEGIC INVESTMENT FOR THE FUTURE

By George R. Schneiter

Introduction

We can all be proud today that the United States has the best-led, trained, and equipped military force in the world. Since World War II, fielding technologically superior forces has been the cornerstone of our national military strategy. This advantage has allowed our forces to deter, and when deterrence failed, prevail, often over numerically larger enemy forces.

Our predecessors invested wisely in technology in the 1960s and 1970s. This contributed to the overwhelming, swift, decisive victory in Desert Storm and to continuing deterrence of potential adversaries. Today, our planning must cope with increased uncertainty, since we are far less certain about who our future adversaries will be—or what technology we will face in their arsenals.

Meanwhile, however, the continuing downward pressure on budgets means we must make the best strategic use of our investment resources. On the procurement side, we are still in the midst of a "pause" for most major end items. By comparison, R&D levels have fared better, but must be carefully directed at strategic goals.

In aggregate terms, commercial industry passed the DOD in R&D spending in 1965. The disparity between DOD and commercial sector investment in R&D has been growing wider ever since. This difference means that this nation's technological momentum is driven to a greater extent by commercial market forces.

As a result, we are witnessing breathtaking changes—driven by commercial markets—in the industrial base supporting our weapon systems and new military capabilities. Nowhere is this more evident than in the U.S. semiconductor industry. The great majority of U.S. semiconductor production is being driven by the rapidly-expanding range of commercial data processing and telecommunications applications.

As a current example, in Bosnia we are spending about $80 million on an information-communications initiative to provide improved command control and communications (C^3) to Operation Joint Endeavor. The initiative is improving our capabilities in two ways: first, using commercial-TV satellite technology to provide a direct-broadcast communications capability; and second, by fielding a wide bandwidth, secure "tactical internet" through fiber and commercial business satellite transponders to allow for distributed collaborative planning among deployed Command and Control (C^2) nodes. In this way, we're giving local commanders a 5,000-mile remote control of the programming they receive through 24 megabit-per-second satellite downlinks.

What this means to our forces is that everyone with a 20-inch receive antenna, cryptologic equipment, and authentication will have access to the same data, at the same time. But, more important, the fielding of this capability will allow us to install and utilize, for this operation, some of the more advanced command, control, communications, computers, and intelligence (C^4I) capabilities being developed by the government and industry today for use in the Global Command and Control System.

The important messages behind this major thrust are that: (1) we're pushing hard to make advanced information capabilities available to our forces; (2) we're demonstrating our willingness to use—even to lease—commercially developed systems; and (3) we've identified the need for system engineering and system integration skills to arrange multiple application layers for tailoring information systems to Defense needs. Although semiconductor-driven C^3 applications like this are the most prevalent current examples, we want the DOD to apply similar principles across all technology areas with a focused *dual-use strategy.*

DUAL-USE STRATEGY

In today's global economy, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base. A military advantage will go to the nation which has the best cycle time to capture technologies that are commercially available; incorporate them into weapon systems; and field new operational capabilities.

In this environment, we have no choice but to move from separate industrial sectors for Defense and commercial products to an integrated national industrial base. Capitalizing on commercial technological advances to create military advantage is critical to ensuring that our equipment remains affordable and the most advanced in the world.

DOD's dual-use strategy remains one key to ensuring our military forces will have affordable access to the world's best technology. It consists of three pillars. The first pillar is to use the commercial sector's base of research and technology to provide militarily useful technology. The second involves taking advantage of the commercial sector's low-cost production capabilities by manufacturing commercial and military items on the same production lines. And the third pillar requires creating the incentives and management approaches inside the DOD necessary to facilitate using these dual-use, "dual-produced" items in military equipment.

In today's global economy, everyone, including our potential adversaries, will gain increasing access to the same commercial technology base.

Dual-Use Applications Program

The FY 1997 president's budget contains $250 million to begin the Dual-Use Applications Program (DUAP), a joint program conducted by the three military departments, Director for Defense Research and Engineering (DDR&E), and the Defense Advanced Research Projects Agency (DARPA). The DUAP will introduce dual-use R&D approaches into the military Services as a new norm by developing dual-use technologies for the direct benefit of military users.

Building on lessons from our past experience in this area, the DUAP will embed this new way of doing business throughout the military Services by building a cadre of people who understand and accept it through real experience. The Service Acquisition Executives are committed to using DUAP to apply technology they need and to make use of dual-use R&D more effectively in their departments.

DUAP funds will create an opportunity for Service program managers to fund new technology through a dual-use approach. R&D projects will be solicited as government/industry partnerships, selected to meet Service needs, and managed by the Services using new authorities and methods. Each project will include, up front, a clear path for the technology to be used in a military system.

As a joint program, the DUAP will be a unique forum for all the Services to simultaneously refine and share what they learn about dual-use R&D while working on technologies of joint interest. Without shared, joint learning in the right environment, our progress in making dual use a new norm will be much, much slower. Think of the DUAP as the joint dual-use battlelab.

At this point, I note my agreement with certain findings of the Potomac Institute's Military and Industry Panel Dual-Use Research Project under the leadership of General Al Gray. I agree with the project's conclusions concerning the importance of a dual-use strategy and that dual-use technology can make major improvements in warfighting capabilities and the affordability of military systems. I also agree with the observation that we have made important progress, and that we must now better institutionalize our dual-use strategy with the military Services.

Commercial Technology Insertion Program

To begin this process, the Commercial Technology Insertion Program (CTIP), being initiated in FY 1997 at a level of $50 million, will accelerate the insertion of commercia technologies into Defense systems by work ing with the Services to identify opportun ties and to provide the funds necessary t overcome barriers to insertion. Funds wi be used to qualify commercial technolog for Defense systems; to adapt commercia technologies to meet military needs; or t modify military systems to accept a com mercial technology.

An ongoing success story, the insertion o Active Matrix Liquid Crystal Displays (AMI CDs) into weapon system cockpits, is bein used as a model for the CTIP. This project i being funded by Title III of the Defense Pro duction Act and is providing funds to pro gram offices to qualify and/or accelerate th purchase of AMLCDs into weapon systems.

Seven AMLCD insertion efforts are under way. One of these efforts is the Army's AH 64D Longbow Apache Helicopter Upgrade Program. The Apache Program Office wanted to incorporate AMLCDs into the Longbow, but lacked the funds to qualify them and was planning to use cathode-ray tubes. The insertion program is providing the funds for qualification, allowing AMLCD technology to be incorporated into the Longbow with no schedule slippage and at a comparable acquisition cost. The results will be four new color displays per aircraft. These displays will be smaller, lighter, and more reliable and capable than the previously planned equipment. Project selection will consider the effect on life cycle costs and performance; potential effects on other Defense systems; and the Service's commitment to provide downstream acquisition funding.

ACQUISITION REFORM

One of the principal objectives of our acquisition reform program is to open the Defense market to commercial companies and technology—not only the primes, but subtier suppliers as well.

Military Specifications Reform

We have effectively turned our procurement system on its head with respect to military specifications and standards. A program manager in the past had to get a waiver in order to use commercial and performance standards. Now the reverse is true. If a program manager wants to use military specifications, he now has to get a waiver to justify the extra cost entailed in military specifications.

We have reviewed all of our 30,000 specifications and standards, and so far eliminated about 2,600 of them. Note that the policy objective is not one of complete

elimination—military specifications will continue to be used in some cases, such as to define interfaces and ensure safety. In those cases, however, we will ensure that the specifications remain current and take current technology into account.

Single Process Initiative

The DOD's Single Process Initiative is significant in that it is aimed at changing existing contracts to address a very real problem in many of our contractors' facilities—the requirements that impose different processes to manufacture similar product lines.

For example, in just one factory, a Defense contractor was forced to use eight different soldering specifications—five for the government and three for commercial clients purchasing similar types of products. This meant the workers had to be trained on all eight soldering and inspection techniques. It also meant that the contractor had to maintain eight different types of production documentation. This cost him more. In turn, he passed those costs on to us. That is fair, but it is expensive—for the DOD and for the taxpayer.

With this Single Process Initiative—starting on existing contracts—we will reduce the number of processes used. This will save dollars, give us a better product, and improve industrial competitiveness.

Industry has enthusiastically embraced the initiative. The Defense Contract Management Command has received proposals from 30 contractors for 156 process changes. Of these proposals, 99 have been accepted, 43 are technically acceptable, and only one has been found to be unacceptable. Thirty-two processes have been modified. And, implementation has been timely—the average number of days for issuance of the contract modification after acceptance of the proposal has been 59 days. Changes have been proposed most frequently in:

- Processes for ensuring quality;
- Electrostatic protection processes; and
- Configuration control systems.

ARMAMENTS COOPERATION

The convergence of two trends—increasing likelihood of committing forces to coalition operations and reduced Defense budgets—make the case for greater armaments cooperation with friends and allies.

Deploying forces in coalition operations with the forces of other countries places a high premium on interoperability—ensuring that U.S. and allied systems are compatible and can be sustained with common logistics support.

The heightened emphasis on coalition operations, to include operations other than war, is especially important because it comes during a period of declining Defense budgets not only in the United States, but on the other side of the Atlantic and Pacific as well. In this environment, it is clear that we will need the technology and industrial base of all our nations to modernize the equipment of our Defense forces at an affordable cost.

We need to avoid the inclination to duplicate each other's capabilities. Instead, we need to think in terms of building on developed capability where possible. To do this, we need to harmonize requirements from the start and increase the incentives for teaming of our industry—including removing the barriers to international teaming and barriers to commercial industry. We need to start doing this in the initial stages for our programs.

As discussed earlier, the DOD has taken a number of unilateral actions to reform our acquisition system and make better use of the commercial industrial base. These actions also have increased the opportunity for international armaments cooperation. Here are two examples of military specification reform.

The first is the adoption of the ISO-9000 series of standards as an alternative for MIL-Q-9858. This change makes it easier for international businesses to compete on our contracts—we now accept the use of an international quality standard instead of demanding the use of a U.S. military-unique standard.

The second example is the adoption of the ISO 10012-1 calibration standard as an alternative for MIL-STD-45662A. Again, this change makes it easier for foreign-based businesses to compete for our contracts.

Summary

We are in the process of making the most revolutionary changes in the Defense acquisition system in the past 50 years. By pursuing a dual-use strategy, acquisition reform, the Single Process Initiative, international armaments cooperation and commercial-off-the-shelf components, the Department of Defense is strongly committed to a national industrial base integrated internally, as well as with that of our allies and reliable friends. The true measure of our success will be the implementation of these initiatives in the field—not just policy pronouncements in Washington.

We already see wide-ranging effects of these investments in all mission areas: For example, a major supplier of heavy tactical trucks to the Army and Marine Corps has been able, by combining the new reform initiatives with innovative management views and a cooperative relationship with the DOD, to fully integrate his production of military vehicles with a remarkably diverse range of commercial production.

Capitalizing on commercial technological advances to create military advantage is critical to ensuring that our equipment remains affordable and the most advanced in the world.

The Army's Force XXI anticipates capitalizing on commercial technologies to proliferate the "appliqué" computer capability throughout the tactical force—as well as using commercial examples as models for developing the multi-level basic architectures. And, the Services' efforts which look toward battlefields even further into the 21st century—such as the "Army After Next," and the Marine Corps' "Sea Dragon"—foresee land combat based even more on situational understanding and connectivity which are enabled by advances in the commercial technology base.

We've made an excellent start in moving the Defense acquisition system in a new direction—one that secures the Department's long-term modernization strategy, meets the national security needs of the nation, and preserves a legacy of technological superiority for U.S. forces in the 21st century.

DR. GEORGE R. SCHNEITER is the Director, Strategic and Tactical Systems in the Office of the Under Secretary of Defense (Acquisition and Technology). He holds Ph.D., M.S. and B.S. degrees, all in mechanical engineering, from Purdue University.

ARMY RESEARCH AND DEVELOPMENT

An Industry Perspective

By Frank Kendall
Vice President, Engineering
Raytheon Company

My view of the Department of Defense's and the Army's research and development (R&D) program is influenced by two previous careers before I joined industry. As a soldier, I served on the Cold War front line in Germany using equipment designed and produced by my current firm, Raytheon Company. As an Army civilian engineer and executive in the Secretary of Defense's Office, I worked with industry extensively. Trying to manage the Defense drawdown from the Pentagon was difficult, but the impact within industry is more direct, severe, and, for me now, more personal. During the last two years, I have been involved with Raytheon's successful strategy of growing our non-Defense businesses while maintaining a leadership position in Defense. The latter effort has been accomplished through a focused and, at times, painful process of consolidation, acquisition, aggressive cost cutting, and adoption of a number of initiatives, including leadership in the acquisition reform process.

Industry has, in fact, borne the brunt of the Defense drawdown. The procurement account reduction of roughly 70 percent in the last several years has impacted all DOD contractors, including Raytheon. We've maintained, and even grown our aerospace and Defense sales partially through acquisitions, but some sectors, such as missile sales, have contracted, forcing layoffs and plant closings. There has never been a more intensely competitive period for the Defense industry. With limited growth opportunities and very few new starts in Defense, Raytheon and other companies are competing fiercely. After two years in this environment, years during which I've experienced first-hand Defense consolidations and plant closings, a major acquisition, tough labor negotiations, and difficult independent research and development (IR&D) investment decisions, I'm prepared to offer some observations and suggestions about the course we seem to be on.

As a nation, we are irrevocably committed to a military strategy that depends on technological superiority. Historically, this is a relatively recent development arising out of the World War II experience. This strategy leverages our strengths as the largest industrialized power and is consistent with a long standing desire to spend resources other than human lives to achieve military victory.

In today's context, research and development is our best hedge against an uncertain future, and technological superiority is one of our most important deterrents. Clearly, in a time of reduced risk, research and development should enjoy a high priority. It is encouraging for industry that this has been the case thus far. The research and development infrastructure is the most perishable part of our industrial base and the most difficult and time-consuming to replace. Laboratories, equipment, and test ranges are certainly perishable, but it is the decades of experience, innovation, and hard work by dedicated scientists and engineers that is virtually impossible to recapture. With the complexity of modern weapons, we cannot expect to field new leading edge weapons systems without

years of development, even if we assume the expertise is in place to start with.

Sustaining R&D in the absence of adequate procurement funding has paid off before. It was no coincidence that virtually every weapon system fielded during World War II was in development prior to the start of the war. We can train Service people, and we can gear up for production by extraordinary financial and physical efforts, but the iterative design and test process necessary for development simply takes time if reliable state-of-the-art systems are required.

Without continued investment in unique military R&D, our strategy of reliance on technological superiority could change by default. Increased reliance on Commercial Off The Shelf (COTS) and Non-Developmental Items (NDI) is no panacea. Raytheon and other Defense contractors are aggressively using COTS and NDI. The fact is, however, that many military needs cannot be met by commercial products or even components designed for commercial environments. There are firm military needs to operate in environmental extremes and under rugged conditions. More importantly, commercial technologies are available to anyone. If the United States intends to maintain technological superiority, we must seek performance beyond that available at Radio Shack. In the current austere environment, it is imperative, however, that we focus on the highest payoff areas for research and development. The impression from industry is that DOD is doing exactly that. Surveillance systems and information technology applications, precision munitions, and greater stand-off attack capabilities offer very high payoff (despite the Government Accounting Office's recent assertions to the contrary).

While we in industry applaud the efforts

As a nation, we are irrevocably committed to a military strategy that depends on technological superiority.

Table 1.
Federal Obligations for Development by Agencies in DOD: Fiscal Years 1994 to 1996.

Agencies	FY 1994 Actual	FY 1995 Estimate (Millions of current dollars)	FY 1996 Estimate	Percentage Change FY 1995 - FY 1996
Total DoD				
Basic Research	1,222	1,282	1,196	(6.7)
Applied Research	3,040	3,169	2,949	(6.9)
Development*	30,304	30,973	29,561	(4.6)
Advanced Tech	4,461	4,496	3,725	(17.1)
Major Systems	25,812	26,451	26,811	(2.4)
Army				
Development	4,721	4,693	3,864	(17.7)
Advanced Tech	1,187	1,087	578	(46.8)
Major Systems	3,514	3,584	3,262	(9.0)
Navy				
Development	8,082	8,323	7,539	(9.4)
Advanced Tech	412	592	502	(15.2)
Major Systems	7,670	7,731	7,037	(9.0)
Air Force				
Development	11,713	11,871	12,369	4.2
Advanced Tech	448	456	495	8.6
Major Systems	11,265	11,415	11,874	4.0
Total Defense Agencies				
Development	5,544	5,839	5,514	(5.6)
Advanced Tech	2,414	2,360	2,150	(8.9)
Major Systems	3,120	3,475	3,362	(3.3)

*DoD development does not equal the sum of the advanced technology and major systems detail because some DoD agencies could not break down development into these two categories.

SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1994, 1995, and 1996

In today's context, research and development is our best hedge against an uncertain future, and technological superiority is one of our most important deterrents.

to uphold research and development spending, we see risk for the future and some disturbing trends. The long-promised increase in procurement funding continues to be deferred year by year. While a $60 billion procurement account for DOD sounds attractive, the plan to use research and development as a major source of funds to reach that level is particularly disturbing.

Research and development is essentially a fixed cost, as compared to procurement, which is variable with quantity. What drives research and development is the number of different systems (or in the commercial analogy the number of products) needed for the forces to operate. This number has grown historically, but is relatively stable. By getting the F-22, V-22, and Comanche, for example, out of research and development and into procurement, DOD would seem to have the opportunity to free up some resources for re-allocation. Over the long haul, however, research and development needs to remain relatively stable to support the DOD and the Army's total "product line." The industry model, including Raytheon's, is generally structured consistent with sustaining a product line as technology evolves and is a relatively fixed cost. This is driven by product life cycle in the marketplace.

Within the Army's RDA account, funds are decreasing disproportionately. The *1996-1997 Army Green Book* indicates that RDT&E funding for the Army dropped about 20 percent in 1996, and will continue to drop in 1997. The National Science Foundation, in an assessment of federal research and development in general, noted that within the Army's development programs (as opposed to research) advanced technology funding, (which does not include system development), fell by 47 percent in 1996 from $1 billion to $0.6 billion (see Table). This is fully half of the total DOD's reduction in this area and very large compared to the other Services' reductions. Just as the procurement reductions of the past several years cannot be sustained indefinitely, neither can this level of reduction in advanced technology be sustained if we wish to maintain a technologically superior industrial base for future weapons systems.

My jaundiced reaction to the shift of research and development resources to procurement is that now the potential to reduce research and development has been put on the table we can all count on those funds coming out of the research and development account. Whether they will migrate to procurement is another matter, given operational and non-Defense demands. My biggest concern is that we will reduce R&D

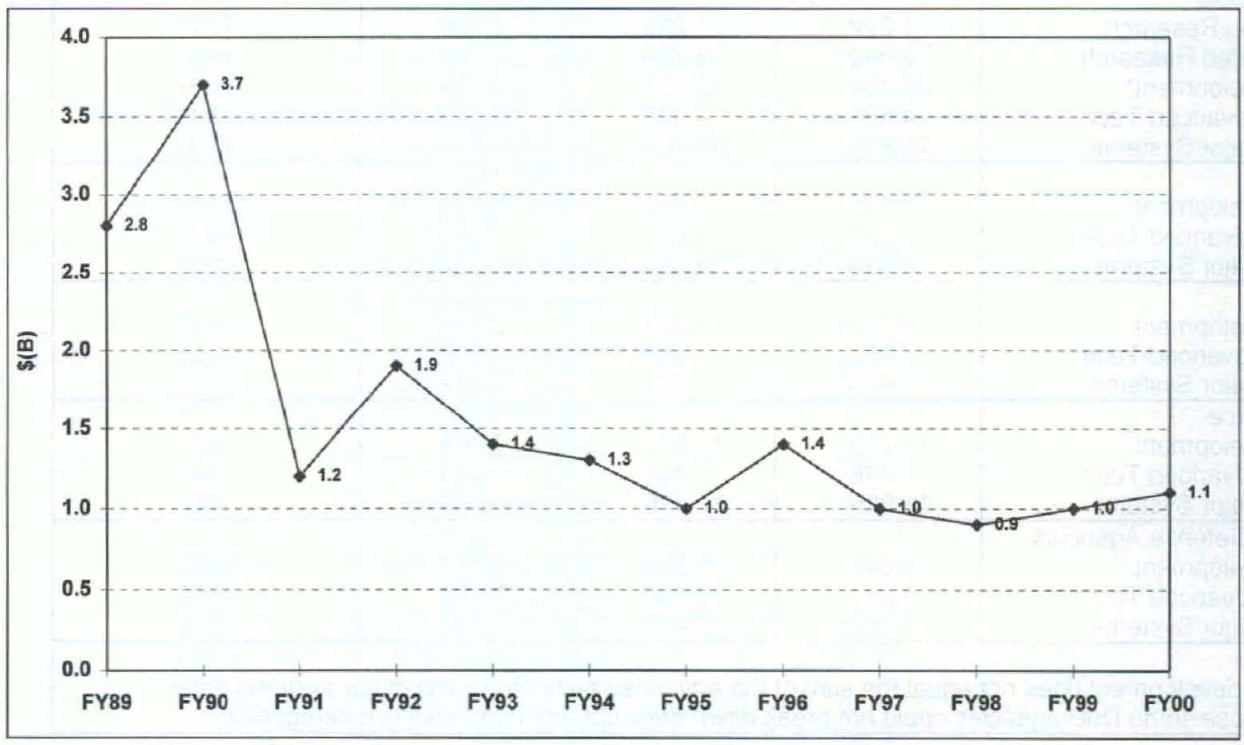

Figure 1.
Army Aircraft Procurement.

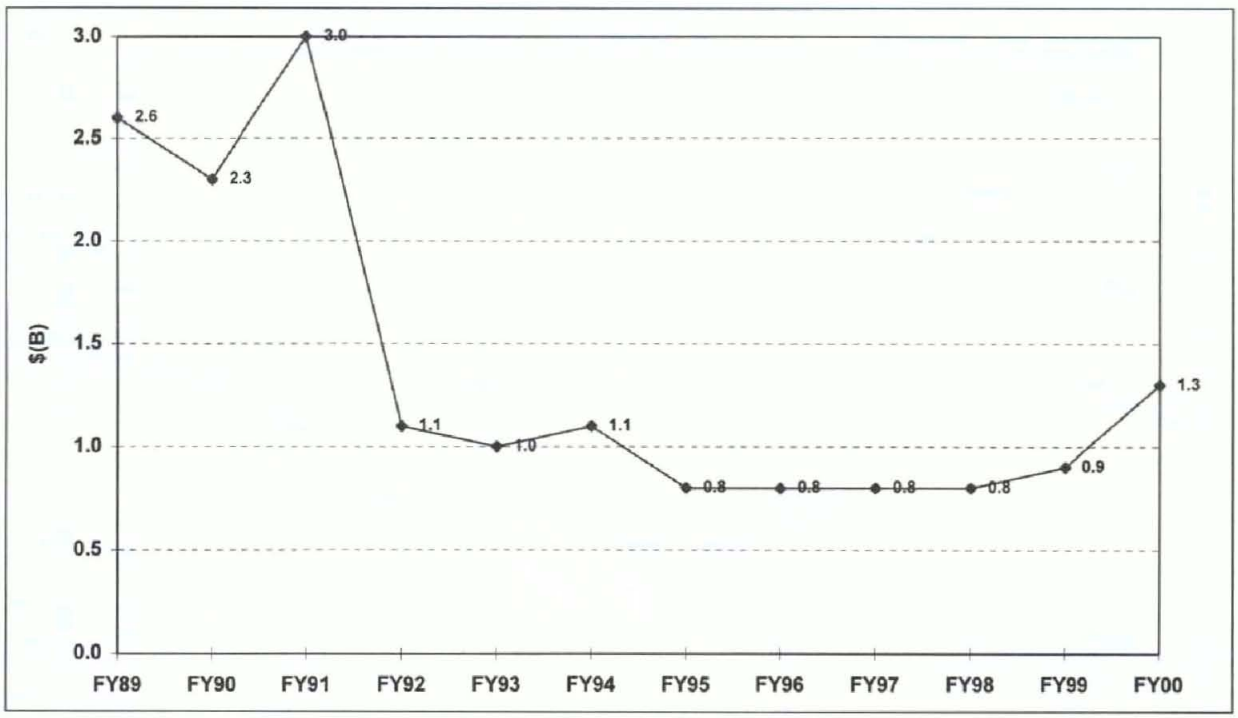

Figure 2.
Army Missiles Procurement.

funds without increasing procurement.

The need for increased procurement spending is glaringly obvious and has been for several years. Figures 1 through 3 indicate the rates of procurement in end items for key Army systems. The industry perspective is that this situation must change in the long run. Industry doesn't know how soon the change will come, but we are aware John Maynard Keynes depressing and well known maxim, "in the long run we're all dead" could also apply to our businesses. From the point of view of a Defense contractor who fully intends to be around in the long run, let me share some observations about industry which may be obvious to Army acquisition professionals, but which are more compelling first hand.

Profits are not optional for us. If we're not profitable, stockholders don't invest in us and banks don't lend us money. In short, we go out of business. Growth is not optional either. Investors buy stocks in companies because they expect a better return than on less risky instruments. Therefore, we can't sit idly during a dramatic market change like the Defense drawdown. I've heard Secretary of Defense Perry describe the Defense sector as being in a "depression." In pure economic terms he's correct. There are fewer Defense companies today scrambling for fewer Defense dollars. We have all trimmed costs aggressively. In one of the areas I oversee, Independent and Research and Development funds, Raytheon has tried hard to sustain a reasonable level of investment but the pressures have been intense.

In today's austere environment we are often asked to absorb development costs by providing "NDI" demonstrations to support competitive procurements. This isn't an appropriate approach for Defense products because government is essentially the only customer for these products. In Raytheon's commercial businesses we directly expense all of our research and development. Consider, for example, a commercial business jet, which is a major research and development investment for Raytheon Aircraft Company. We can predict aircraft sales fairly well. Even if we miss our projections there are many potential customers making individual decisions and we can still hopefully obtain a reasonable rate of return or recover our investment. For Defense products, this isn't the case. If we finance development of a Defense product and are not selected, the investment is a total loss. This is the reason the government pays for its research and development. The risk to industry is too high otherwise. Under the pressure of budget reductions, DOD and, in some cases, the Army sometimes "encourages" company investment to support specific programs. While our IR&D investments are always consistent with existing policy, this trend leads to duplicate investments across industry and wastes resources overall. Asking industry to fund R&D which the DOD cannot afford is inappropriate and counter-productive, even if it allows isolated programs to move forward.

Like all companies, Raytheon invests in areas where we expect a good return. For us, this certainly includes technology we believe will be attractive to the Army. In the current environment, there is strong internal pressure to make Defense-related IR&D investments in projects with near-term payoff. At the same time, we do our best to maintain a leadership position in core technologies including enabling technology in microwave and millimeter wave integrated circuits, seekers, signal processors and image processing to name a few. While we welcome cooperative projects we still have to evaluate them based on their future profit potential.

From my relatively new perspective in industry, I'd like to conclude by offering some suggestions to my friends and colleagues in the Army Acquisition Corps and the Army leadership:

• ***Carefully assess the balance between near- and longer-term investments.*** The change in administrations, regardless of the election outcome, is an opportunity to do so. The need to increase

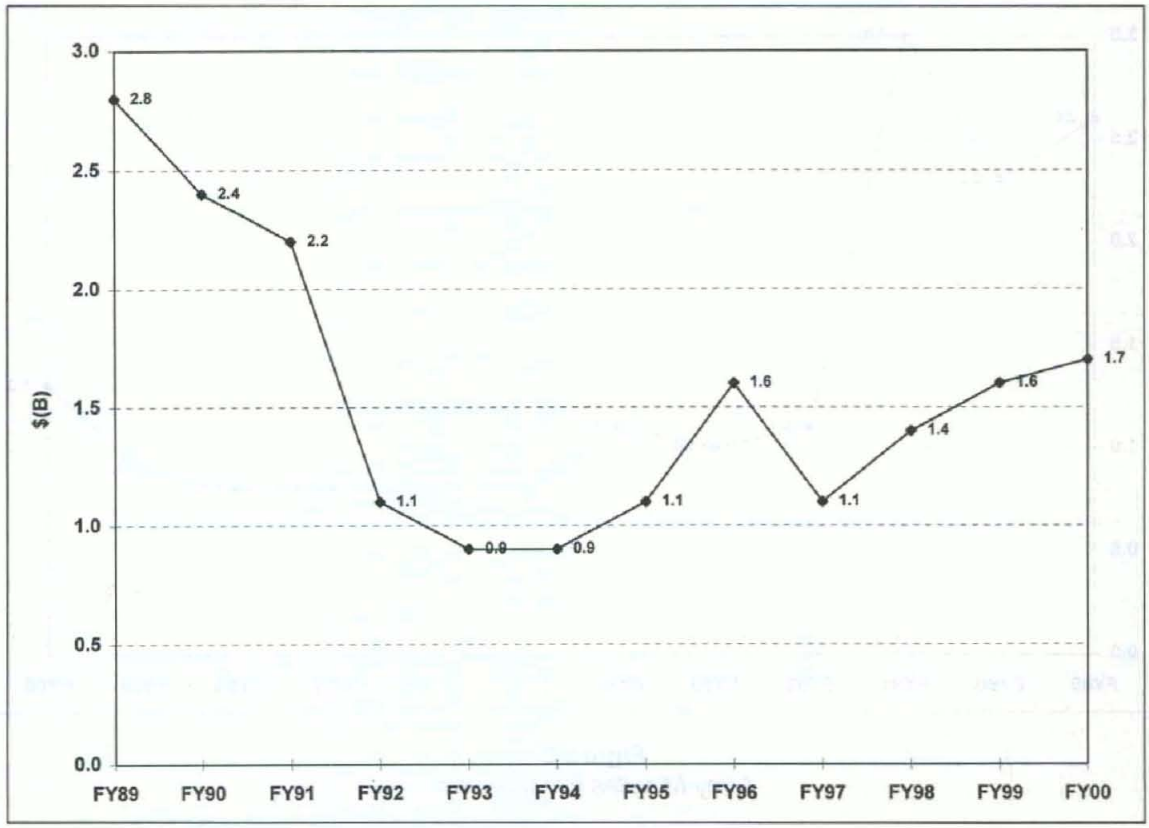

Figure 3.
Army Weapons and Tracked Combat Vehicles Procurement.

procurement is very real, but so is the need to sustain advanced development spending.

• ***Nothing works like competition to control both costs and prices.*** Present circumstances often force sole source situations, however. Future competition should remain an option and a competitive vendor base should always be sustained (material is about 70 percent by cost of most systems).

• ***Continue the acquisition reform initiative.*** Real progress is being made, but there is still much to be done. Within this context, avoid the suboptimization that results from asking industry to carry the financial burden and risk of under-funded programs. Acquisition reform is producing great results, but the concept can be abused.

• ***Recognize the uniqueness of the Defense market and tailor acquisition strategies to it.*** Defense is not an open market. It is a monopsony with a limited number of firms competing to sell to one customer.

• ***Continue the "experimental" approach through Advanced Technology Demonstrators, Advanced Concept Technology Demonstrators, Battle Laboratories, Louisiana Maneuvers and so on.*** These activities pull technology forward and provide for operational innovation at the same time. Both prepare us for an uncertain future. Simulation is a tool we have just begun to explore for this purpose and we should expand its use.

• ***Embrace COTS where it makes sense, but don't overdo it.*** Being "commercial" doesn't imply operational superiority. Military technological superiority isn't free.

• ***Finally, and most of all, trust us more.*** All good business relationships are built on trust. The infrequent but overblown procurement scandals have made it much harder and more expensive to do business together. Nothing hurts more than a revolving door policy that makes it almost impossible for industry and government people to get to know one another's worlds. Raytheon has over 70,000 employees. Our ethical standards are clear and unequivocal but I can't vouch for every one of our employees' character. I can, however, assure you of our standards and how we deal with those who don't meet them. Absent changes in the revolving door legislation, use of other vehicles, such as training with industry, and exchange programs, should be increased. I've found that people in industry are just as dedicated, hard-working, committed to excellence, ethical, and patriotic as people in government. Why should it be any other way? We are all Americans.

FRANK KENDALL is currently Vice President, Engineering of Raytheon Company. Prior to holding this position, he was Director of Tactical Warfare Programs in the Office of the Undersecretary of Defense (Acquisition and Technology). He is a lieutenant colonel in the active Army Reserves and a member of the Army Acquisition Corps.

ARMY RESEARCH CONSORTIA: CONCEPT FOR 'OTHER TRANSACTION' ASSISTANCE AGREEMENTS

By Dr. Gerald J. Iafrate,
Mark H. Rutter,
and Roger K. Cannon

Background

The rising threats facing today's Army are far more complex and less predictable than those of the bipolar Cold War era. The challenges are pervasive, including major military crises, humanitarian peacekeeping, and domestic disaster relief; and yet, the Army force structure is approaching its smallest number since 1939. As the challenges grow while force structure declines, the U.S. Army force multiplication strategy is essential for maintaining its warfighting edge.

To enhance land warfare capabilities, major force multiplication is attainable only through novel and innovative science and technology concepts and applications. Yet, today, there is strong pressure to shift resources away from Defense science and technology (S&T) and modernization programs to other Defense priorities. The Army technology base challenge is to generate S&T for building a CONUS-based, power projection Army consistent with resource constraints and changing operational dynamics.

The Concept

The U.S. Army Research Office (ARO) is proposing a new initiative. It is an ARO-managed, industrially funded, Army Research Consortium (ARC) designed to meet the challenge of generating S&T in a constrained budgetary environment. In concept, consortia will be formed in several key thematic research areas which are both conducive to industrial investment and prominent in their relevance to the long-range U.S. Army mission and underlying battlefield capabilities. Additionally, an open topic will be reserved to allow industry to propose research in one or more areas which are not specifically identified. Special emphasis will target independent research and development (IR&D) companies where dual commercial and military venue are prevalent and where IR&D dollars may be a viable source of industrial funding.

The amount of industrial funding is projected to be between $500K and $1,000K per industrial partner over the total period of performance. The initial performance period for a given consortium will be a maximum of three years with a two-year extension option.

Methodology

Thematic ARCs (see figure on pages 16 and 17) will be formed and managed by ARO. The ARC assistance agreement will be an "other transaction" as authorized by 10 U.S.C. 2371. Thematic ARCs will be developed in the following phases:

- **Phase One:** Issue public announcements soliciting industrial members to join the consortia on a cost-contributing basis.
- **Phase Two:** Negotiate "other transaction" terms and conditions with the industrial members, including intellectual property provisions and criteria for soliciting and selecting university research partners to the consortium.
- **Phase Three:** Devise methods to receive and deposit the funds from the industrial members into a specially created account per 10 U.S.S. 2371.
- **Phase Four:** Publish Broad Agency Announcements requesting research proposals from universities. ARO will receive and log proposals that will be evaluated by a Source Selection Evaluation Board of ARO, Army, and industrial consortium members. Finally, the best research proposals will be selected and university winners will negotiate to join the established "other transaction" consortium with Army and industrial partners.
- **Phase Five:** Administer and evaluate consoritum research programs funded from the 10 U.S.C. 2371 based account by an ARC-formed Executive Advisory Board comprising ARO, Army, and industrial partners. The proposed ARCs cannot be accomplished by conventional contract, grant, or cooperative agreements; these instruments do not have the flexibility necessary to allow the ARC partners to be joined in the same agreement at the discrete phases described above. Additionally, the "other transaction" format establishes statutory funding accounts and the negotiation of unique intellectual property provisions which are not available in a conventional contract or assistance agreement.

Benefits

The ARCs provide major advantages to all consortia members. The industrial partners are the major cost providers. For their investment they receive scientific and technological opportunities generated by top flight universities in thematic areas central to their future business areas. Their investment offsets their need to build major in-house infrastructure to generate and transfer research opportunities and products in the designated topical areas. Army laboratories and the Research, Development and Engineering Centers (RDECs) derive an opportunity to leverage research products to enhance battlefield capabilities within their purview at a minimal or indiscernible cost. In-house labs and RDECs may also provide funding where desirable or appropriate. ARO profits by providing research expertise to develop themes, to guide the selection of

ARMY RESEARCH CONSORTIA THEMES

High Quality Color Graphics and Images Renditions--Physics Division

Current Problem	*Future Research*
Achieving accurate, color graphic and image renditions are difficult but are critically important for Army implementation of the digital battlefield and specifically for the electronic transmission of maps and battlefield information.	Research must focus on issues associated with: machine dependent calibration; the stability of colored inks used in printing; the throughput and image quality variability related to compression techniques and algorithms used to render images. Besides the DOD market, there is a larger commercial desk-top publishing, scanning, and printing systems market and the standard photographic market.

Smart Structural Materials Innovative Patterning--Materials Science Division

Current Problem	*Future Research*
The program obective is to develop the next generation of active smart structural systems that intelligently adapt to changing operational environments through mesoscale (1 to 0.001 millimeters) integration of actuators, sensors, and microprocessors at the internal structure level. This will be accomplished through research combining state-of-the-art processing techniques (laser stereo lithography and self-assembly) with fundamental analyses of piezoelectricity and composite materials.	This research program will develop sensors and actuators that are simultaneously sensitive and sufficiently small. They will be readily integrated into microelectronics and micro-mechanical systems. Arrays of such units can potentially be used as building blocks for smart material systems at larger length scales. Commercially, program results could lead to automotive shock absorber development that automatically adjusts to road conditions, airplane wings that adapt to rough weather, industrial precision machining, precision alignment for optical systems, vibration reduction of space platforms, and sensitive hydrophones for monitoring blood pressure in small blood vessels.

Military Hazardous Waste Disposal and Site Remediation Modeling Technologies--Chemical and Biological Sciences Division and Engineering and Environmental Sciences Division

Current Problem	*Future Research*
The U.S. military services, like other large-scale producers of commodities, dispose of large amounts of waste products [explosives, propellants, solvents, fuels, lubricants, other organic compounds (e.g., herbicides), metals and the U.S. chemical weapon inventory]. DOD is committed to an environmental stewardship policy.	This research program is to develop chemical process models and tools to enable DOD program managers to evaluate hazardous waste destruction technologies and site remediation technologies.

top universities to do the research, to manage the ARCs through life cycle, and to work to transfer scientific products to the Army and industrial consortia components. The universities will generate novel research ideas in the chosen topical areas and enhance the supply of graduate students and future technologists in research areas of dual use to industry and the Army.

Descriptors

The sequence of events for forming and consummating an ARC is listed below:

- Establish selection plan and request for DA approval for "other transaction;"
- Receive DA approval to proceed;
- Publish announcement in *Commerce Business Daily* electronic media soliciting industrial members to join the "other transaction" consortium;
- Negotiate "other transaction" terms and conditions with industrial co-funding members to include intellectual property provisions and criteria for soliciting and selecting the university research partners to the "other transaction;"
- Receive funds from industrial members and deposit in specially created account per 10 U.S.C. 2371;
- Publish announcements requesting research proposals from universities, nonprofit research centers, and other interested parties;
- Evaluate research proposals using ARO/Army/industrial "other transaction" members as evaluators;
- Select winning research proposals and negotiate with winners to join the established "other transaction" consortium consisting of Army and industrial members;
- Administer and evaluate research programs performance funded from 10 U.S.C. 2371 account, with oversight from ARO,

Environmentally-Benign Raw Materials Production in Plants for Ballistic Protection and Industrial Processes--Chemical and Biological Sciences Division	
Currrent Problem	*Future Research*
Focused research efforts in the plant biotechnology field are necessary to: improve current techniques or identify novel techniques for plant transformation; engineer bacterial, viral, or fungal enzymes for plant use; discern biochemical pathways involved in useful raw material or proteins production.	This research program objective is to engineer plants with the ability to produce useful raw materials such as plastics and synthetic fibers, and also custom-designed oils and specialty polymers. By using plant bioengineering, plants can now be used as miniature factories to produce raw materials such as polyester-like compounds for clothing, soaps and oils, and biodegradable plastics.

Low Power/Minimum Energy Electronics--Electronics Division	
Current Problem	*Future Research*
Electronic devices/systems that operate under low dc power consumption conditions are becoming more important as mobile and personal systems infiltrate the civilian sector. As well, such electronic and optical systems will be required to establish advanced Army capabilities in communications, information processing, computation, imaging, control, sensing and detection, etc. In addition, many systems will require ultra-high speed capability for handling complex voice, data, and video multimedia signal formats. For envisioned wireless applications, these systems must be portable, functional, versatile, and highly reliable.	To ensure timeliness, conduct research to produce low-power-consumption devices, circuits, and systems that are required for both signal and information processing and radio frequency (RF) applications. For RF circuits, transmitting a specified RF power means that low dc power consumption can only be achieved by high efficiency. Consequently, well-known projected limits of lightweight power sources are necessary to focus research in electronic systems development which will operate with minimum energy and very low dc power dissipation.

Energetic Materials--Research and Technology Integration Office, Chemical and Biological Sciences Division, and Engineering and Environmental Sciences Division	
Current Problem	*Future Research*
The DOD and industries which support the DOD mission depend on continued emphasis on research issues which relate to the synthesis, manufacture, and safe use of novel, more powerful, energetic materials for propulsion and lethality.	Basic research studies of novel, strained-ring, and cage-type compounds containing functional groups, which increase energy output during oxidation or combustion, will lead to improved energetic materials with higher energy yield levels.

Open Topics	
Current Problem	*Future Research*
	Industry may propose topics of interest to them and relevant to the Army's ongoing programs. Open topic selection in an area to form a consortium will be made based on mutual research relevance to the Army and industry and the availability of Army management resources to oversee the consortium.

Army, and industrial team partners; and

- Conduct workshops and symposia during the research program to enhance technology transfer among participants.

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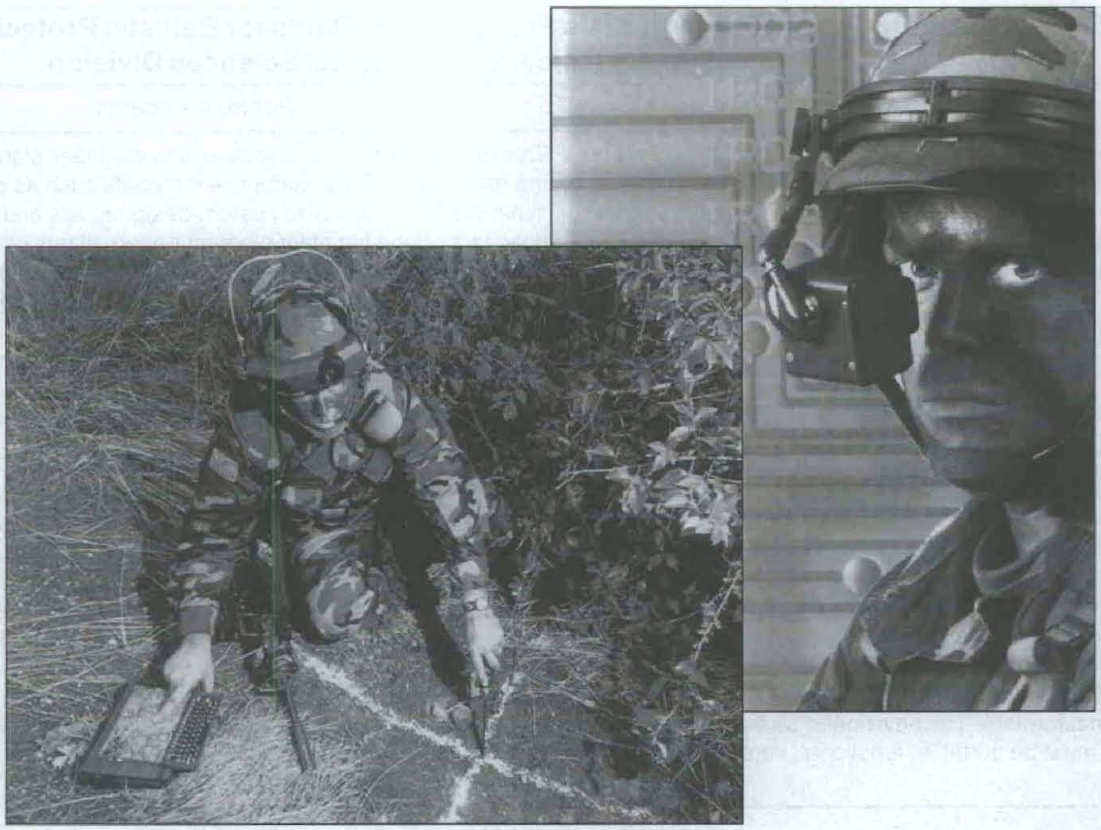

From Concept to Contract to Consumer in 12 Months. . .

THE ARMY ADVANCED CONCEPTS AND TECHNOLOGY II PROGRAM

By CPT(P) Jeffrey J. Mockensturm and CPT J.G. Byrum

Introduction

The Army has developed a process that teams the battle labs with the Army's development community, as well as industry and academia, to focus on potential technology solutions to our soldiers' needs. The Advanced Concepts and Technology II (ACT II) Program provides the Battle Labs with a means of experimenting with targeted, enabling technologies for near-term exploitation. This is a "good news" story about an Army exploratory development (6.2 dollars) program which, in just two short years, has already executed 63 of these projects and is funding 25 more in the current year.

The ACT II Program transforms mature technology into demonstrations for our soldiers in just 12 months with costs not to exceed $1.5 million for each demonstration. The process exploits the substantial resource of industry's independent research and development by funding demonstrations of commercial-off-the-shelf (COTS), near-COTS, and non-developmental items for rapid insertion into the battle labs. Military evaluators in the battle labs select the concepts for funding and conduct operational tests and simulations to determine the value of this technology for potential transition to the Army as well as for shaping requirements, refining doctrine, defining future capabilities, and improving existing systems. As such, ACT II is unique in DOD by providing funding and a common forum for user/developer interaction. This enables Battle Labs to rapidly access targeted technologies and demonstrate meaningful solutions for our soldiers.

This article presents an analysis of the success of the ACT II Program. A brief description of the ACT II process is presented first, followed by a description of an analysis conducted by the Army Research Office (ARO). The analysis was directed by Dr. A. Fenner Milton, Deputy Assistant Secretary for Research and Technology, Office of the Assistant Secretary of the Army (RDA), to determine the success of ACT II. Last, the merits of the program to date are presented

with highlights of several of the most compelling projects of the past two years.

The History Of ACT II

In 1994, its inaugural year, the ACT II Program initiated 28 projects with a budget of $10 million. The 1994 projects were completed in fiscal year (FY)95, while an additional 35 projects were executed for a total budget of $38 million in FY95. In FY96, 25 projects are currently underway which will complete demonstration during second quarter FY97. Concurrently, the selection process for projects beginning in FY97 is also underway. A total of 101 proposals have been invited from an initial receipt of 639 concept papers. Anticipated funding for FY97 is currently $11.9 million (see Figure 1).

How ACT II Works

As shown in Figure 2, ACT II is jointly executed by the U.S. Army Training and Doctrine Command (TRADOC) and the U.S. Army Materiel Command (AMC). ARO facilitates ACT II by developing an annual broad agency announcement (BAA), managing ACT II funding, and coordinating the selection process through technical and military evaluations. TRADOC Battle Labs develop the technology topics for the BAA and provide the operational environment for assessment of the deliverable products. AMC's research, development, and engineering centers (RDECs) in conjunction with the Army's Space and Strategic Defense Command, Medical Research and Materiel Command, Army Research Institute, and the Corps of Engineers, provide technical evaluation, financial management, and contract management.

From Concept To Demonstration In 12 Months

In response to the BAA, interested offerors prepare two-page concept papers that describe the essence of their proposed project. A joint military and warfighting technical evaluation is conducted by the Battle Labs and the Army technical labs to select a limited number of concepts from which to invite full proposals. Upon receipt, the full proposals (limited to 25 pages) are then reviewed by the same technical and military evaluators who evaluated the concept papers. The ACT II selection cycle culminates in a three-day joint technical evaluation board (TEB) held at ARO. During the TEB, the Battle Labs develop individual order-of-merit listings (OMLs) of their most highly-rated, technically acceptable proposals. Ultimately, a single, integrated OML is developed, from which projects will be selected for funding. This final, integrated OML is presented for approval to the Army's Science and Technology Executive and the Assistant Deputy for Force Development, Office of the Deputy Chief of Staff for Operations. The full ACT II selection process is detailed in Figure 3.

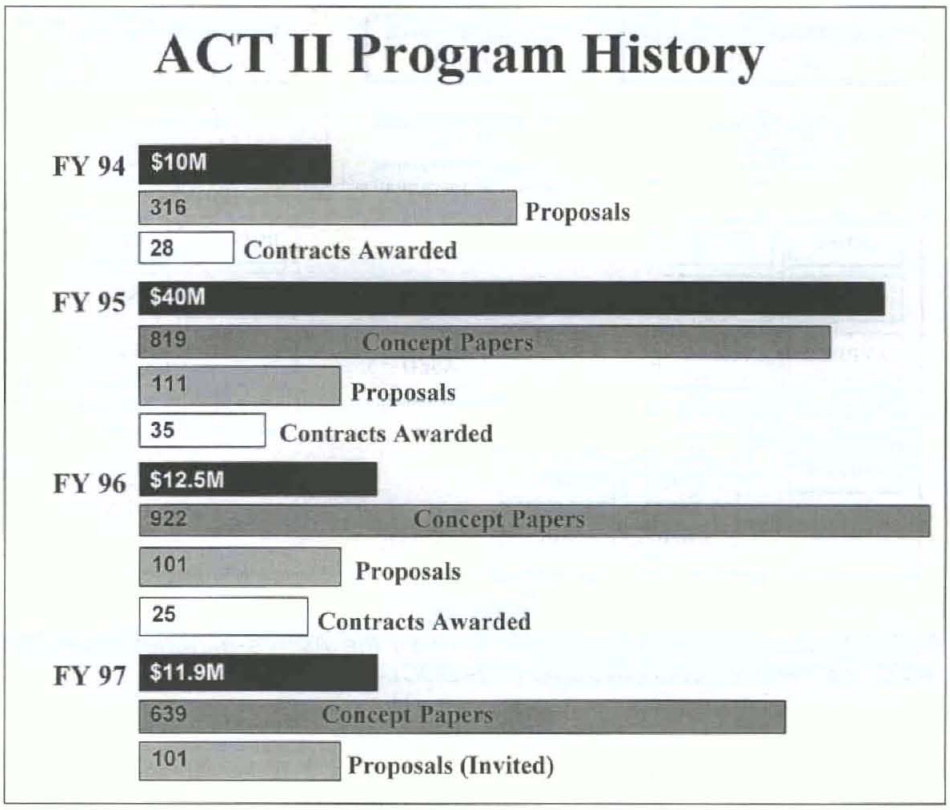

Figure 1.
ACT II funding and program history since its beginning in 1994.

Project Demonstrations

ACT II projects demonstrate technology as part of ongoing Battle Lab experiments which may encompass the full range of Doctrine, Training, Leadership, Organization, Materiel and Soldiers (DTLOMS), using soldiers and leaders in realistic, live, tactically competitive training environments. When possible, the projects are demonstrated in conjunction with an Advanced Warfighting Experiment (AWE) where they can be conducted and evaluated using real soldiers trained in the particular DTLOMS change. Ultimately, the experiments may provide the basis for a material requirement. Those that demonstrate significant added value to warfighting capabilities may be nominated for consideration by the Army leadership for rapid acquisition.

Success Of ACT II

ACT II began in 1994 and has had just two years' worth of demonstrations to date. Of the 63 projects demonstrated (28 in 1994 and 35 in 1995) there have been many "successful" demonstrations. Some projects have shown to be immediately relevant and ready for rapid transition, while others are still being evaluated with a focus on transition in the future. To quantify the contributions of these projects, ARO developed a metric which captures the results demonstrated and the potential for transition to rapid acquisition.

ARO's analysis began with a request for objective project assessments for each project from three sources: the Battle Lab project officer, the technical oversight representative, and the contractor's project manager. The respondents were asked to rate the overall maturity of the demonstrated technology by indicating the results of their respective ACT II projects in one of five possible categories (see Figure 4). In addition to assigning an overall assessment for each project, respondents were required to provide descriptive summaries that reinforced their appraisals.

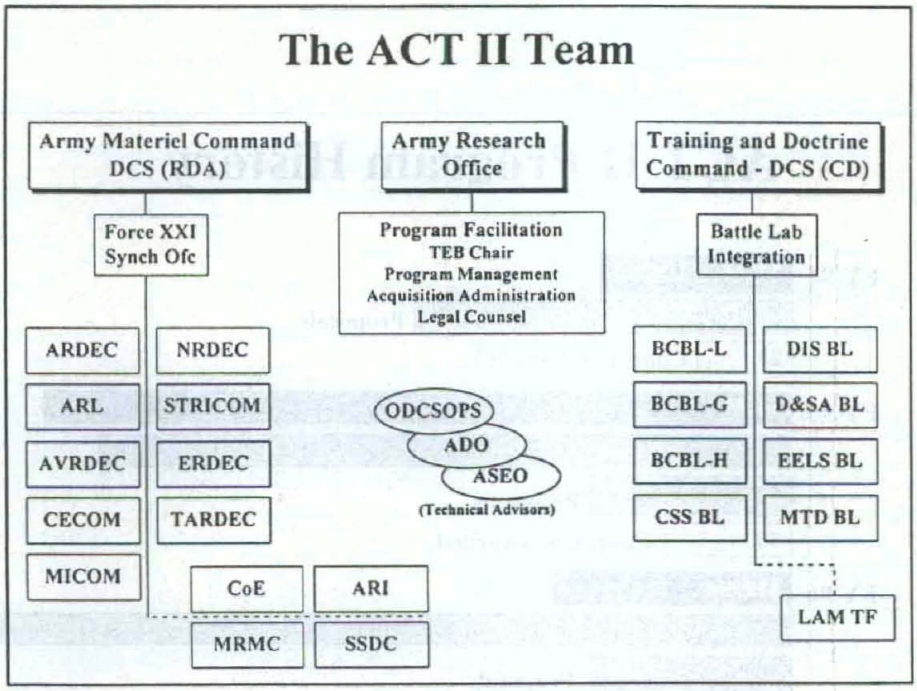

Figure 2.
ACT II fosters unique partnerships between the Army's materiel developer (AMC) and requirements developer (TRADOC).

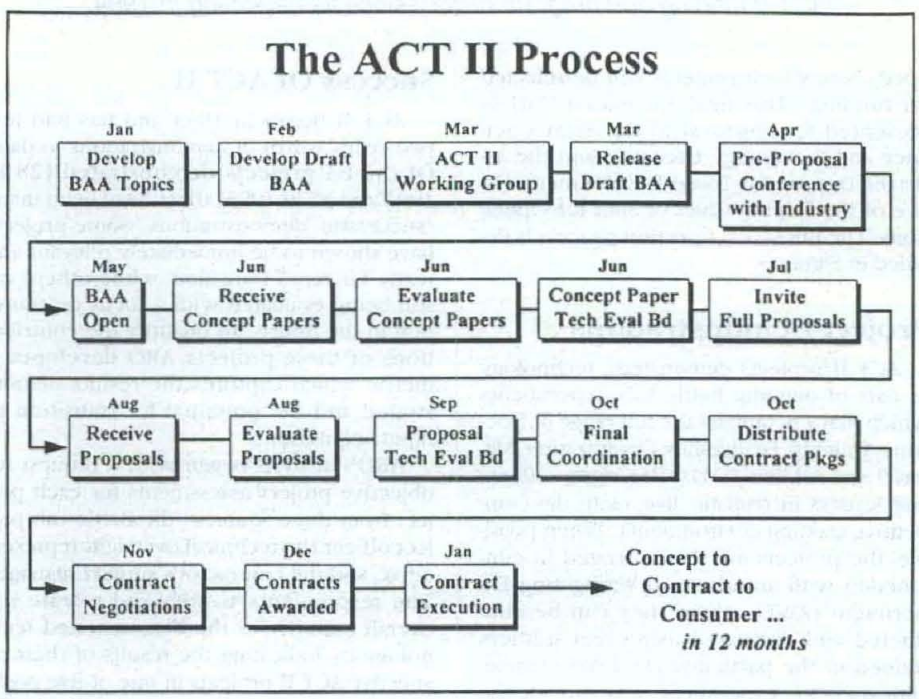

Figure 3.
The 12-month ACT II cycle begins in January each year and culminates with contract awards in December, subject to funds availability.

The metric used provides a technology "maturity spectrum." At the lowest end, Category One, the project demonstrated little maturity or potential for transition. At the highest end, Category Five, the demonstrated technology either has already transitioned, or is ready for immediate, short-term transition. The remaining categories provide a range of alternative measures: support or initiation of a Science and Technology Objective (STO supporting - Category Two); explore further in Advanced Technology Demonstrations or Advanced Concept and Technology Demonstrations (ATD/ACTDs - Category Three); and technology refinement in AWEs or as a Concept Exploration Program (AWEs/CEPs - Category Four).

Results Of Analysis

The overall results of this analysis are shown in Figure 5. The reader's attention is drawn to the clear center of mass defined by Category Four - *Refine in AWE/CEP.* No projects were rated in Category One and only three projects were rated overall as Category Two. More interesting still was the number of projects rated in Category Five. The results indicate an affirmation of the ACT II selection process (described above) and an indication of the quality of technologies explored by the battle labs. But behind this analysis lies a series of individual acquisition success stories which are discussed below.

Success Stories

Ultimately, ACT II success stories are measured by the user: the impact of ACT II on solving problems and assessing materiel solutions for the field. The findings of the FY96 Battle Lab Board of Director's (BOD) meeting was consistent with this analysis in its review of the 1995 ACT II projects. The BOD recommended that 22 of 35 projects be explored further by the Battle Labs, while six projects have transitioned outside the Battle Labs for further development. The FY96 ACT II projects have not yet been evaluated, as they are just reaching their demonstration phase. But of the 63 projects completed in 1994 and 1995, approximately one fourth could be categorized as already transitioned (as a material benefit for the Army) or ready for transition (Figure 6). Highlights of several of the most compelling ACT II projects are described below.

• **Battlefield Commander's Decision Support System: Phoenix.** The Phoenix System was initially demonstrated for the Battle Command Battle Lab - Leavenworth during Prairie Warrior 1994 as a surrogate commander's decision support system that replicated the capabilities of an improved maneuver control system (MCS). This initial demonstration was intended only to replicate a capability which would be included in a future release of the MCS. The Phoenix interface, however, proved so popular

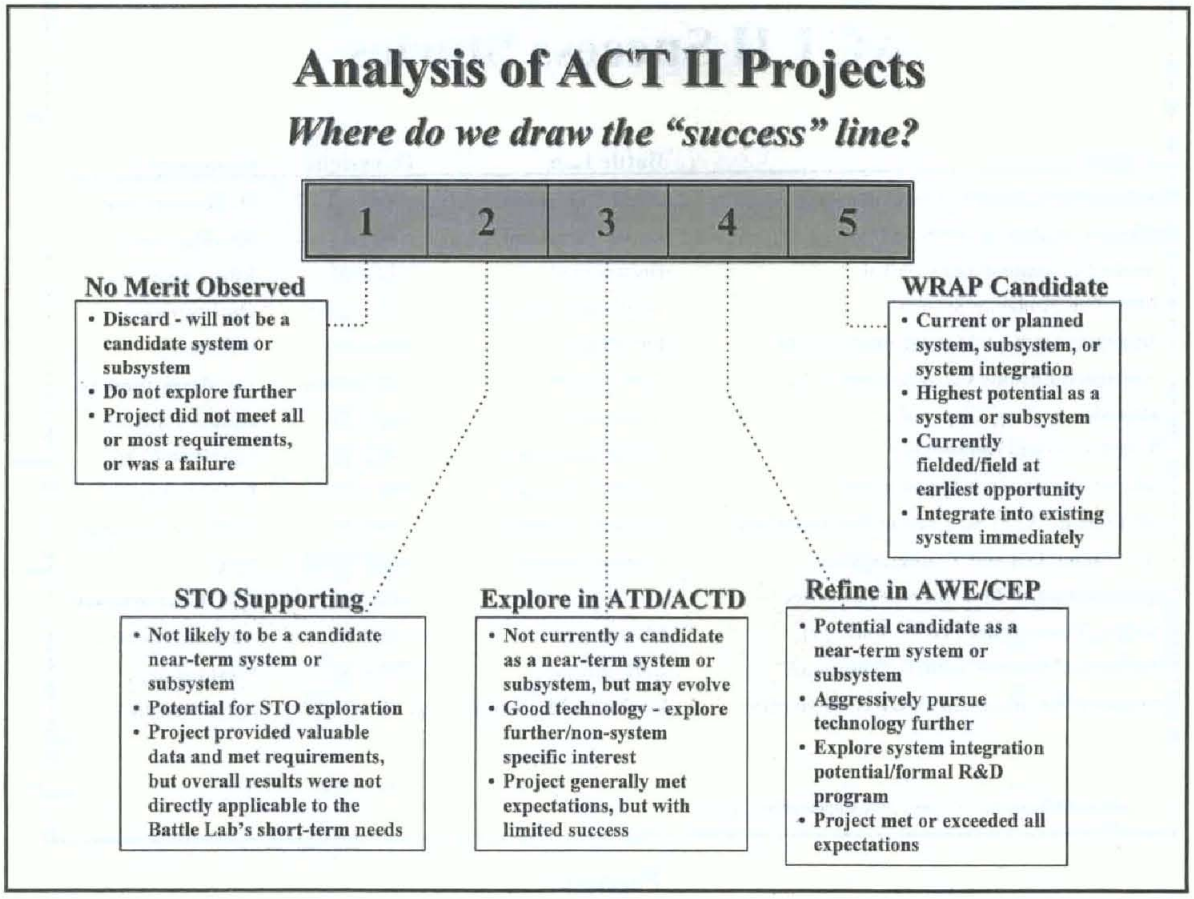

Figure 4.
The ACT II technology maturity spectrum.

among the participants of Prairie Warrior that a follow-on capability demonstration was added as an ACT II project in 1995. The improved capability provided additional interfaces to other Army management information systems and promised compatibility with the future releases of MCS. Today, Phoenix functionality has been incorporated into the MCS baseline program. The software has been stabilized, training materials developed, renamed as MCS/P BETA software, and made available for experimentation to units Army-wide.

• **Precision Airdrop Capability.** The precision airdrop capability was initiated in 1994 as a pair of ACT II projects for the Early Entry Lethality and Survivability Battle Lab by United Technologies USBI of Huntsville, AL, and Draper Labs Inc., of Cambridge, MA, with highly successful results. The core technologies demonstrated included high glide, precision airdrop, and Global Positioning System (GPS)/inertial navigation. These technologies are an integral part of the Advanced Precision Aerial Delivery System

Summary of ACT II Project Analysis Results

	Maturity Category					
	Discard/ No Interest	1	2	3	4	5 Fieldable System
						Responses
Battle Lab	0	4	5	23	11	43/63
Govt Lab/RDEC	0	3	14	23	6	46/63
Contractor	0	0	3	31	17	51/63

Figure 5.
Results of ACT II project analysis (summary). Response center of mass is Category 4, Refine in AWE and CEP. Response rate was 74 percent with all projects receiving at least one response.

ACT II Success Stories

Project	Battle Lab	Technical Oversight	Contractor
Integrated Comm Sys Controller	Battle Command	CECOM	Hughes Aircraft
Phoenix - Cdr's Decision Spt Sys	Battle Command	CECOM	Mystech Assoc.
Soldier Command and Control	Dismounted	CECOM	Litton Data Sys
MultiSim Modeling System	Depth and Sim Atk	STRICOM	Optimetrics
Dynamic Airspace Management System	Early Entry	MICOM	E-Systems
Advanced Enroute C2 System (AEC2S)	Early Entry	CECOM	Lockheed-Sanders
Precision Airdrop Capability	Early Entry	MICOM	Draper Labs
Wideband Data Networking	Battle Command	CECOM	Hazeltine Corp
Voice Control of C2 Applications	Battle Command	CECOM	ITT Aerospace
Multimedia ATM Services on the Battlefield	Battle Command	CECOM	GTE Govt Systems
Adv Maint Asst and Trainer System	Combat Svc Spt	STRICOM	RTI
Tactical End-to-End Encryption Device	Combat Svc Spt	CECOM	GTE Govt Systems
Soldier Power (Fuel Cell Technology)	Dismounted	CECOM	Analytic Power
Unmanned Ground Vehicle "Pointman"	Early Entry	MICOM	Westinghouse
Synthetic Environment Database Generator	Louisiana Maneuvers	CoE - TEC*	Loral Vought

* Corps of Engineers - Topographic Engineering Center

Figure 6.
These projects have demonstrated technical maturity and have either transitioned to systems or are ready for transition as a proof-of-principle for rapid acquisition.

(APADS) family of systems being developed by the Natick RDEC. APADS technology was demonstrated during the Advanced Technology Demonstration (ATD) of Advanced Airdrop for Land Combat.

• **Soldier Command and Control.** The Soldier Command and Control System was initiated as a 1994 ACT II project for the Dismounted Maneuver Battle Lab by Litton Data Systems Inc. The project built upon work performed and lessons learned from the Soldier Integrated Protective Ensemble ATD and the 21st Century Land Warrior program. Soldier Command and Control integrates a Lightweight Leader Computer (486 processor), hand-held SINCGARS radio, helmet-mounted display, microphone/earphone, lightweight camera, and a ruggedized hand-control glove. Currently, Air Force forward area controllers are using the Lightweight Leader Computer (Litton's Hand-held Terminal Unit) integrated with GPS and the SINCGARS radio in support of our forces in Bosnia.

Conclusion

ACT II solidifies the partnership between AMC and TRADOC as they build jointly toward more focused, streamlined requirements and acquisition processes. With a 12-month cycle and low entry cost, ACT II provides for rapid demonstration of enabling technologies by soldiers in the Battle Labs. The analysis presented in this article affirms the process by which ACT II provides technology for Battle Lab experimentation. In just three years, and with data available for only two of these years, ACT II has clearly demonstrated success in providing relevant and mature technologies for the rapid solution of our soldier's problems. ACT II provides the flexibility to keep pace with rapid technology turnover—from concept to contract to consumer in 12 months.

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USE OF MODELING AND SIMULATION TO REDUCE MISSILE ACQUISITION TEST COSTS

By James B. Johnson Jr. and Jerry A. Ray

Introduction

The U.S. Army Test and Evaluation Command (TECOM) is developing the Virtual Proving Ground in order to reduce acquisition test costs while improving test quality and reducing test time. An excellent example of this concept is the Simulation/Test Acceptance Facility (STAF) which was developed by TECOM's Redstone Technical Test Center (RTTC) located at Redstone Arsenal, AL.

Traditionally, small guided missiles undergo production flight testing, otherwise known as "fly-to-buy," for lot acceptance/rejection. Typically, a sample set of the production lot is selected. This sample set undergoes functional testing, environmental and dynamic testing, and is then destructively flight tested. If a predetermined number of rounds of this sample fails to impact the target, the entire production lot is rejected. Emerging small guided missiles and submunitions are "smart" or "brilliant," carrying a very large price tag, making full-scale production flight test programs prohibitively expensive.

STAF provides a continued high confidence level for production missile lot acceptance testing with a significantly reduced number of traditional destructive flight tests. The STAF functionally tests a random selection of production missile rounds in a real-time nondestructive millimeter wave (MMW) radar Hardware-in-the-Loop (HWIL) simulator. Completed missiles containing tactical seekers, guidance electronics, inertial navigation systems, warheads, squibs, motor, and control actuators, are tested in a remotely controlled bunker. The facility modulates Radio Frequency (RF) signals to present realistic in-band representations of complex targets to the MMW seeker. Missile flight dynamics are simulated using a six degree of freedom digital model of the missile's airframe running in real-time. A real-time data collection system stores data from the simulated launch to simulated target impact.

Problem Definition

In fiscal year 1992, the U.S. Army Program Executive Office for Tactical Missiles, Air-to-Ground Missile Systems (AGMS) Project Office solicited a proposal from the TECOM RTTC to develop an alternative method for performing lot acceptance testing on Longbow HELLFIRE Missiles during Low-Rate Production and Full-Rate Production. The status quo for the previous generations of AGMS missiles, the HELLFIRE and HELLFIRE II, was a fly-to-buy program conducted at the Eglin Air Force Base. This program involved taking a random lot sample and flight testing to determine lot acceptance. Due to a significantly higher per round cost for the Longbow HELLFIRE Missile, an approach other than fly-to-buy was desired.

Problem Solution

The problem solution involves a combination of open- and closed-loop testing to fully characterize the All Up Round (AUR) missile under test. The open-loop testing involves characterizing the control actuator system, the inertial measurement system and the end-to-end RF chain. The closed-loop testing involves presenting the missile under test with in-band threat and background scenery, real-time three-axis motion in pitch, yaw, and roll and injected inertial measurement data. This process occurs until simulated target impact. This solution allows real-time flight dynamics, real-time threat and background scene generation, and comprehensive data collection to the point of simulated target impact. All tests are performed under extreme temperature conditions to simulate various climates.

STAF development and operation is a joint venture between the U.S. Army TECOM RTTC and the U.S. Army Missile Command Research, Development and Engineering Center (RDEC).

Cost Tradeoffs

Prior to development of the STAF, a cost tradeoff was conducted for performing a traditional fly-to-buy program at a test range vs. performing a simulated flight program through utilization of HWIL.

Some assumptions that went into this analysis were: (1) the number of missiles that would be fired per year for a typical fly-to-buy; and (2) the number of missiles fired per year in the simulation program augmented by the number of missiles per year going through simulated flight. The results of the cost tradeoff using conservative values result in a cost avoidance of at least $5 million per year, with potential of up to $10 million per year. The tremendous yearly cost avoidance is due to the nondestructive nature of the simulated flights which allows the rounds to be placed in inventory upon test completion. This same analysis indicates a facility cost payback period of much less than one year.

Theory Of Operation

In Figure 1, the concept of HWIL simulation implemented in the STAF for the Longbow HELLFIRE Missile is illustrated. The objective behind the STAF HWIL simulation is to create a simulated environment around the test missile. Every stimuli that the missile is capable of sensing is presented to the missile in a realistic, dynamic fashion. In this way, the missile hardware can be tested in a simulated flight.

In the top half of Figure 1, subtitled "Real Flight," a missile is seen transmitting and receiving MMW energy reflected from a target. After processing this received energy, the missile determines the range, range extent, velocity, and line of sight to the target. In order for the missile to maintain stable flight, it must produce fin commands and also receive feedback in the form of fin position and inertial sensor (accelerometers and gyros) feedback. Using these fin positions,

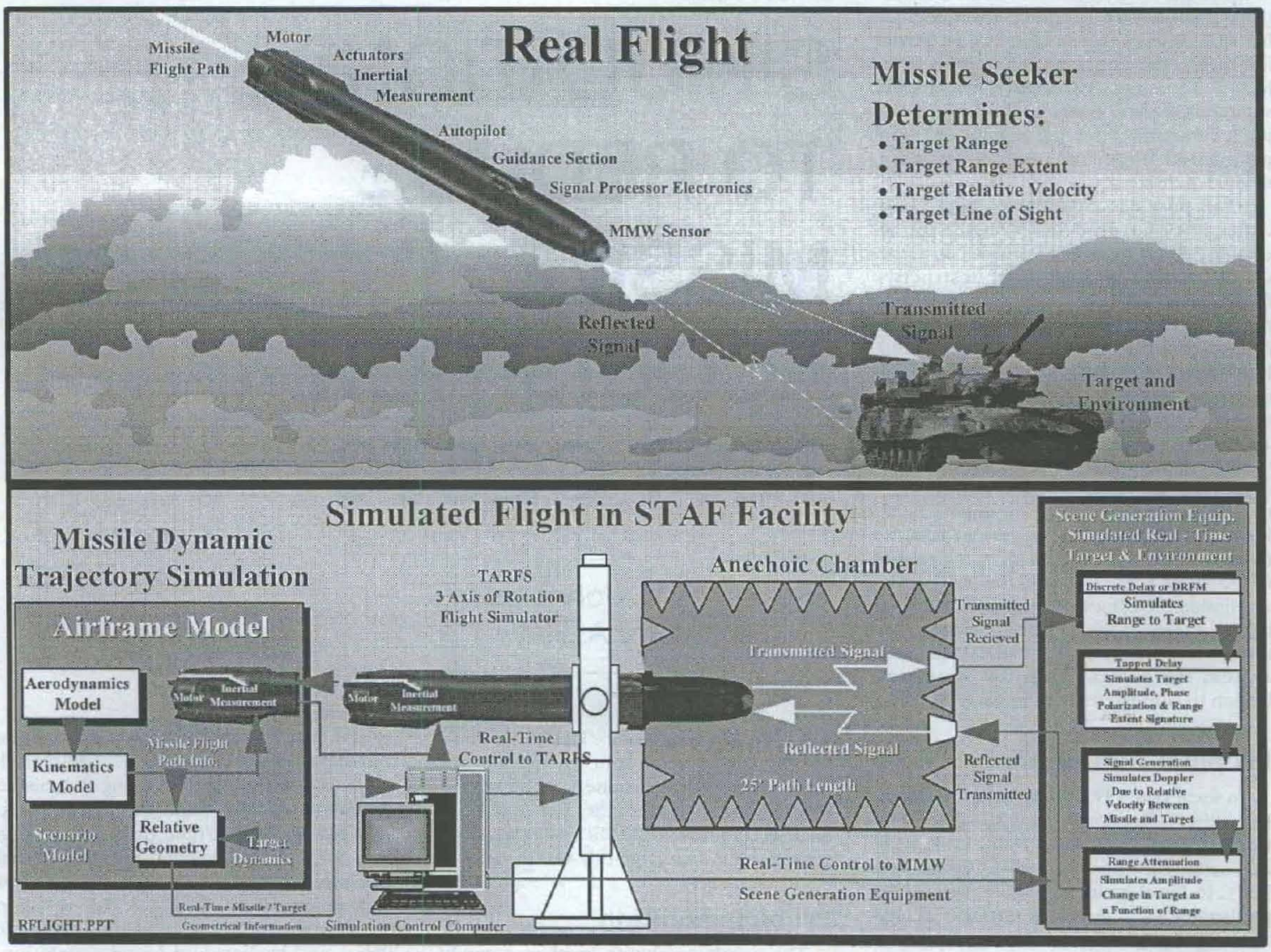

Figure 1.
Real vs. Simulated Flight.

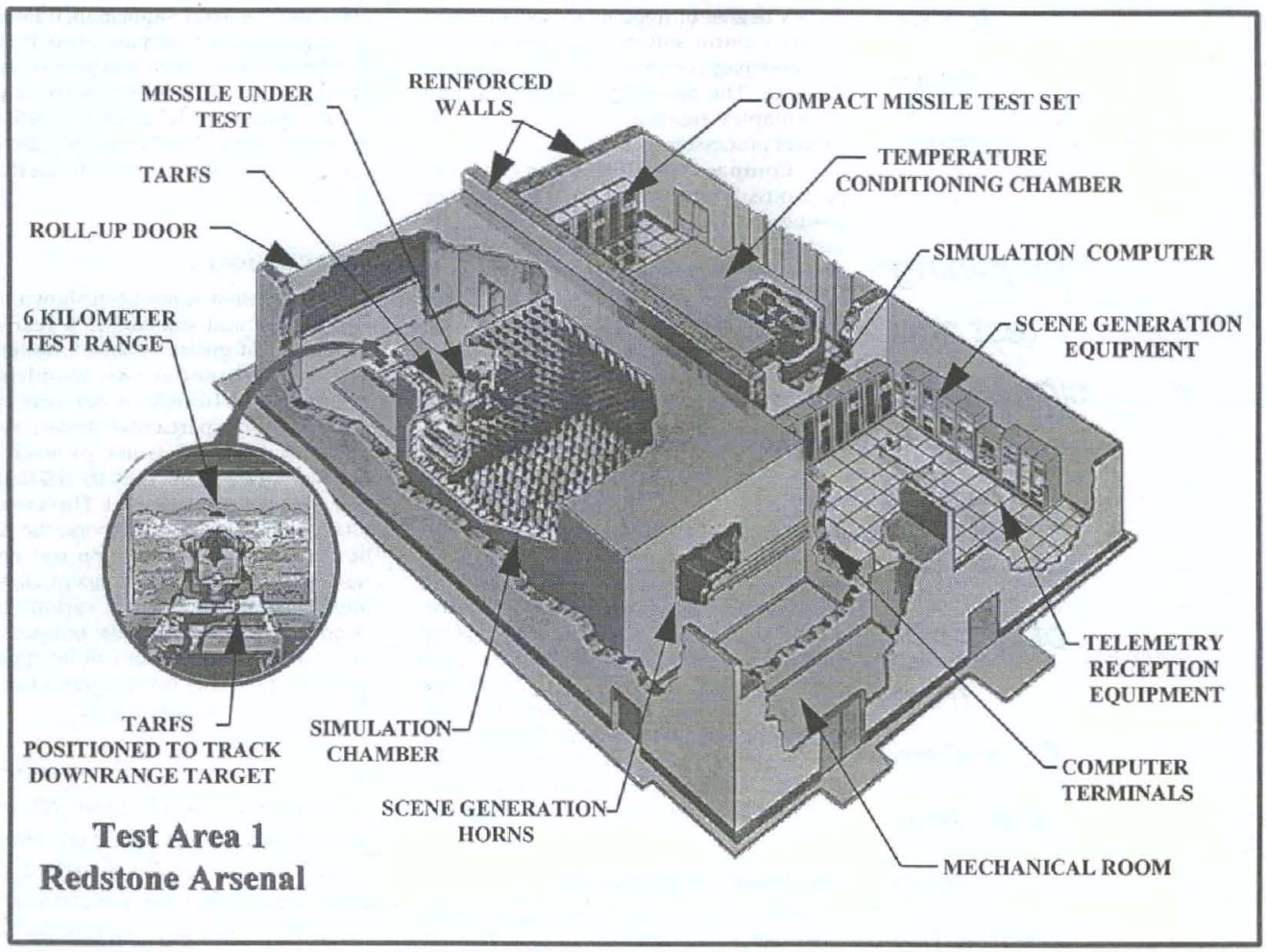

Figure 2.
Simulation/Test Acceptance Facility.

inertial sensor feedback, and the information generated from the MMW sensor, the missile's guidance and autopilot functions generate fin commands to steer the missile to the target.

In the HWIL simulation, the MMW environment, fin position feedback, and inertial sensor feedback represent the stimuli that must be generated for the missile in order to test the hardware missile in simulated flight.

In the bottom of Figure 1, subtitled "Simulated Flight in STAF Facility," a missile is seen transmitting and receiving MMW energy in the STAF Facility. The scene generation equipment in the STAF modulates the transmitted pulse to simulate a reflection from a real target. The missile receives this signal and processes it to determine the range, range extent, velocity, and line of sight to the target. This information is used by the missile's guidance and autopilot functions to generate fin commands to steer the missile to the target. In the STAF, these fin commands are monitored and entered into a computer running a digital model of the missile's airframe. This airframe model processes the fin command data and generates simulated fin position feedback and inertial sensor feedback data. This simulated feedback data is then input back into the missile hardware to close the loop and allow the missile to maintain a stable simulated flight.

Facility Description

The major components of STAF are listed below:

- **Bunker** - An artist's rendering of the STAF is shown in Figure 2. The STAF is approximately 2,000 square feet and features a test item room, test chamber, and a computer room.
- **Scene Generation Equipment** - The target generation system intercepts the MMW signal transmitted by the missile, delays to simulate dynamic range to the target, tap delays to simulate target signature, doppler shifts to account for missile body and target movement, and power attenuates to close the radar equation. This is accomplished on a missile pulse-for-pulse basis in real-time from launch through simulated target impact.
- **Three Axis Rotational Flight Simulator (TARFS)** - The TARFS provides the mounting structure for the missile and provides real-time missile flight motion in pitch, yaw, and roll.
- **Simulation Computer** - The simulation computer consists of two computer systems—a control computer and a modeling computer. The control computer runs

It has been shown that by joining test and simulation, a yearly cost avoidance of greater than $5 million per year with potential cost avoidance of greater than $10 million per year can be achieved for a particular missile system.

the six degree of freedom (6-dof) program, facility control software, performs I/O to the modeling computer and interacts with the user. The modeling computer models the complex signature of the target using parallel processing.

• **Compact Missile Test Set** - The compact missile test set performs open-loop testing and characterization of the missile, such as squib resistance, ground integrity, power quality, built-in test (BIT), fin functionality, etc. prior to closed-loop simulation testing. This test set performs safety checks and acts as the gateway for all serial communication with the missile under test.

Advantages Of Concept

The advantages of the STAF concept are numerous. There will be minimal costly flight tests and all STAF tests will be nondestructive, allowing insertion into the Army inventory. More rounds can be tested since STAF testing is nondestructive. More scenarios can be evaluated since the missile is not expended. Future stockpile trend analysis can be conducted with STAF in an attempt to extend the shelf life. The test conditions are well-defined, affording much greater test repeatability. Finally, there is cost avoidance potential up to $10 million per year with a facility payback period of less than one year.

Potential Expansion

Other weapon systems that utilize MMW radar technology can take advantage of the STAF facility. The STAF facility is planned to have many expansions. A few are summarized below:

• **Infrared (IR) STAF** - Since the original STAF accommodates missiles with MMW sensors, a logical progression will be to accommodate imaging infrared (IIR) missiles. This will encompass the same basic theory of operation with the exception of replacing the MMW scene generator with a Dynamic IR Scene Projector (DIRSP). The DIRSP will project accurate, dynamic, realistic IR scenes of various targets that will provide repeatable functional testing of IIR missiles. The first candidate system for IR STAF will be the JAVELIN missile system.

• **Defense Simulation Internet (DSI) Compatibility** - A planned upgrade to STAF will be connection to the DSI network. This will allow personnel at other locations such as pilots in flight simulators to "fire" missiles interactively with the STAF. This will provide the pilot in training with more realism in training missions.

• **Reactive Threat** - To provide a more realistic virtual test and training environment, the U.S. Army Simulation, Training and Instrumentation Command, Threat Simulator Management Office will provide and operate, via the DSI, fully reactive threats. These intelligence based threats will be independently validated and will function in accordance with appropriate tactics and doctrine.

Conclusion

In conclusion, it has been shown that by joining test and simulation, a yearly cost avoidance of greater than $5 million per year with potential cost avoidance of greater than $10 million per year can be achieved for a particular missile system. This cost avoidance is due to much fewer live flight tests augmented by HWIL simulation testing at the AUR level. This program is totally nondestructive, allowing the AUR to be placed in inventory upon test completion. Furthermore, this concept allows for multiple test scenarios at various launch conditions, ranges, targets, temperatures, etc. Finally, this concept can be applied to stockpile reliability test programs to extend the shelf life of fielded systems.

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JERRY A. RAY is an electronics engineer for the U.S. Army Missile Command's Research, Development and Engineering Center (MRDEC). He is responsible for STAF System Engineering functions as well as the operation of MRDEC's Millimeter Simulator System-1 (MSS-1). Ray holds a B.S.E. degree from Auburn University.

INTELLIGENCE AND ELECTRONIC WARFARE PROGRAM EXECUTIVE OFFICE PARTICIPATES IN EUROSATORY 96

By MG David R. Gust
Program Executive Officer
Intelligence and Electronic Warfare

Editor's Note: The words "Defense/Defence" are spelled according to their United States or French reference.

Under the sponsorship of the French Defence Ministry and GICAT (French Land Defence Manufacturers' Association), U.S. Secretary of Defense William Perry approved the U.S. Department of Defense's (DOD) participation in the EUROSATORY 96 international land Defense equipment exhibition in Paris, France, from June 24-29, 1996. EUROSATORY 96 was recorded as being the largest land Defense systems exhibition in Europe.

Displayed DOD systems included, but were not limited to, the M1A1 Abrams Main Battle Tank, the M2A2 Bradley Fighting Vehicle, the Patriot Air Defense System, the Avenger missile system, the AH-64 Apache attack helicopter and the UH-60A Black Hawk helicopter. Office of the Program Executive Officer (PEO) Intelligence and Electronic Warfare (IEW) displayed systems including products from two project management (PM) offices; Night Vision/Reconnaissance, Surveillance, and Target Acquisition (NV/RSTA) and Joint Surveillance Target Attack Radar (JSTARS).

PM-NV/RSTA displayed a number of its third generation image intensification (I^2) systems and demonstrated its latest Horizontal Technology Integration (HTI) and Commercial-Off-The-Shelf (COTS) initiatives using dimensional storyboards. Two of its displayed and most sought-after I^2 systems by foreign industries and militaries alike include the AN/PVS-7B Night Vision Goggle (NVG) system and the Aviator Night Vision Imaging System-Heads Up Display (ANVIS-HUD). PM Night Vision also effectively presented the multinational content and international partnerships already in existence with the development and production of its Second Generation Forward Looking Infrared (GEN II FLIR), the Thermal Weapons Sight (TWS) and several other of its imagery sensor programs.

PM-JSTARS and Motorola, the contractor for the Common Ground Station (CGS), sponsored a prototype CGS system currently in use by U.S. Army Europe USAREUR and SHAPE Technical Center. Dr. Paul Kaminski, Under Secretary of Defense (Acquisition and Technology) directed that the developmental/testbed CGS be used within the Eurasian landmass to address NATO air/ground surveillance concept of operations and technical interoperability issues in the European theater. PM-JSTARS capitalized from CGS's geographical location and shipped that particular system to EUROSATORY instead of incurring the high cost of transporting one from CONUS to France.

Army Chief of Staff GEN Dennis J. Reimer discusses the JSTARS Program with U.S. Army European Command Soldiers.

The JSTARS and Motorola team impressively demonstrated CGS's capability to receive and process information from the JSTARS E-8 aircraft, Unmanned Aerial Vehicles (UAV) and the Intelligence Broadcast Network (IBS). The team also demonstrated CGS's ability to disseminate targeting data to command and control elements such as TACFIRE, Advanced Field Artillery Tactical Data Systems (AFATDS) and the All Source Analysis System (ASAS). General William W. Crouch, CINCUSAREUR and VII Army and a guest speaker at EUROSATORY, stated how well this critical asset helped the soldiers in Bosnia during its December 1995 to March 1996 deployment. JSTARS helped the ground commanders in Bosnia establish the Zone of Separation and ensure compliance with the Dayton Accords.

Paris-Le Bourget

Paris-Le Bourget presented the accommodations, capacity and attractions of a large capital city. It is the leading exhibition center in Europe and is a major cultural site. The Le-Bourget area offered easy access and functional areas where all types of ground Defense systems could demonstrate their particular capabilities under ideal conditions. The Le-Bourget area accommodated nearly 600 exhibitors with enough exhibit space to demonstrate their equipment and materiel, life-size and in a dynamic manner.

All U.S. exhibitors, whether a DOD agency or from U.S. industry, participated under the guidance of the U.S. Pavilion Committee sponsored by the Association of the United States Army (AUSA). DOD participation, I believe, demonstrated the U.S. government's commitment to actively defend the security of Europe. It also provided an ideal forum to display U.S. Defense technology, U.S. military capabilities and the effort to promote standardization and interoperability with our allies.

It should be noted that U.S. businesses and industry might have benefited from DOD participation even though DOD inclusion was encouraged to promote security of the region instead of marketing for sales. However, DOD supports the sale of U.S. systems through coordination with security assistance when such sales promote U.S. national security interests. And, since DOD's stated goal was to enhance NATO's partnership for peace and to promote force interoperability and equipment commonality, this exhibition was a significantly critical initiative as NATO and partner nations collectively shape forces to meet the new strategic paradigm in Europe.

Security Assistance

Decisions to support and approve international sales for Army equipment are made on a case-by-case basis after interagency coordination with the U.S. Army Security Assistance Command. Security assistance, as an entity, is a U.S. foreign policy instrument that consists of a variety of authorities. The most significant are to transfer Defense equipment, services and training to foreign governments and international organizations by sale, grant, credit financing or lease.

The principal components of the military portion of security assistance are foreign military sales (FMS), foreign military financing (FMF) grants and loans, international military education and training (IMET), transfers of excess Defense articles (EDA), and presidential-directed drawdowns of Defense assets. The programs promote the interoperability needed among coalition forces and enhances self-sufficiency among allies.

I believe the U.S. security assistance effort is greatly enhanced when the United States and DOD participate in international air and trade shows like EUROSATORY. The success demonstrated as a result of DOD involvement in EUROSATORY is indicative of the Security Assistance Command's commitment to regional security and is evidenced by the working relationship they hold with the French Defence Ministry and GICAT.

GICAT (French Land Defence Manufacturers Association)

GICAT is comprised of French companies, associations, organizations or individuals whose activities are dedicated to the study, development and manufacture of ground Defense and security products. They are directly connected to the marketing and sales of such products manufactured in France.

GICAT's objectives are to ensure that its members jointly benefit from valuable information, recommendations and policy analysis; and identify and conduct initiatives of mutual interest in various industrial sectors related to ground Defense products and equipment. To meet these objectives, the GICAT commits itself to developing and maintaining contacts within the French Defence government agencies, promoting dialogues and trading of technical information between French and foreign governments and industries and assuming responsibility for the international EUROSATORY exhibit held periodically in France.

EUROSATORY 96

The success of EUROSATORY 96 notably comes from a carefully organized promotional campaign which was oriented according to the targets that interest exhibitors. The show included a first-class GICAT sponsored reception for VIPs and special guests at the Medieval Louvre Museum and, for U.S. and DOD Pavilion exhibitors, a reception hosted by American Ambassador to France Pamela Harriman at her residence in Paris.

This program executive office's participation in this major international land armaments exhibition illustrates the importance we attach to helping the U.S. Army achieve maximum interoperability and commonality of equipment among its allied and coalition forces. Our project manager's efforts underscore a determination to help achieve global peace by demonstrating, procuring and fielding to the U.S. and allied warfighters the best technology and state-of-the-art equipment in the world.

MG David Gust, PEO, Intelligence and Electronic Warfare, meets Ambassador to France Pamela Harriman at one of the many DOD booths at EUROSATORY 96.

DOD, INDUSTRY DISCUSS SINGLE PROCESS INITIATIVE

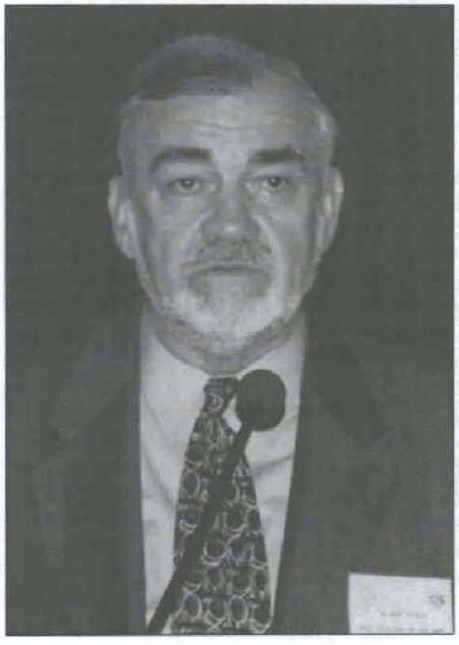
Key issues related to the Single Process Initiative (SPI) were addressed at an Association of the U.S. Army (AUSA) Symposium, "The Army and the Single Process Initiative—Making Good Business Sense Together," Aug. 27, 1996, in Falls Church, VA. SPI is an acquisition reform effort to consolidate down to as few processes as possible, and through consolidation, make those processes commercial. The objective is to save money, obtain a better product for processes that are better understood and controlled, and to foster a more competitive industry.

Attended by more than 150 representatives from the Department of Defense (DOD), Department of the Army, and industry, the SPI symposium facilitated a detailed discussion of SPI-related topics such as the block change process in Defense contractor plants, the role of SPI in the context of other acquisition reforms, and the need for greater clarity in implementing SPI where there is both a prime and a subcontractor. There was consensus among the speakers that SPI is an initiative with a great potential for saving money.

Hon. Gilbert F. Decker, Assistant Secretary of the Army (Research, Development and Acquisition) (ASA(RDA)) and Army Acquisition Executive, opened the conference. He welcomed the attendees, noting that the yearly AUSA symposium is an efficient forum with focused topics, allowing in-depth discussion on a given dimension of Army acquisition. He emphasized the importance of questions from the attendees to inform the acquisition leadership what is on the minds of those implementing acquisition reform, and where gaps in reforms exist. Decker added that SPI is a common-sense solution to the expense of having five or six different processes accomplishing the same function within one facility.

A presentation on Army Materiel Command (AMC) Support to SPI was provided by GEN Johnnie E. Wilson, Commanding General, AMC. He emphasized that SPI is "not the be-all and end-all of acquisition reform, but a major step in the right direction." Wilson added that acquisition reform is not a destination, but a journey, so a focus on *continuous process improvement* is required. Because of a 16 percent reduction in the procurement account projection for FY 97, he said that acquisition efficiency and improvement is not a luxury, but a necessity. "We have the duty to use every resource—people, facilities, dollars, and processes—as efficiently as possible," Wilson added.

MG Robert W. Drewes (U.S. Air Force), Commanding General, Defense Contract Management Command (DCMC), Defense Logistics Agency, provided an update on the status of SPI implementation. He said that many current DCMC activities are seeking oversight reduction, so the representatives of major Defense contractors should see a decline in DCMC presence at their plants. Regarding the prime/subcontractor relationship, Drewes said, "Formal revision to policy is needed. Our initial approach was to not get into the whole prime/sub relationship—but to honor the privity of that relationship." According to Drewes, the Army is responsible for proactively working with DCMC to inform industry of the opportunity to use single processes, and of the government's eagerness to receive proposals—called concept papers—on what that single process should be. In addition, the Army should select a team leader—one individual for each proposed initiative—who will coordinate with all of the Army buying activities that have business with the facility and seek concensus on what is the "right approach."



Hon. Gilbert F. Decker, Assistant Secretary of the Army (RD&A) and Army Acquisition Executive.

Dr. Kenneth J. Oscar, Deputy Assistant Secretary of the Army for Procurement, Office of the ASA(RDA), discussed Army implementation of SPI. Oscar emphasized that SPI doesn't work by itself, but is rather complemented by other initiatives that "push it along and make it work better." These other initiatives include improvements during the pre-award phase of contracting, such as oral communication, and identifying source selection board members. Oscar added that spare parts money, which was previously used only to maintain equipment, can now be used to maintain *and upgrade if* more modern spare parts are used.

Next at the podium was Eleanor R. Spector, Director of Defense Procurement, Office of the Under Secretary of Defense (Acquisition and Technology), who addressed SPI challenges. Spector finds the responsiveness of the procurement community to SPI "truly impressive." "Whenever we make a lot of changes to existing equipment there are technical challenges, pricing challenges, and coordination challenges. Technically, it is absolutely essential to ensure that no degradation of equipment performance occurs, because user safety is paramount," said Spector. She added that administrative contracting officers, who seek agreement on what the single process should be, face the challenge of coordinating the disparate needs of program managers within each of the military departments, and sometimes different agencies, such as NASA, as well.

Deputy Under Secretary of Defense (Acquisition Reform), OSD Colleen A. Preston described DOD Acquisition Reform and SPI. She urged the attendees to think about SPI in the context of the whole acquisition reform process, as a part of a cultural change, and what SPI means to acquisition reform in terms of making that cultural change. Preston said that *how* change is being driven—

GEN Johnnie E. Wilson, Commanding General, Army Materiel Command.

Dr. Kenneth J. Oscar, Deputy Assistant Secretary of the Army for Procurement, Office of the ASA(RDA).

process action teams, working groups, the use of ideas from conferences, from the field, and from both industry and government—is critical. She believes that the changes and recommendations being implemented should come from the day-to-day practitioners of a rapidly-changing acquisition business, not from leaders drawing on experiences from five or 10 years earlier.

A question-and-answer panel comprised of the government speakers wrapped up the morning session. Topics of the discussion included furnishing government property to contractors ***only*** when there is no alternative; objectivity as past-performance becomes an increasing factor in best value source selection; and eventually eliminating the need for SPI as contracts become performance based.

The luncheon speaker was Cathleen D. Garman, Vice President for Legislative Affairs, National Security Industrial Association, who earlier served on the House Armed Services Committee (now the National Security Committee). She provided a congressional perspective on acquisition reform. In 1994, she said, the enactment of the Federal Acquisition Streamlining Act (FASA) started the ball rolling to make acquisition reform and SPI possible. Garman said that FASA and the earlier 800-series panel and Defense Acquisition Workforce Improvement Act grew out of a need for a systematic manner of changing the acquisition process. She said, "About the same time that Sen. John Glenn, in a White House press conference, called acquisition 'the grunt work of government,' the release of the section 800 report was eagerly awaited, something like the latest best seller by John Grisham."

The afternoon session consisted of seven brief presentations by industry representatives, followed by a question-and-answer panel chaired by Nicholas W. Kuzemka, Director, Acquisition Management, Lockheed Martin Corporation.

William H. Swanson, Executive Vice President and General Manager, Raytheon Electronic Systems, Raytheon Company, described the birth of SPI at Raytheon's Andover Plant—initiated in conjunction with George Williams, then Army PEO Tactical Missiles (now retired) (see March-April 1996 issue of *Army RD&A* magazine). Swanson also emphasized the importance of having a single-point DOD or Army arbitrator during the SPI process.

David W. Welp, recently named President of Texas Instruments' (TI) Systems Group, said that TI's implementation of SPI began in electronic assembly, where SPI would be most beneficial. He also emphasized the value of DCMC in the process, and cautioned against failing to abide by an established single process in future contracts. Welp added that regarding SPI, the prime/subcontractor relationship is complicated, and suggested that companies in these relationships keep one another informed.

Deputy Segment Executive (Weapons Systems), Hughes Aircraft Company Louise L. Francesconi described SPI implementation at Hughes' missile plant in Tucson, AZ. "We have a variety of products and customers, so the ability to go to a common process gives us tremendous operating efficiency and the opportunity to really improve what we're doing," she said. According to Francesconi, the first block change proposal for the Hughes missile business covered 14 processes, including soldering, hazardous material disposal, electronic component testing, and configuration management software; affected about 100 contracts; and replaced approximately 84 military specifications or DOD requirements.

A briefing by Richard J. Millman, President of Textron Systems Division, followed. Textron's business is largely commercial—only 15 percent Defense. This, he said, has given this company an advantage in shifting from military to commercial processes. Millman believes that Textron's success can be attributed to well-executed growth strategies and an intense focus on operating excellence. Using integrated product teams (IPTs) to carry out SPI allows a fully-coordinated change through a parallel, rather than a sequential process, he noted. According to Millman, this is important because in a competitive world, speed counts, and companies wanting to succeed must change from being slow and deliberate to fast and prudent.

Cristopher A. York, Vice President, Business Management, McDonnell-Douglas Helicopters, discussed that company's use of SPI, stating that just as new aircraft are being developed, so are new ways of doing business. Said York: We've been working aggressively on streamlining and affordability ... and empowering people to manage risk. He cited McDonnell-Douglas's multi-year Longbow contract as evidence of acquisition reform success, noting that this contract has ***only one*** required military standard, and a statement of work only 28 pages long.

Vice President of Contracts for Boeing Defense and Space Group Matthew E. Brislawn said that not only SPI, but process improvement across the board, is a high priority at Boeing. "Changing internal processes that have built up in a company that is 80 years old is not easy," Brislawn noted. However, he said that Boeing's Defense and Space Group has thought of imaginative ways to do business and solve problems at a local level, rather than seek waiver approval. "No good idea is too small," Brislawn concluded.

Nicholas Kuzemka wrapped up the industry presentations, addressing the issues of inter-divisional work transfer and the broad impact of process changes where large companies have centers of excellence. According to Kuzemka, one obvious solution to this challenge is citing—in the concept paper—all major programs involved. He also suggested that perhaps industry could be an "honest broker" in encouraging subcontractors who are not also primes to participate in SPI.

Topics addressed during the industry panel included involving small businesses—whether direct or subcontractor—in SPI; overseas direct sales; and how government participation in IPTs impacts negotiation of profit.

ASA (RDA) and AAE Gilbert F. Decker provided closing remarks, thanking the attendees for their participation. He explained that there is plenty of leeway for *regulatory* waivers ***not*** in the law, as long as SPI requires it and the request for waiver makes sense. However, he said, *statutory* waivers are reserved for 'silver bullet' issues and are not addressed below the Secretary of Defense level. "Obviously, the industries that are here to stay have embraced SPI ... Successful leaders don't achieve improvement by issuing memos. They think through the needed changes, and roll up their sleeves and go to work," Decker conluded.

BIOLOGICAL AGENT DETECTION AND THE THIRD REVOLUTION

By Dr. James J. Valdes,
Dr. Peter Emanuel, and
Dr. Mohyee E. Eldefrawi

We are at the dawn of the third revolution of the modern age. The first revolution, known as the industrial revolution, radically changed society by introducing new sources of energy to manufacturing. Its single defining symbol is the steam engine. The second revolution began in the 1950s with the invention of the transistor and continues unabated today. Sometimes called the information revolution, it brought new ways of handling vast amounts of data to manufacturing and is best symbolized by the microchip.

Both the industrial and the information revolutions have significantly altered warfare, the implications of the latter being hotly debated by military and civilian Defense planners even now. Alvin and Heidi Toffler's book, *War and Anti-War,* has been an influential catalyst in the debate over what is now being called Third Wave Warfare.

The third revolution can most properly be called the biological revolution, and traces its origin to the elucidation of the DNA double helix, which stores the information for all life, and the subsequent development of the tools of molecular biology needed to manipulate genetic material. In a sense, the biological revolution is an extension of the information revolution because it allows access to the vast information stored in genes which will allow us to radically remake the biological world. Edward Yoxen referred to the biological world as "a vast organic Lego kit," and technologically advanced nations now have the ability to tailor life forms to order. It is against this backdrop that we have to reconsider the future of biological defense.

Biological agents, unlike chemical agents, are weapons of mass destruction and represent the primary strategic threat against the United States. Live pathogenic agents such as viruses or bacteria are self-replicating, hence very small initial quantities could be used in an attack and the effect amplified by secondary infection as they are passed from person to person. Toxins and bio-active peptides currently used in research may now be produced in large quantities by advanced fermentation processes similar to the process of beer production, and engineered to have precise physico-chemical and pharmacologic properties which could make them a military threat. More recent breakthroughs such as "antisense" technology, a method to turn genes off, suggest the ultimate in biological control, the ability to selectively control gene expression, hence the biochemical processes required to maintain life.

In the mid-1980s, the Army's Edgewood Research, Development and Engineering Center (ERDEC) initiated a program to address the issue of detection of this expanding threat. The primary focus was on the development of immunoassays (i.e., antibodies) for test kits and detectors to detect known agents. Antibodies are molecules created by the body in response to foreign substances, and can be manufactured and used to detect these substances. Realizing that much of the potential threat would remain unknown, a small parallel program was initiated to assess the feasibility of detecting classes of unknown threat agents using another type of biological recognition site (BRS) known as a receptor. In this concept, an array of antibodies and receptors would be coupled to microsensors to detect a broad spectrum of agents; antibodies for the detection of known biological and toxin agents and receptors for classes of agents, both known and unknown.

The emergence of gene probe technology added another BRS to the array which could detect particular sequences of DNA known to be present in certain pathogenic organisms. Immunoassays based on known antibody-antigen reactions, that is, the recognition by the antibody of a particular threat agent, remained the focus because of the maturity of the technology. Whether antibody or receptor based, the philosophy was the same: to mimic the body's exquisitely sensitive response to threat agents.

A brief review of the immune response is in order at this point. The immune system recognizes foreign agents by generating a vast repertoire of antibody molecules. This is done by recombining a finite number of genes. The antibodies are displayed on the surface of B lymphocytes, cells normally found in the immune system, with each B cell expressing only one particular antibody.

When the body is exposed to a foreign material (i.e., the antigen) it selects antibodies which can attack the antigen by proliferation of a particular B cell in response to antibody-antigen binding. The affinity (i.e., sensitivity) of the antibody is gradually increased by random point mutation of the genes and subsequent selection of better antibodies in response to antigen binding. The number of possible genes in this "library," hence the number of possible antibodies which the body can produce (excluding mutations) is large, but finite. The mouse, for example, has approximately 10-100 million in its library. The B cell is therefore the genetic display package in the body.

The practical use of antibodies for diagnostics and therapy was made possible by the development of hybridoma technology in 1975. This is a method to create immortal cell lines which produce antibodies by fusing B cells with cancer cells, the former providing the antibody production capability and the latter immortality. This technology was first extended by somatic cell mutation in which mutants with unique characteris-

In a sense, the biological revolution is an extension of the information revolution because it allows access to the vast information stored in genes which will allow us to radically remake the biological world.

tics are chosen, and refined by cloning hybridoma genes into mammalian or bacterial cells to create either whole antibodies or fragments, respectively.

Hybridoma technology is currently the antibody production method of choice, but has several serious limitations: Immunizing animals is a laborious process which takes months; hybridoma cells are notoriously finicky and must be grown in expensive medium under sterile conditions; genetic drift often results in a cessation of antibody production in otherwise healthy cells; and, finally, yields are fairly low.

In response to these concerns, the ERDEC initiated, in 1993, a new science and technology objective entitled, "Antibody Manufacturing Technology," which focuses on applying the new tools of molecular immunology to the production of recombinant antibodies. This program has several overlapping stages.

As described earlier, the B cell is the body's genetic display package, so the question remains: How does one display antibodies for selection in the laboratory? A bacteriophage is a virus which infects bacteria, but is harmless to humans. The phage has genes which code for a minor coat protein on its surface called cpIII, and a major coat protein called cpVIII. By fusing the gene which codes for an antibody to the coat protein gene, it is possible to make the phage "display" or express the antibody on its surface. The phage thus becomes the genetic display package. The phage with this gene is then isolated by affinity selection using the antigen of interest, and further rounds of selection can be performed to enrich the yield a million fold or more. Thus, even when only a few phage exist in a population of billions with the correct antibody gene, they can be isolated in relatively short order. Bacteria are then infected with the phage for rapid production of the antibody using standard fermentation technology.

It is readily apparent that this technology solves the production problem, because bacteria are cheap and easy to grow in large quantities. However, the process still begins with an immunized animal and a hybridoma cell line, and is therefore time consuming. Hybridomas have subsequently been removed from the process by cloning antibody genes directly from the B lymphocytes, inserting them into phage, and infecting bacteria as before.

The ERDEC, in collaboration with the University of Maryland School of Medicine and the Naval Medical Research Institute (NMRI), has recently produced 40 viable clones which express antibody fragments which bind to botulinum toxin, and are working on a number of other antibodies against potential biological warfare agents. Large scale (i.e., multiple gram quantity) production of these antibodies is currently being scaled up in fermentors at ERDEC's Bioprocess Engineering Facility and at the University of Maryland's Engineering Research Center, and further characterization and selection will be performed. Antibodies can now be produced for biological agent detection much more quickly than with existing hybridoma technology; however, there is still room for improvement.

Current systems of phage display isolate antibodies from animals which will react specifically against the antigen used in immunization. The purpose of the immunization is to increase the representation of antigen-specific lymphocytes, that is, to bias the antibody selection process towards a particular biological agent of interest. These methods, while expedient when compared to traditional methods of hybridoma production, are still contingent upon an immunization schedule which could last for weeks or months, and a knowledge of the identity of the threat. It is likely, given the pace of progress of biotechnology, that a unique threat agent may be encountered to which no detection system has been designed. In this scenario, traditional hybridoma technology could be used to detect this threat, but there may be new approaches which would significantly enhance this capability.

It may now be possible to by-pass animals completely by constructing a synthetic repertoire of antibody genes, eliminating the need to immunize. This "super library" is a collection of all the billion or so possible genetic combinations in the immune system and would not have the limiting bias of an immunized animal, would eliminate the need for injection schedules and harvesting tissues, and could function as a synthetic immune system in which antibody selection occurs *in vitro*. The super library could be prepared in advance and stored until needed, at which time the library would be screened for antibodies which recognize the new agent. Literally billions (trillions, including mutations) of possible antibodies could be rapidly screened and production could commence immediately.

In principle, a single super library could generate human antibodies against any antigen or threat agent that the intact immune system can recognize and would therefore mimic the immune response. The ERDEC and the Scripps Research Institute are currently developing such a super library for biological detection. It is intriguing to note that technology which allows the creation of antibodies de novo could be extended to the creation of structural and catalytic proteins with a myriad of applications as "smart" materials.

In summary, a program is described for the development of antibodies using recombinant DNA techniques which by-passes both traditional hybridoma technology and animals entirely. The system will allow for rapid response to new threat agents, surge production using scale-up fermentation, and will significantly reduce costs by at least an order of magnitude compared to existing technology.

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DR. MOHYEE E. ELDEFRAWI is Professor of Pharmacology and Experimental Therapeutics at the University of Maryland School of Medicine.

OPTICAM: A REVOLUTION IN OPTICS MANUFACTURING

By Dale G. Adams
and Stanley P. Kopacz

Army MANTECH has developed new flexible automated methods for making precision optics which are replacing ancient manual skill techniques.

Introduction

Today, precision optics are found in nearly every military weapon system. An M1 Tank contains approximately 90 lenses, 30 prisms, and an assortment of mirrors, windows and laser components. To image properly, the surfaces of these optics must be shaped to a precision better than one wavelength of light, that is, 0.5 micrometers or 12 microinches.

They must be optically polished to a surface roughness less than 0.0025 micrometers. Spherical (lenses) or flat surfaces (prisms, mirrors) are usually used because these are the easiest and least expensive to manufacture. While these components are made mostly from optical glass they are also made from costly non-glass materials such as Germanium, Zinc Selenide and Neodymium:YAG which play an important role in night vision and rangefinding.

Individual optical component costs range from tens to several thousands of dollars. New performance goals for missile seekers, night vision, laser rangefinder/designators, communications, chemical weapon detection, and helmet displays continuously place greater demands on the precision, quality and capability of the optical elements.

Conventional Optics Fabrication

For hundreds of years, lenses have been made by highly skilled opticians in a complex multi-step process (Figure 1). The optical glass is rough ground to general shape, fine ground, and then polished to final shape and smoothness. The last stage of polishing creates the final shape, determines the surface roughness and removes the layer of subsurface damage left from previous grinding. This is performed for two sides of a lens after which the outside diameter of the lens is ground to align the mechanical center of the lens with its optical axis. The sharp edges are beveled prior to optical coating and assembly. This requires multiple workstations leading to large work-in-process (WIP), queuing delays and attendant management problems.

Specialized tools for fixturing, fine grinding and polishing have to be made for each lens's radius of curvature. This makes small volume production and prototyping very expensive. Pitch materials for fixturing and polishing the workpieces contaminate the optical surface and require environmentally harmful solvents for cleaning between each manufacturing stage.

Conventional fabrication is totally dependent on skilled opticians who can take two years to apprentice. If a new optical material becomes available, it requires time to adapt skill-based techniques to its processing. Dependence on skilled labor makes the domes-

New performance goals for missile seekers, night vision, laser rangefinder/designators, communications, chemical weapon detection, and helmet displays continuously place greater demands on the precision, quality and capability of the optical elements.

tic industry vulnerable to stiff competition from the Pacific Rim pool of cheap labor. Conventional manufacturing is also limited to fabrication of flat and spherical surfaces, a severe problem when facing new demands for novel optical surfaces and shapes.

Center For Optics Manufacturing

Since 1990, the Army's Manufacturing Technology (MANTECH) Program has supported the development of new technologies to address present and future requirements in military optics. The Army Materiel Command (AMC) has provided cornerstone funding to the Center for Optics Manufacturing (COM), based at the University of Rochester in Rochester, NY. Along with the University of Rochester, the Universities of Arizona and Central Florida are among the other academic participants. The American Precision Optics Manufacturers Association (APOMA) provides the industrial participation in the COM. There are presently 100 members who are optics manufacturers and approximately 70 percent are small businesses. The COM's goal is to reinvigorate the U.S. industrial optics base with the introduction of flexible automated computer numerically controlled (CNC) machinery based on deterministic processes to replace dependence on highly skilled opticians. Development of the machines is supported by improved understanding of the process and materials.

Concurrent engineering takes place by review of the development efforts by end users of optics and the optics manufacturers. The COM is recognized worldwide as a Center of Excellence in optics manufacturing. Close involvement of the COM, with its industrial members, speeds implementation and insures relevance of their efforts to industry (Figure 2). The COM is committed to rapid implementation of technology.

Opticam Technology

The new optics fabrication technology developed by the COM is called Opticam (Optics Automation and Management). It is a comprehensive approach employing deterministic processes, CNC machines and flexible tooling. For the first time, flexible automation has eliminated reliance on labor-intensive lens manufacturing processes for glass and other brittle materials. Deterministic processes can be precisely characterized and do not require the constant monitoring and feedback of a skilled optician. Deterministic microgrinding (DMG) is used to shape the workpiece into a lens. Bound diamond abrasive ringtools rotating at 10,000 RPM are precisely fed into a glass blank rotating at 200 revolutions per minute (RPM). DMG is performed on a CNC machining center called the Opticam SX, a five-axis machine (Figure 3) having sub-micron motion accuracies.

Changing the angle between the rotational axes of tool and workpiece can continuously adjust the curvature of the lens surface being fabricated. This eliminates the need for producing and storing specialized tooling for each lens surface radius. Typically, three tools of increasingly finer grit (two micron diamond size for the last stage) are taken from the automatic tool changer and used sequentially to attain final surface figure and smoothness.

Spherical lenses and domes can be ground to net shape. Having RMS roughnesses of three to 10 nanometers, the final surfaces appear polished to the eye. This reduces post-polishing cycle times as much as 80 percent. The Opticam SX can produce lens diameters ranging from 10 to 150mm. The optical figure (in terms of deviation from sphericity) is routinely one-third wave or better, more than adequate for most military lenses. Centering and beveling the lens on the same machine permits 10X improvement over manual methods in dimensional tolerancing. This is an advantage when stringent mechanical tolerancing is required, such as optical domes.

Flexible automation on the Opticam SX allows for precision machining of formerly difficult features into a lens for mechanical positioning purposes. Optics can be machined from many optical glasses and infrared materials such as Germanium, Zinc Selenide, and even Sapphire.

Sapphire has a hardness just below that of diamond. Also, a UV-curing adhesive for fixturing eliminates the use of pitch and the attendant environmental problems from cleaning and solvent disposal. Any CNC machine operator can now make a lens, eliminating the long lead time to train opticians. If a new optical material is introduced, optimum feeds and speeds can be quickly determined and employed on any machine to achieve the same results. An Opticam prism module for fabrications of prisms was introduced in 1993. It has served as a platform for process studies at the COM. Another iteration will be required to develop an affordable design for commercialization.

Opticam In Industry

The first Opticam CNC machine was first introduced in 1992, two years from start of development. The Opticam SX is an affordable second generation design introduced in 1993. Opticam machinery is presently used by 12 U.S. optics manufacturers, eight

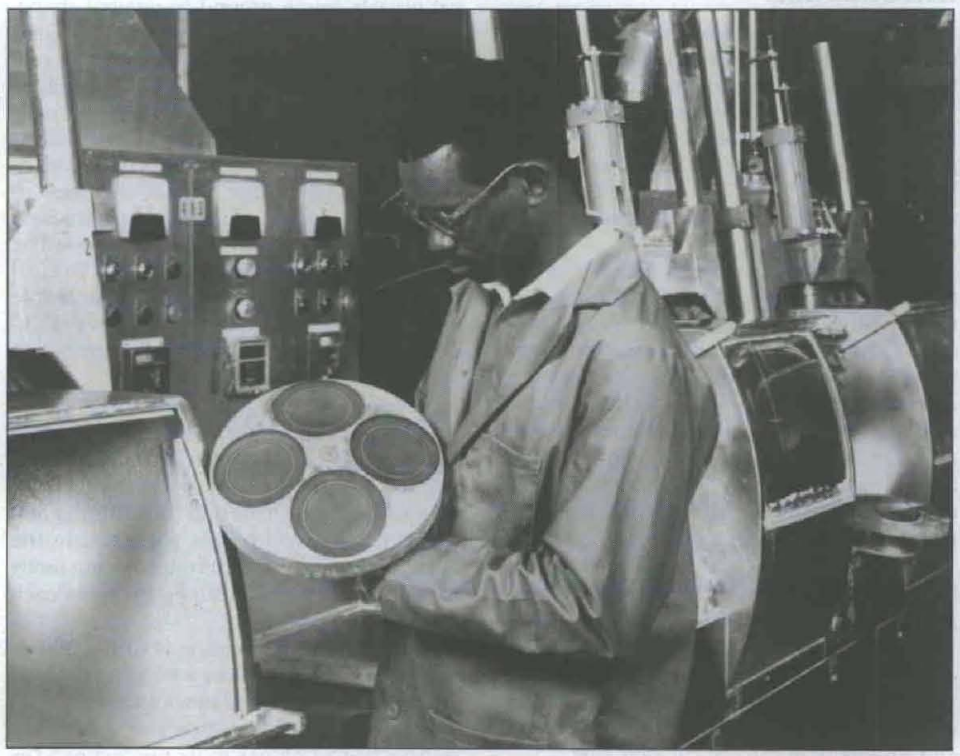


Figure 1.

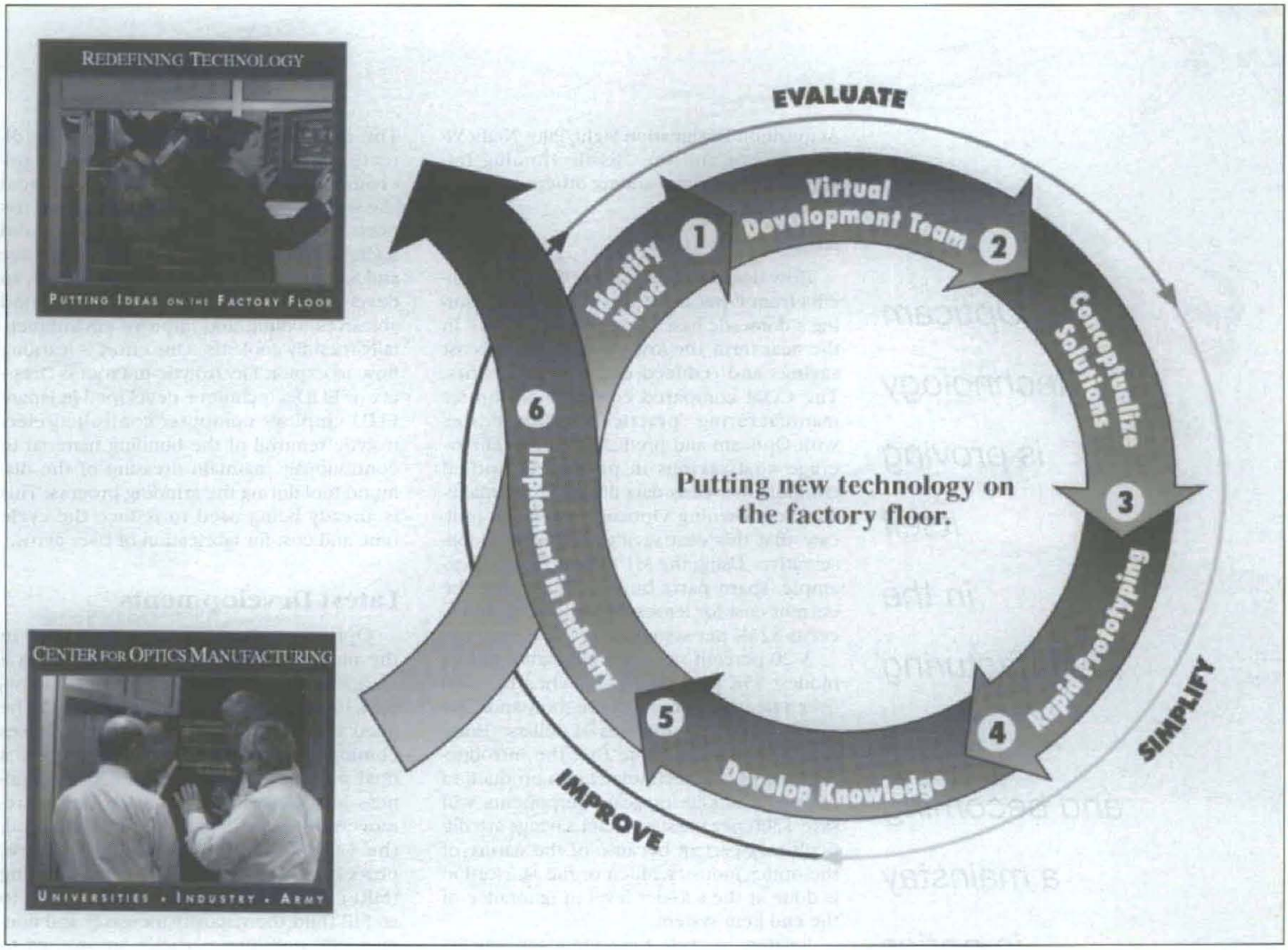


Figure 2.

of whom are small businesses and subtier manufacturers. This provides a new and growing flexible manufacturing base with new capabilities which can quickly be adapted to new requirements for optical materials. Since specialized tooling is no longer required, fast prototyping is now possible and the $20K/lens toolup cost is eliminated. One manufacturer advertised "lenses in a week" vs. the previous wait of four to six weeks.

Flexible automation allows just-in-time manufacturing of optics. Manufacturers have reported that Opticam reduces overall cycle time by 30-60 percent, depending on the material and shape of the optic. Opticam also has a negligible scrap rate, which is particularly important when expensive materials such as Sapphire are involved.

Opticam technology is considered competitive with conventional methods in volumes over a 1,000. Production surges due to mobilization can be met more quickly since CNC operators with general skills can now produce optics. Opticam machinery has produced optics for the Javelin, F-16, Target

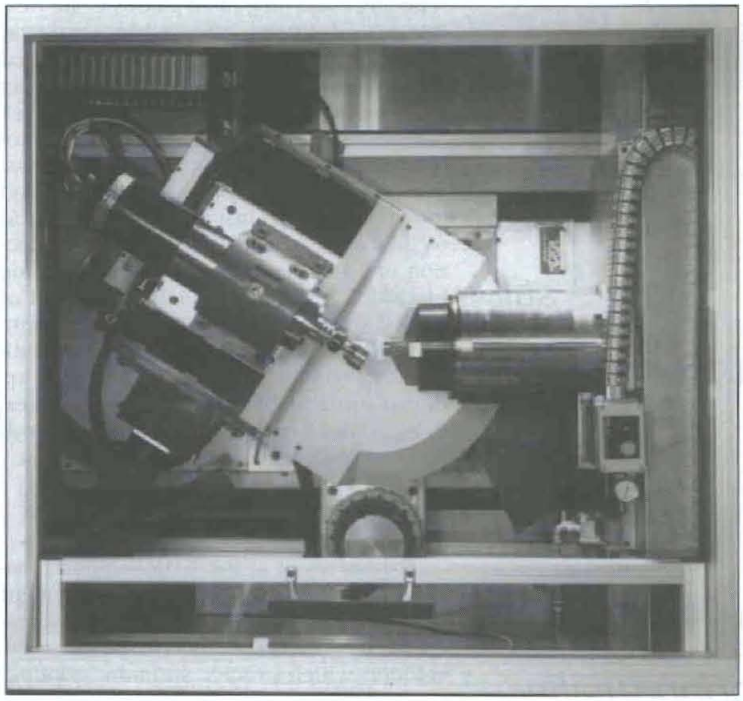


Figure 3.
Opticam SX.

Acquisition Designation Sight/Pilot Night Vision Sensor and the Missile Homing Improvement Program among others.

Military Benefits

How does the Army and DOD realize benefits from Opticam efforts other than assuring a domestic base for supplying needs? In the near term, the Army should realize cost savings and reduced cycle time benefits. The COM compared conventional optics manufacturing practices and processes with Opticam and predicted 20 percent average cost savings in producing optical components. Early data derived from manufacturers owning Opticam machines indicate that this cost savings estimate is conservative. Using the M1 Tank again as an example, spare parts buys indicate that the current cost for lenses and prisms alone exceeds $25K per system.

A 20 percent savings would amount to a modest $5K per system but, when factored over a fleet numbering in the thousands, the savings are in the millions of dollars. Fairly solid estimates indicate that the introduction of Opticam technology into production of Javelin missile optical components will save $200 per missile. Exact savings are difficult to ascertain because of the nature of the optics industry. Much of the fabrication is done at the sub-tier level in ignorance of the end item system.

Relative to cycle time, Opticam benefits should be realized throughout the life cycle, from development through production, to the support of fielded systems. The key to reducing cycle time in all phases is the flexible manufacturing afforded by Opticam, that is, manufacturing what is required when it's needed instead of manufacturing what a machine is tooled for. In the development phase, precision lenses for prototype systems are no longer long lead items. The tooling costs of $20,000 per lens are no longer required. Just in time production techniques are achievable through production of various components on the same machine. In the area of logistics support of fielded systems, smaller spare parts inventories and smaller spare procurement quantities are realizable through significantly reduced turnaround time for spares fabrication and the fact that the quantitative break point for reduced cost is virtually one unit.

Opticam technology is proving itself in the manufacturing arena and becoming a mainstay in optics manufacturing. However there are still technological gaps to be filled and new opportunities.

Process Work At The COM

Process work at the COM supports machine development with the measurement of optical material characteristics as they relate to manufacture. Models have been developed which predict optimum grinding feeds and speeds as a function of glass type. The main part of the effort has been directed at characterizing deterministic microgrinding. Microgrinding of optical glasses from all regions of the glass map has been characterized as well as for infrared materials such as Germanium, Zinc Selenide and Sapphire. There are efforts underway to develop bound polishers, optimize diamond abrasives tooling, and improve environmentally-friendly coolants. One effort is learning how to exploit Electrolytic-In-Process-Dressing or ELID, a technique developed in Japan. ELID employs computer-controlled electrolytic removal of the bonding material to continuously maintain dressing of the diamond tool during the grinding process. This is already being used to reduce the cycle time and cost for fabrication of laser gyros.

Latest Developments

Opticam technology is proving itself in the manufacturing arena and becoming a mainstay in optics manufacturing. However, there are still technological gaps to be filled and new opportunities. Glass lenses coming off an Opticam SX still require a final polishing step to attain RMS roughness less than two nanometers and to remove subsurface damage. Toward this end, the COM is exploiting a deterministic process called magnetorheological finishing (MRF). When a magnetic field is applied to an MR fluid, the viscosity increases and nonmagnetic polishing particles are pushed to the surface. The magnetic field can produce a controllable pressure spot or "work zone" in a stream of MR fluid as it passes across the lens surface.

The COM has already performed process studies on a pre-prototype MRF machine. By computer-controlled positioning of the lens in the stream of MR fluid, RMS roughness better than one nanometer has been attained and axial symmetric error reduced to one-tenth wave. Subsurface damage was eliminated by "DC" removal of two microns of material across the entire surface. This was performed without the need for specialized tooling and a skilled optician. An Opticam MRF prototype was recently delivered to the COM by its subcontractor. Work is proceeding on characterizing and optimizing the MRF process on the prototype which will establish the design of a commercialized version this year.

MANTECH monies for the next two years will support the exploitation of the MRF process. An Opticam microSX for lenses 2-50mm will also be introduced this year. Less expensive than the Opticam SX, it can produce approximately two-thirds of the lenses required by the military and extends Opticam capability to shaping single microlenses.

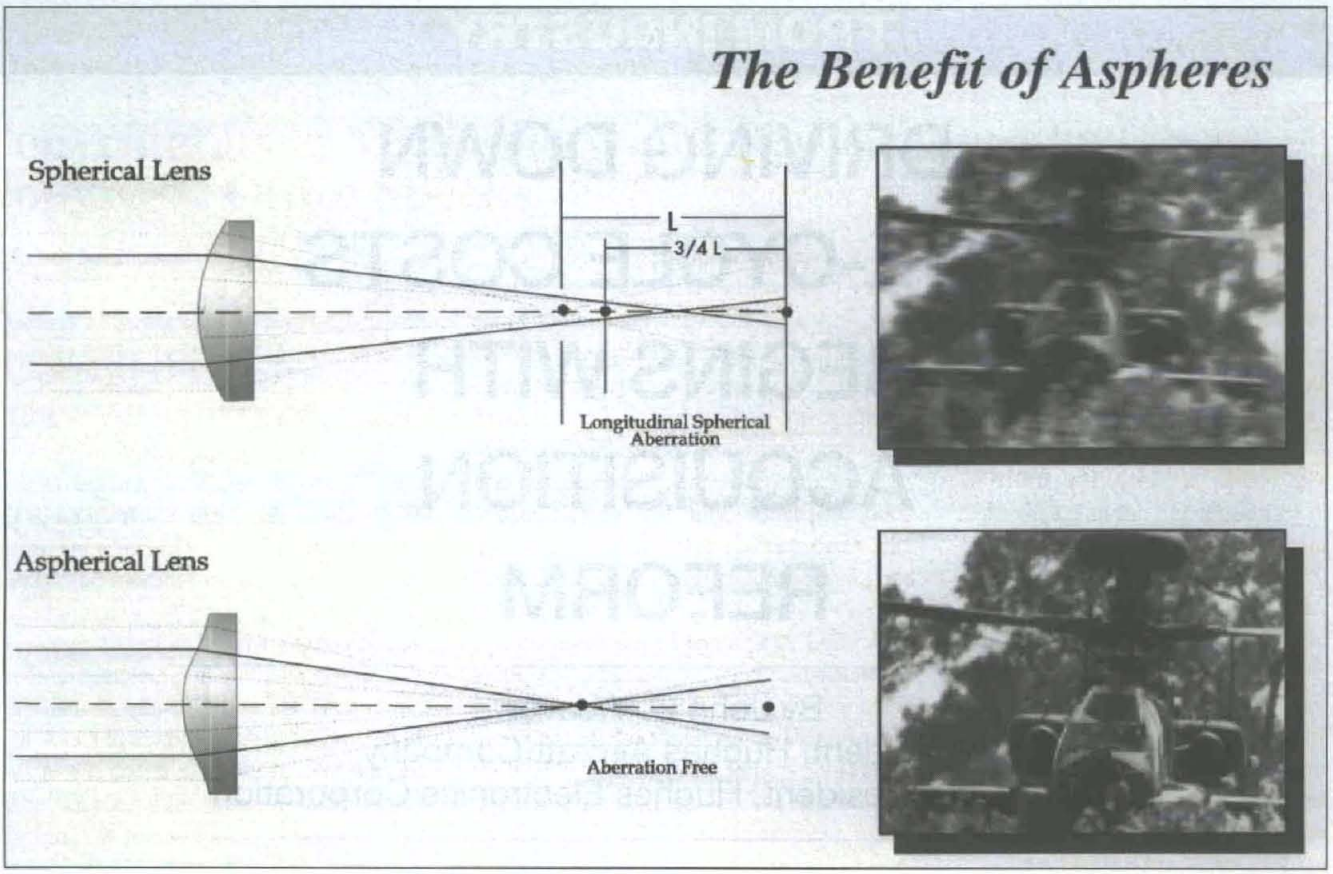


Figure 4.

Future Development: Aspheres And Beyond

The next phase in optics manufacturing will allow the manufacture of affordable aspheric lenses in glass and other brittle materials. Aspheric lenses, having precise and complex deviations from a spherical surface, can bend light more efficiently than conventional lenses (Figure 4). Inclusion of aspheric surfaces in an optical design can image or structure light more effectively while using fewer lenses. Aspheres make possible a whole new range of optical system designs, reducing weight, size and/or the number of lenses in the system. This has already been accomplished with infrared materials like Germanium, which can be made into an asphere by diamond point turning (DPT). DPT is not possible for brittle materials such as optical glass. Modern optical design programs can design systems with glass aspheric lenses but these optics cannot be affordably or consistently fabricated by conventional methods.

A new Technology Reinvestment Project (TRP) from the Defense Advanced Research Projects Agency (DARPA) is being initiated in 1996. This two-year $6M program (50/50 government/industry cost share) will extend Opticam technology to the fabrication of aspheric lenses in glass and brittle materials. This will be accomplished by a combination of DMG for shaping and MRF for polishing. Other efforts under the TRP will address assembly techniques to optimize the performance of the asphere in the optical system. To prove out the technology, several aspheric lenses will be fabricated, assembled into commercial and military optical systems and tested. Commercialization of the manufacturing equipment is expected in 1999. This technology will also support the fabrication of precision dies for molding of plastic and glass aspheric lenses.

Under a three-year DARPA Broad Area Announcement effort, the COM will also initiate the development of methods for fabrication of non-axisymmetric and conformal optics. This extends optics fabrication to shapes possessing no radial symmetry. Non-axisymmetric lenses such as cylinders and toric lenses have different refractive powers along their vertical and horizontal planes. This is effective for shaping semiconductor laser beams, performing optical computing functions and in displays. Conformal optics allow for aerodynamically shaped optical windows, reducing drag for missiles while retaining the imaging performance of the electro-optics package.

Summary

Recent developments in optics manufacturing are replacing skilled labor with flexible automation. First fruits of these developments are already in industry, reducing costs and improving the quality of DOD optics. For the next few years, Army MANTECH monies will complement DARPA efforts, yielding developments which will revolutionize the design of military optical and electro-optical systems and enabling new solutions for cost, size and performance.

DALE G. ADAMS is the Principal Deputy for Acquisition, U.S. Army Materiel Command. He received a bachelor's degree in chemical engineering from Lafayette College and a master's degree in electrical engineering from the New Jersey Institute of Technology.

STANLEY P. KOPACZ is a physicist at the TACOM Research, Development and Engineering Center. He received a bachelor's degree in physics from St. Joseph's University and a master's degree in optical engineering from the University of Rochester.

DRIVING DOWN LIFE-CYCLE COSTS BEGINS WITH ACQUISITION REFORM

By John C. Weaver
President, Hughes Aircraft Company
Senior Vice President, Hughes Electronics Corporation

Acquisition reform is one of several highly effective ways we in industry and our Army customers can join forces to meet DOD's most pressing goal, driving down costs while optimizing military effectiveness. Acquisition reform gets the ball rolling. In addition, we can help by applying the latest in technology and know-how to new weapon systems to cut life-cycle costs at every step along the way from their design, development and production to field operations and maintenance.

So far, the Army has one full-scale acquisition reform pilot program well underway, for its Fire Support Combined Arms Tactical Trainer (FSCATT). Already, it is a proven cost cutter.

Acquisition Reform: The Army Way

Individually, each party to FSCATT's fixed-price contract is benefiting: the Army saves procurement costs and oversight expenses while we at Hughes provide lower contractor compliance costs and a performance-based payment schedule. Together, we and our customer benefit from reduced cycle times for new equipment designs. New technology gets into production and into the field quicker and at lower cost.

One key to success in acquisition reform is elimination of milspecs and standards that don't add value, relying instead on performance specifications. This frees contractors to find innovative and lower-cost solutions to technical issues and systems integration, as well as to take advantage of commercial off-the-shelf products. Side-stepping the need for milspecs and standards also reduces our staffing of integrated product teams. In the FSCATT program, it's greatly decreased our contract deliverables and enabled us to cut data requirements by a factor of eight.

Another key to success in acquisition reform is the replacement of government oversight with an integrated product team approach. All three parties—customer, end user and contractor—work together daily to make sure that what we're building will meet the end user's requirements in the field.

Central to our success is a commitment to mutual trust and communication. Everyone working on the program has a computer link to everyone else's office. When new information becomes available, it's put on an electronic bulletin board that's accessible 24 hours a day. Anyone can respond instantly.

In addition to improving quality and increasing customer satisfaction, our integrated team approach to FSCATT eases the management burden and enables all the parties to more clearly identify, focus on and assess program risks. Our decision process is incremental, building smoothly on prior decisions based on common goals and objectives.

Overall, the FSCATT program's time savings are significant and the cost savings are impressive. Source selection hours are down by nearly one-third, and both development time and development cost are down by more than a third. Consequently, the contract price has been trimmed by better than 13 percent. Concurrently, our quality also is improved because we're applying best commercial practices and technology.

In another Army program, for a new thermal weapons sight, we're applying acquisition reform principles to the way we write requirements for our suppliers. So far, we've cut down a 65-page product spec by two-thirds and our cost savings are estimated in the 7-13 percent range.

In addition to embracing acquisition reform, industry can help the Army achieve additional savings in total life-cycle costs by applying the latest technology and know-how—much of it derived from the commercial side of our business—in ways that hold down the cost of delivering new weapon systems, as well as operating and maintaining them once they are in the field.

Advanced Technologies, Design And Manufacturing Improvements

Today's most advanced technologies—expensive though they may have been to develop—can contribute significantly to reducing weapon systems life-cycle costs. We see as much as 10-fold jumps in performance-to-cost ratios.

They result directly from the use of the latest generation of integrated circuits, micro-miniaturized filters and other devices, digital gate arrays, multi-chip modules, and today's ever-faster information processing techniques. For example, for the Army's Follow-On To TOW (FOTT) missile, we are taking advantage of a signal process chip developed for the automotive industry by Hughes Electronics Corp.

Still another contributor to lowering costs is the application of ongoing improvements in industrial design and manufacturing processes. We apply a variety of the latest tools and techniques: robust design, open architecture, concurrent engineering, six sigma, design for manufacturing and assembly, and strategic sourcing.

In building weapons systems that combine, for instance, electro-optics and radar, we apply common processes from the start, including computer hardware and software, to achieve a seamless interface between our various engineering groups. This helps improve manufacturing efficiency. Early in every program, we extensively test equipment for functionality and reliability. And rather than assemble the first production units in a lab setting, we work to build them in a manufacturing environment so we can apply full production standards right from the start.

Off-The-Shelf Technologies

Off-the-shelf technologies include a whole range of hardware and software that does not have to be developed from scratch. Using off-the-shelf technologies cuts both development time and cost. At Hughes, for example, our design teams now include people trained to spot the potential for design reuse and off-the-shelf technologies. We and other systems integrators increasingly seek ways to incorporate these into new systems we're building for DOD, such as FSCATT.

An example from Westinghouse Electric is a low-cost torpedo defense system made principally from off-the-shelf components. An example from AlliedSignal Aerospace is their adaptation of commercial avionics to military aircraft like the A-6 Intruder. All of us realize that using common systems will keep on contributing to cost reduction generation after generation and product after product.

Quantum Improvements In Reliability

Using such repeatable designs, plus taking advantage of today's increased digitization, miniaturization and improved power supplies, also helps industry build in improved reliability from the get-go. High reliability, for instance, is enabling Hughes to reduce life-cycle costs on various radar systems as we deliver each new set to our military customers.

For the Army, we've achieved a dramatic 13-fold improvement in mean time between failures in the thermal imager for man-portable weapon sights, vastly reducing the number in repair at any one time. Yet the recurring cost of our new thermal weapon sight (TWS) is half that of its predecessor.

Today's most advanced technologies—expensive though they may have been to develop—can contribute significantly to reducing weapon systems life cycle costs. We see as much as 10-fold jumps in performance-to-cost ratios.

Because improved equipment reliability translates directly into less system downtime for the customer, that opens the door to even greater potential cost savings. The Army and other Services can contract with original equipment manufacturers to send equipment back to us for repair, thus reducing their military diagnostic and repair infrastructure and saving the cost of constantly training maintenance personnel.

Service Agreements, Warranties, Etc.

Today, original equipment manufacturers also are increasingly willing to offer up-front "warranties." For example, at Hughes Defense Communications, we are offering to provide communications equipment extended warranties in the new contracts we're bidding on today.

Warranties also can be tied to long-term "reliability improvement" service contracts under which companies guarantee to repair and turn around any failed units at a fixed price while loaning customers spares from inventory. Such "lifetime" service agreements can help dramatically reduce military depot costs. Recently, for instance, Boeing and Allison Engine proposed offering B-52 engines to the Air Force under a commercial lease agreement that would cover the engines' entire life-cycle costs.

Innovative ways to cut costs can be applied at every stage of a weapon system's life cycle, starting with the acquisition process, continuing through design, development and production, and even extending to field operations and maintenance. And DOD's commitment to continue streamlining procurement and acquisition laws, regulations and procedures puts us and the Army on the same path, to drive down total life-cycle costs together while optimizing military effectiveness.

SENIOR RATER POTENTIAL EVALUATION

By Dr. JoeAnne P. Bridge
and Patricia M. McNabb

It is important to recognize that the selection of "best qualified," currently restricted to Acquisition Category I and II program management positions, individuals requires comparison of qualifications of both military and civilian AAC members competing for these critical acquisition positions.

Introduction

By now, most of you have hopefully heard of the Acquisition Senior Rater Potential Evaluation (SRPE), a new personnel tool which is being tested to determine if it accurately evaluates the leadership potential of the acquisition workforce. This article provides some general information on the SRPE initiative to date, and answers some of the common questions encountered during its development and initial testing.

Some common questions are: "What do we need that for?"; "Why another evaluation?"; "What's the difference between this evaluation and the one we already have?"; and "Why do you think it will be better than the current evaluation system?"

Why An SRPE?

The answer is found in the Defense Acquisition Workforce Improvement Act (DAWIA), which requires that the best qualified individuals be selected for acquisition positions: (10 USC Chapter 87 Subchapter II, ...Sections 1722 (a) and (d)):

"The Secretary of Defense, acting through the Under Secretary of Defense for Acquisition, shall ensure that appropriate career paths for civilian and military personnel who wish to pursue careers in acquisition are identified in terms of the education, training, experience, and assignments necessary for career progression of civilians and members of the armed forces to the most senior acquisition positions.... The Secretary of Defense shall ensure that the policies established are designed to provide for the selection of the best qualified individual for a position...."

It is important to recognize that the selection of "best qualified," currently restricted to Acquisition Category I and II program management positions, individuals requires comparison of qualifications of ***both*** military ***and*** civilian AAC members competing for these critical acquisition positions. Current files of military personnel include a senior rater evaluation reflecting ***both*** manner of performance ***and*** demonstrated potential for advancement. However, Total Army Performance Evaluation System (TAPES) ratings are based solely on performance of current job requirements.

The SRPE instrument was developed to provide a civilian rating of potential enabling comparison of military and civilian career management files. The design is closely aligned with the Officer's Record Brief (ORB) to maximize comparability of files submitted to senior acquisition leadership selection boards. However, the SRPE is competency-based, therefore enabling the rater and employee to focus on leadership competencies which may need strengthening through training or education or experience. Any competency rated lower should

(Sep 96)

Oral Communication	Listens to others. Makes clear and effective oral presentations to individuals and groups. (Note: Use of a sign language interpreter may be appropriate for people who are deaf or hard-of-hearing.)
Written Communication	Communicates effectively in writing. Reviews and critiques others' writings.
Problem Solving	Recognizes and defines problems, analyzes relevant information, and encourages alternative solutions and plans to solve problems.
Leadership	Demonstrates and encourages high standards of behavior. Adapts leadership style to situations and people. Empowers, motivates, and guides others.
Interpersonal Skills	Considers and appropriately responds to the needs, feelings, capabilities, and interests of others. Provides feedback and treats others equitably.
Self-Direction	Realistically assesses own strengths, weaknesses, and impact on others. Seeks feedback from others. Works persistently toward a goal. Demonstrates self-confidence, invests in self-development, and manages own time efficiently.
Flexibility	Adapts to changes in the work environment. Effectively copes with stress.
Decisiveness	Take action and risks when needed. Makes difficult decisions when necessary.
Technical Competence	Demonstrates technical proficiency and understanding of its impact in areas of responsibility

Figure 1.
Acquisition Leadership Competencies.

be linked to training requirements in Individual Development Plans.

How Was The Program Developed?

The acquisition potential rating is based on nine leadership competencies (see Figure 1). As you can see, the competencies have been defined, thereby providing benchmarks and enabling consistent ratings among senior ratings. The competencies themselves are the result of an extensive Office of Personnel Management job analysis of supervisory, managerial and executive positions government-wide. Field testing of the SRPE was approved by the Office of the Assistant Secretary of the Army (Manpower and Reserve Affairs) and the Office of General Counsel.

Phase 1 of the SRPE test was conducted at Program Executive Offices (PEOs) and direct reporting Program Manager (PM) offices during the period March through July 1996. Site visits included: the PEOs for Air and Missile Defense and Tactical Missiles, Huntsville, AL; Armored Systems Modernization, Warren MI; Intelligence and Electronic Warfare and Command, Control and Communications Systems, Fort Monmouth, NJ; Field Artillery Systems, Picatinny Arsenal, NJ; and PM Chemical Demilitarization, Aberdeen Proving Ground, MD.

Phase 1 provided input from 45 senior raters and a total of 640 SRPE test ratings. Initial analysis of the ratings and the senior rater comments found the initiative to be a valuable one, but some of the procedures to be cumbersome. The majority of raters agreed with the nine competencies; many would also add some additional competencies (the greatest number suggested adding "team building" and "creative thinking"). Phase 1 ratings were spread over the one-to-five scale to a much greater degree than are TAPES ratings (the vast majority of which are "excellent" ratings). From an evaluation standpoint, these results were very positive, since they show that the rating instrument allows the rater to ***distinguish*** among his or her ratees.

During Phase 2 of the SRPE test, potential ratings will be collected from the senior raters of the AAC ***Corps Eligibles*** and GS-13 AAC members, who are being asked to rate all GS-12 through 15 acquisition workforce employees for whom they are the senior rater. As of press time for this issue of *Army RD&A* magazine, Phase 2 ratings were being entered into a database which will be used to validate the tool.

The "Profile" Part Of The SRPE

One element of the SRPE program design which is directly comparable to the military system is the senior rater profile. This profile provides information on how a particular employee is rated when ***compared to all other employees*** of the same grade that the senior rater has rated over time. Senior raters will also be able to monitor their evaluation distributions on the Senior Rater Profile Report which will be maintained by PERSCOM. Figure 2 is an example of a completed Senior Rater Profile Report, showing (reading across the first row) that this senior rater awarded a total of 11 ratings of "1"

SENIOR RATER PROFILE REPORT
CIVILIAN PERSONNEL REPORTING SYSTEM

A. NAME	B. SSN	C. GRADE	D. DATE OF REPORT
DOE, JOHN L.	123-45-6789	SES	951101

SENIOR RATER PROFILE

GS-12	GS-13	GS-14	GS-15	TOTALS	HIGHEST
	6	3	2	11	1
	31	12	6	49	2
	39	19	11	69	3
	3	2	1	6	4
	1	1	0	2	5
0	80	37	20	137	LOWEST

Figure 2.
Example of a completed Senior Rater Profile Report.

when assessing the ratees' leadership characteristics and qualities. Of this number, six are GS-13s, three GS-14s, and two GS-15s. Reading the columns vertically provides the senior rater profile for each grade.

Evaluating The SRPE Test

The evaluation of the SRPE will be performed by the Director for Acquisition Career Management and the Acquisition Career Management Office (ACMO) in conjunction with the Assistant Secretary of the Army, Manpower and Reserve Affairs (ASA(M&RA)), the proponent for civilian personnel management. The objective of the evaluation is to determine the validity of the instrument and to ensure it does not have any adverse impact. Additionally, narrative information from senior raters filling out the SRPE Attitude Survey will be analyzed for impact on the content and implementing instructions of the program. Upon approval of the SRPE by the ASA(M&RA) and the Office of the General Counsel, the program will be refined and disseminated to the field for implementation. The target date for implementation is no later than fourth quarter FY 97.

Summary

The Senior Rater Potential Evaluation will be an important tool to identify GS-12 through GS-15 acquisition workforce members with the potential to assume positions which demand increased accountability and responsibility. An additional benefit of the initiative will be the identification of training requirements for those employees not rated in the "top block." These requirements can then be addressed in the employee's Individual Development Plan.

Given the dynamics of all the factors which influence the Army acquisition community, it is incumbent on today's leaders to identify and prepare tomorrow's leaders. The technological, social, and economic changes buffeting us today will not abate in the future. They will most likely intensify. Those who will lead the AAC must be as prepared for this ever-changing future as they can be.

Obviously, the success or failure of this initiative is totally dependent on the senior raters...As *the* evaluator, the senior rater must clearly understand the importance of producing objective and consistent ratings of potential leaders of the acquisition workforce.

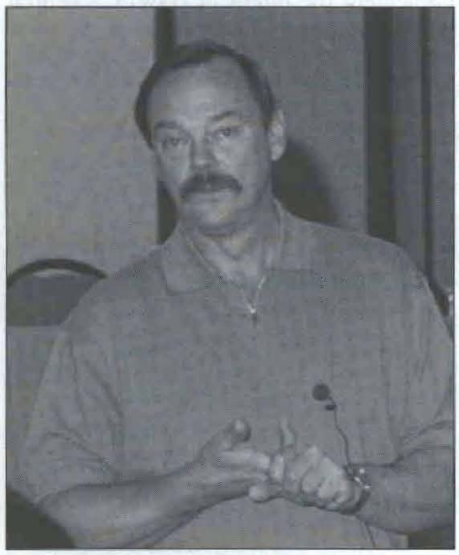
Hopefully, the information contained in this article has answered many of the questions posed about the SRPE. As always, information is key to understanding and accepting change and, as such, we have established the following electronic mailbox: <srpe@sarda.army.mil>. Please send remaining questions to this address.

Thank you to all the senior raters who have participated in the SRPE test. We appreciate all the time you have devoted to rating your employees on their potential and helping us test this new evaluation tool.

DR. JOEANNE P. BRIDGE, a personnel management specialist in the Civilian Acquisition Management Branch of the U.S. Total Army Personnel Command, developed the Senior Rater Potential Evaluation Program. She received her Ph.D. in psychology from California Coast University in Santa Ana, an M.A. in clinical/community psychology from Norfolk State University, and her B.A. in social science from Virginia Wesleyan College.

PATRICIA M. MCNABB is a personnel management specialist in the Policy and Program Development Division, Office of the Assistant Secretary of the Army for Manpower and Reserve Affairs. Since November 1995, she has been detailed to the Army Acquisition Corps Reengineering Team, providing the link between civilian personnel policy and AAC career management initiatives. She holds an M.A. degree in Spanish from Middlebury College and a B.A. degree from Wells College.

ACQUISITION CAREER MANAGEMENT WORKSHOP REVIEWS PROGRESS



Keith Charles, Deputy Director for Acquisition Career Management, OASARDA.

Current and future initiatives impacting the professional development of the Army's civilian acquisition workforce were addressed Sept. 23-25, 1996, at an Army Acquisition Career Management Workshop in San Antonio, TX. Sponsored by Keith Charles, Deputy Director for Acquisition Career Management (DDACM), Office of the Assistant Secretary of the Army (Research, Development and Acquisition), the conference was attended by members of the Army Acquisition Corps (AAC) and Workforce to include Acquisition Career Management Advocates, Functional Acquisition Specialists, and representatives from various Program Executive Officer organizations as well as numerous acquisition career fields.

Shortly after his appointment as the DDACM in September 1995, Keith Charles undertook a series of major initiatives to reengineer management of the civilian component of the Army Acquisition Corps. The San Antonio workshop served, among other things, as a gauge to measure the progress of these initiatives. Additionally, a pre-workshop meeting provided the first opportunity for the new Acquisition Career Management Advocates (ACMAs) to meet as a group with Keith Charles to discuss their roles and responsibilities. (The accompanying sidebar on page 44 lists the new ACMAs and their locations).

In the opening workshop session, Charles noted that the ACMAs should serve as two-way conduits of information between the people they represent and the acquisition leadership. He compared them to the Board of Directors of a major corporation, and the Army acquisition workforce to its stockholders.

A highlight of the ACMA meeting was input from the Fort Monmouth ACMA, Ed Elgart, Director of the Acquisition Center, Communications-Electronics Command (CECOM). Long before the ACMA concept was formally conceived, Elgart was filling that role. His efforts have had a major impact on acquisition reform initiatives at CECOM.

All attendees were welcomed the following morning by Charles, who presented an update on Army Acquisition Corps (AAC) initiatives. Charles emphatically told the attendees, "this is not a headquarters Acquisition Corps—it is your Acquisition Corps. If we have success at headquarters and not in the field, we are a failure, so we need your input." Charles said that when he became DDACM, the civilian component of the AAC was way behind in terms of implementing the intent of the Defense Acquisition Workforce Improvement Act (DAWIA). The AAC reengineering team has worked to improve this. It has been an arduous challenge because the statutory basis for managing civilians is completely different from that of the military.

Participants questioned Charles on how new civilian initiatives would impact civilian mobility in the AAC. Charles said that while there is a new emphasis on broadening the training, education, and experience of civilians through functional, organizational, and geographic mobility, moves are expensive, so civilians will be moved geographically only for one of two reasons: to provide an opportunity to advance an individual's career because that opportunity does not exist in his or her geographical area; or because a particular skill is needed in an area where no one has that skill. Since the inception of DAWIA there have been very few geographical moves, and most were initiated by the individuals involved or were promotions.

A dynamic presentation on mentoring was provided by Dr. John Daly, Professor of Communication, College of Communications, University of Texas. Daly said that good mentors and leaders are optimistic, display a sense of purpose, teach by narratives and examples, and pay rapt attention to their subordinates or followers—they may not agree, but they listen and *understand*. He added that the most critical char-

Figure 1.

acteristic of good leaders is that they need not force people to perform tasks, because they know how to get people to want to do what needs to be done.

Mary Thomas, Deputy Director of the Acquisition Career Management Office, described the programs and players involved in improving the AAC. She discussed senior rater potential evaluation (SRPE); central management; competitive development group; and customer support through ACMAs and customer/field support offices. Thomas emphasized the essential role that the "acquisition career development community" (Figure 1) has played in efforts to reengineer the civilian component of the AAC. She also stressed that in order to fully implement the intent of DAWIA, a central management program is key. Central management is the tool that will enable the AAC to facilitate the career and leadership development of AAC members.

MAJ Jim Ralph, Chief of Information Management and Analysis, Acquisition Career

ACQUISITION CAREER MANAGEMENT ADVOCATES

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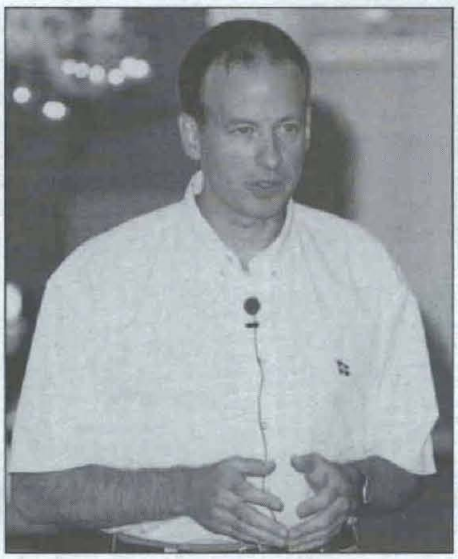
Mary Thomas, Deputy Director of the Acquisition Career Management Office, describes the programs and players involved in improving the AAC.

Pat McNabb, a Personnel Management Specialist in the Policy and Program Development Division, Office of the ASA for Manpower and Reserve Affairs.



MAJ Jim Ralph, Chief of Information Management and Analysis, Acquisition Career Management Office.

Dr. John Daly, Professor of Communication, College of Communications, University of Texas.

Management Office, spoke on information technology for acquisition career management. He stressed the importance of making maximum use of information technology through all phases of the career management process, including accession, certification, training, information and communication. Ralph said that the team is working to improve both the quality and quantity of civilian data. "Without good quality data, we'll have central *mis*management," he added. According to Ralph, the U.S. Army Research, Development and Acquisition Information Systems Activity in Radford, VA, is a valuable asset in making these improvements.

The workshop closed with a discussion of issues raised during the three-day session. Key participants in this discussion were Keith Charles, Mary Thomas, and Pat McNabb, a Personnel Management Specialist in the Policy and Program Development Division, Office of the Assistant Secretary of the Army for Manpower and Reserve Affairs. In his closing comments, Charles reiterated the importance of feedback, noting that individuals in the field can provide ideas that would not occur to those in the headquarters.

Charles also discussed the importance of mentoring for civilians in the AAC and workforce, noting, "Mentors can get you through times in your career that you would not survive on your own." Studies of successful professionals who have had mentors show that it was the guidance received from a mentor that made the difference in their careers. A mentor should be chosen *by the mentoree,* he said. The best relationships grow informally through mutual interest and respect.

McNabb addressed questions raised by the participants on quality achievement factors (QAFs) and the SRPE. She emphasized that QAFs are career management goals, designed to make one competitive in filling leadership positions within the acquisition community. The factors themselves are not mandatory requirements, nor will they be used for promotion or board screening purposes. QAFs comprise a "road map to success" to guide an acquisition employee in terms of training, education and experience through his or her career.

McNabb described the senior rater potential evaluation as a tool to measure an individual's readiness for increased responsibility. She added that the SRPE was developed to provide a civilian rating of potential, enabling comparison of military and civilian career management files. (see Senior Rater Potential Evaluation article on page 40)

Mary Thomas closed the conference with brief summary remarks, restating the importance of communication and the plan to improve it through customer support, and the newly-identified ACMAs. Thomas commented on a Civilian Army Acquisition Workforce Survey which has been distributed to the Acquisition Workforce to assess the effectiveness of efforts to communicate new and existing acquisition career management initiatives. She stated that the results of this survey will be used to identify ways to improve two-way communications within the acquisition community. Thomas concluded by inviting the attendees to visit the Army Acquisition Corps' display, "Developing the People Who Develop the Systems," at the 1996 Association of the U.S. Army annual meeting which was held Oct. 14-16, 1996, in Washington, DC.

Tactical Missiles PEO George Williams Retires With Honors

Former Program Executive Officer for Tactical Missiles George Williams (shown in the center with his wife Margo) received the Army Acquisition Executive Award for Excellence in Acquisition Management at his retirement ceremony July 18, 1996. Assistant Secretary of the Army for Research, Development and Acquisition Gilbert F. Decker (shown left) recognized Williams for his outstanding accomplishments and contributions in improving Army acquisition management and for his achievements and dedication in the development of the Army acquisition workforce. This award was specifically named for Williams who, throughout his Army career, demonstrated extraordinary excellence in both the technical and managerial aspects of all assignments, while exhibiting the highest standards of personal dedication and integrity. Williams was praised as a leader, a mentor and a true model of an acquisition professional.

How Best Can The Army Maximize The Return On Its R&D Investment?

Keith Charles
Deputy Assistant Secretary
(Plans, Programs, and Policy)
Office, Assistant Secretary
Of the Army (RDA)
The Pentagon

We owe it to soldiers to provide them the equipment they need. We have, and we will continue to look for, ways to better use every dollar provided for modernization—and I do mean every dollar. In our most recent POM, FY98-03, we instituted efficiencies in the neighborhood of $2 billion for the Army. While it is easy to say these were RDA efficiencies and RDA should get to keep them, we must not become a prisoner to this type of thinking. Yes, one needs money to make money. Just as one must have money to invest in preparation for change and to reap continued efficiencies. We must find incentives and keep part of our efficiencies to invest and reap future efficiencies. But, more importantly, no, most importantly, we have invested many dollars in the development of a professional acquisition corps; and, we will continue to make this investment. Our biggest return will come from this investment—it will come from YOU. After all, it will be you who finds new ways to be more efficient while maintaining or increasing our effectiveness.

In the recent past, we have avoided numerous costs and obtained modest cost savings through acquisition reform, multi-year procurements, and realignments. We will continue to see efficiencies from these types of activities, but if we are to see significant change or significant efficiency it must come from outside the box. This will require the breaking of some "rice bowls." A lot of the ideas that we need to implement are not new. We just need to pull them from the file drawer, dust them off, and work to make them a reality. These, too, will require our investment of time and money.

I know you are up to the challenge and will continue to find better ways to use our RDA moneys.

Dr. Kenneth J. Oscar
Deputy Assistant Secretary
(Procurement)
Office, Assistant Secretary
Of the Army (RDA)

The return on R&D investments can be maximized by rapidly developing and inserting technology across the force, conducting efficient development programs, and keeping the force modernized through technology upgrades for spares.

Significant efforts are now underway to infuse technology in the Force XXI process. An Army Acquisition Reform Reinvention Laboratory has been established to rapidly acquire more affordable, technologically current equipment for fielding the first Army XXI division on Sept. 30, 2000.

The use of performance specifications, commercial technologies and processes, more efficient business practices, and integrated product teams in development programs is paying dividends in improved efficiencies, which both save costs and avoid incurring future costs. Over the FY98-03 POM period and beyond, cost reductions of $8.3 billion have been realized on 68 systems programs. Savings have been reinvested to accelerate programs, undertake technological enhancements and reduce unit costs.

Under a build-to-print technical data package acquisition, the Army has to pay R&D costs to upgrade its spares. The use of performance specifications for spares acquisition permits a continuous upgrade to current technology, which will reduce acquisition and support costs and improve performance. Spares acquisitions should be made to form, fit and function requirements to enable manufacturers to propose their latest models.

Dr. Lewis E. Link Jr.
Director of Research and Development
U.S. Army Corps of Engineers

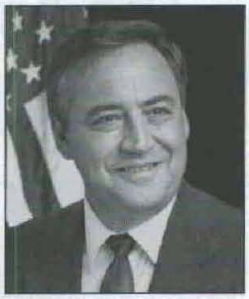
The Army's R&D investment has been and remains considerable. The return on that investment is best measured by the ultimate impact on the capability of the customer, our operational forces. It is often difficult to establish, however, a direct return on investment for an individual research effort because of the complexity of the problems addressed, the utility of an individual advancement to multiple issues and the need for multiple advancements to create a significant increase in operational capability. It is not difficult, however, to specify key ingredients to achieving success. In my experience, two of the most important are quality people and research programs that have a significant component of direct customer funding. These have been icons of the Corps of Engineers R&D programs and have served them well.

Quality people are the single most important asset for achieving maximum return on investment. It is imperative that the Army sustain a state-of-the-art expertise in technology areas relevant to current and future missions. Having a recognized in-house expertise is not only critical to the most productive use of unique Army R&D facilities, but also for effective interaction with experts in other government agencies, the private sector, and academia. Providing the opportunity for Army scientists and engineers to spend a significant proportion of their time conducting research in a quality R&D infrastructure is a key to both attracting and retaining the best people.

A significant portion of any research program should be customer driven and funded. There is no better way for the customer to get what they want or for the research community to maintain a sense of urgency, competitive business practices, and a focus on the ultimate product. Research addressing complex problems also needs funding from more generic sources (i.e., the technology base program) to facilitate the more general advances in understanding that are the basic building blocks of increased capabilities. The combination of these funding schemes is a powerful approach for both the customer and the research community.

SPEAKING OUT

Robert F. Giordano
Director
Research, Development and Engineering Center
Army Communications-Electronics Command, Fort Monmouth, NJ



The CECOM Research, Development and Engineering Center (CERDEC) is pursuing a wide range of enhancements to the Army's Command and Control, Communications, Computers, Intelligence, Electronic Warfare and Sensors (C^4IEWS) capabilities. These technologies promise a dramatic improvement for the Army of the 21st century. In order to maximize the return on the Army's R&D investment, we must expedite the insertion of technology into existing products; provide new technology for the future; capitalize on the information technology "explosion"; build a flexible infrastructure and architecture for all Army systems; integrate military and commercial technology and integrate new technology with emerging doctrine.

CERDEC has captured the essence of the Army's Training and Doctrine Command, program executive officers, and industry; extending our significant technical capability to the field by "deploying" our technical workforce; pursuing relevant technology by listening to our users; emphasizing the application of technology vs. technology generation to expedite products; providing capability improvements now by establishing "Beta" sites with users for technology evaluations; maximizing use of commercial technology and leveraging ongoing efforts within DOD. We have also implemented a 12-point business strategy which is intended to maximize CERDEC's return on R&D investment. The 12 points include: integrated product teams; customer focus; establishing a presence with the user; reducing infrastructure; saving money by modeling and simulation, interconnected/distributed labs; developing a flexible architecture to build on; use of commercial standards; buying commercial, adapting commercial; focusing on dual-use technologies; forming strategic alliances and software commonality and reuse.

Thus far, this strategy has been successful by maximizing my return on investment in order to meet the challenges of force digitization for the Army of the 21st century. Concepts and hardware were tested and evaluated in my Digital Integrated Laboratory, bringing the developer and user together for Prairie Warrior, Warrior Focus, Focused Dispatch, Unified Endeavor, and JWID. The process continues for Task Force XXI and beyond. Only through a mutual understanding and commitment between government and industry can we best maximize our return on the R&D investment.

NEWS BRIEFS

AMC Recognizes 1995 PMs Of The Year

COL James B. Cross, Project Manager for Mobile Electric Power, was selected as the 1995 U.S. Army Materiel Command (AMC) Project Manager of the Year and LTC Walter B. Reading, Product Manager for Construction Equipment and Materials Handling Equipment, was selected as the 1995 AMC Product Manager of the Year. The selections were announced at the 1st Annual PM Conference in November 1995.

COL Cross was cited for visionary leadership in the total life cycle management and standardization for mobile electric power generating sources within the DOD, valued at $25 million in research, development, test, and engineering and $1 billion in procurement programs.

LTC Reading was recognized for deftly managing 20 different systems, spanning all phases of the life cycle with an estimated value of more than $700 million.

The second Annual AMC PM Conference was held Oct. 22, 1996. Announcements of the 1996 AMC PM winners will be publicized in a future issue of *Army RD&A* magazine.

TACOM Awards DEUCE Production Contract

The U.S. Army Tank-automotive and Armaments Command (TACOM) has awarded Caterpillar Inc. of Peoria, IL, a contract option for production and testing of a revolutionary high-speed, rubber-tracked bulldozer. "Caterpillar will produce 15 of the Deployable Universal Combat Earthmover, or DEUCE, bulldozers and deliver them to the Army beginning in May 1997 for testing and fielding to the Army's elite light infantry and airborne combat engineers," says CPT John Koetz, Assistant Product Manager for Construction Equipment.

According to Koetz, the DEUCE can be parachute dropped into a combat zone and, thanks to its rubber tracks, can travel at speeds of up to 30 mph without being hauled by truck and trailer as with other bulldozers. This reduces the number of pieces of equipment Army engineers need to deploy, and reduces the time and number of aircraft required to transport units to new theaters of operations. The DEUCE also provides improved operator controls and operator compartment for increased bulldozing efficiency, improved operator comfort, and reduced operator training requirements. It also features advanced communications and global positioning systems to enhance the Army's capabilities on future battlefields.

The Army plans to issue DEUCEs to its light infantry and airborne units, beginning with the 10th Mountain Division, Light Infantry, Fort Drum, NY, and the famed 82d Airborne Division, Fort Bragg, NC, in 1998, says Koetz, adding, the DEUCE will be used in combat engineer units to accomplish their missions—to prepare airstrips, roads, and protective positions in combat environments.

The contract awarded to Caterpillar is a production option to an existing 1995 research and development contract for the development production of prototypes, and testing of the DEUCE. The production option awarded is valued at $8.7 million, and is the first of several such options to the contract. The 1995 contract, valued at $3.3 million, was a competitive solicitation to which Caterpillar was the only respondent. The total contract, with all options, is valued at over $56.6 million over the next four years. Koetz says, the Army has a requirement for 184 DEUCE bulldozers and is planning to purchase DEUCEs through the year 2003 subject to availability of funds.

Caterpillar's non-developmental item (NDI) DEUCE is an integration of commercial components and technologies, used throughout their other lines of construction equipment. Caterpillar's Defense and Federal Products Group, Mossville, IL, manages the development and production program and plans to build the DEUCEs at its Caterpillar Paving Products facility in Minneapolis, MN.

The Army DEUCE program, which is managed by the Project Manager for Tank-Automotive Weapon Systems and the Product Manager, Construction Equipment/Materials Handling Equipment, is heralded as a successful example of the Army's acquisition reform efforts.

From The AAC Career Manager...

From the Director, Acquisition Career Management Office...

Significant changes are transforming both the military and civilian sectors of the Army Acquisition Corps (AAC). On Aug. 30, 1996, the Chief of Staff, Army approved a plan to return approximately 186 year group 76-83 officers back to their basic branches. While that process is well underway, we are doing everything possible to assist the AAC officers facing the transfer board selection process. One important means of assisting these officers is to keep the communications lines open and to put out all available information to the Corps. The Acquisition Career Management Office (ACMO), working with the Military Acquisition Management Branch at PERSCOM, stands ready to assist where possible. The following article by MAJ(P) Jesse Stone with frequently asked questions from the field further explains the downsizing decision and the transfer board process.

Our AAC Reengineering Team has defined and refined many exciting initiatives which can produce the civilian acquisition leaders that our Army needs for the future. We have dialoged on these initiatives with the Civilian Acquisition Management Branch of PERSCOM, functional chiefs from the various civilian career programs, and the Office of the Assistant Secretary of the Army (Manpower and Reserve Affairs). As we continue to move forward we will decide which of these initiatives to implement such as the senior rater potential evaluation (see article on page 40.), and work to ensure that they create a positive impact on the field. In addition, the Reengineering Team has now moved to the Pentagon and will begin to integrate some of its common functions with its military proponency counterpart. The article on page 54 explains in greater detail what the ACMO is doing for the entire Army Acquisition Corps and Workforce.

Finally, and most importantly, we continue to seek your input and ideas to ensure that service to you, our customers, is continually improved. We are your advocates during these turbulent and bewildering times. Managing rather than reacting to change is our goal. Don't hesitate to make your voice heard. Let us know when we come up with a good idea, just as you let us know when we come up with a bad one! You too have a stake in developing future acquisition leaders!

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AAC Postures For Success In The 21st Century

On Aug. 30, 1996, the Chief of Staff of the Army (CSA) approved a plan to downsize the Army Acquisition Corps (AAC). The objective of the plan is to reshape the AAC by aligning the number of officers in each year group (YG) with current requirements. This article answers questions AAC officers might have about the plan and how it will be implemented.

Why "Size" The Army Acquisition Corps?

Figure 1 shows the effect on the AAC of earlier decisions to downsize the Army. AAC officer strengths were set in 1990, with the anticipation of a likely reduction in the Army, but did not forecast the full magnitude of the actual drawdown. In 1994, the Army Deputy Chief of Staff for Personnel, in coordination with the Director, Acquisition Career Management, reset the target for AAC colonels from 250 to 215. At the same time it was agreed to reduce the AAC officer inventory to 2000 by the year 2000. The AAC immediately reduced annual accessions from 194 to 154 to align newly accessed year groups with the new inventory requirement. No action was taken at that time to further reduce the existing officer inventory. We have already seen the result in declining promotion rates. Without immediate action, AAC promotion selection rates will fall well below the Army average to the detriment of our younger officers and the future of the AAC.

How Will Overstrength Year Groups Be Sized?

The CSA-approved plan will allow AAC officers in overstrength year groups, regardless of their basic branch, to voluntarily return to their basic branch. If the number of volunteers in each year group is insufficient, a transfer board will convene to select AAC officers for transfer to their basic branch control. The objective of the transfer board will be to select officers for transfer who can best serve the Army in their basic branches and will be least disadvantaged by the transfer. Criteria to be considered will include basic branch inventory requirements and an individual officer's basic branch qualifications and experience vs. his or her AAC qualifications and experience. An officer's year group will be identified by his or her date of rank.

Figure 2 depicts the strategy for reductions based on each year group's current career mark. At the top of Figure 2, we show how each overstrength year group aligns with upcoming promotion boards. The number of officers identified as overstrength in each year group will be met by either voluntary transfers or, if necessary, by officers selected for transfer by the board. Since the career status of year groups differ, separate strategies were developed:

YG 75 and 81: Promotion boards will size YGs 75 and 81. For YG 75, already a small year group, we expect a selection rate slightly below the Army average. By implementing the plan to transfer the AAC officers in FY 97, we anticipate promotion requirements will support approximately a 50 percent select rate for YG 81. YG 81's selection rate to lieutenant colonel will likely be about 10 percent below the Army average. The actual select rates could vary based upon changes in lieutenant colonel requirements and the eligible population. These select rates will balance both year groups with requirements.

YGs 76-78: Lieutenant colonels in YGs 76-78 have had at least two looks from program manager and command (PM/CMD)

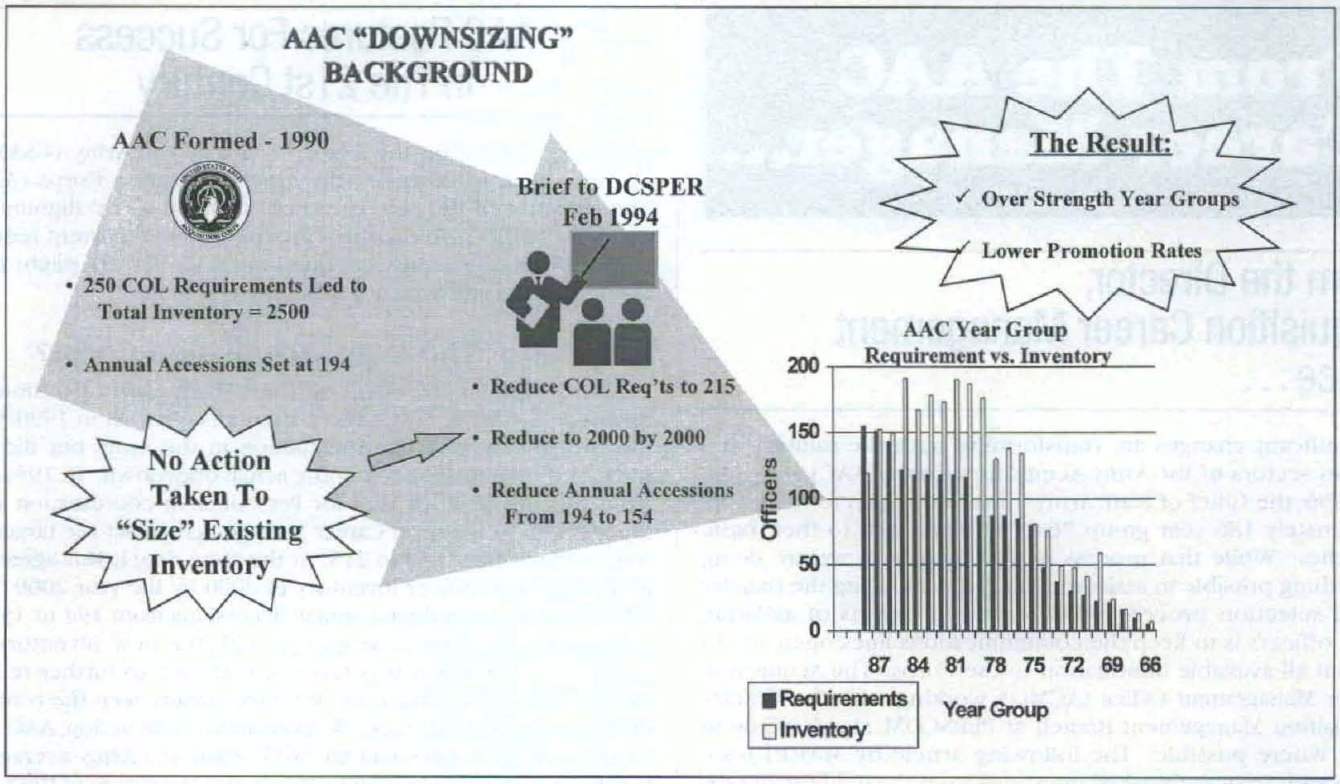

Figure 1.

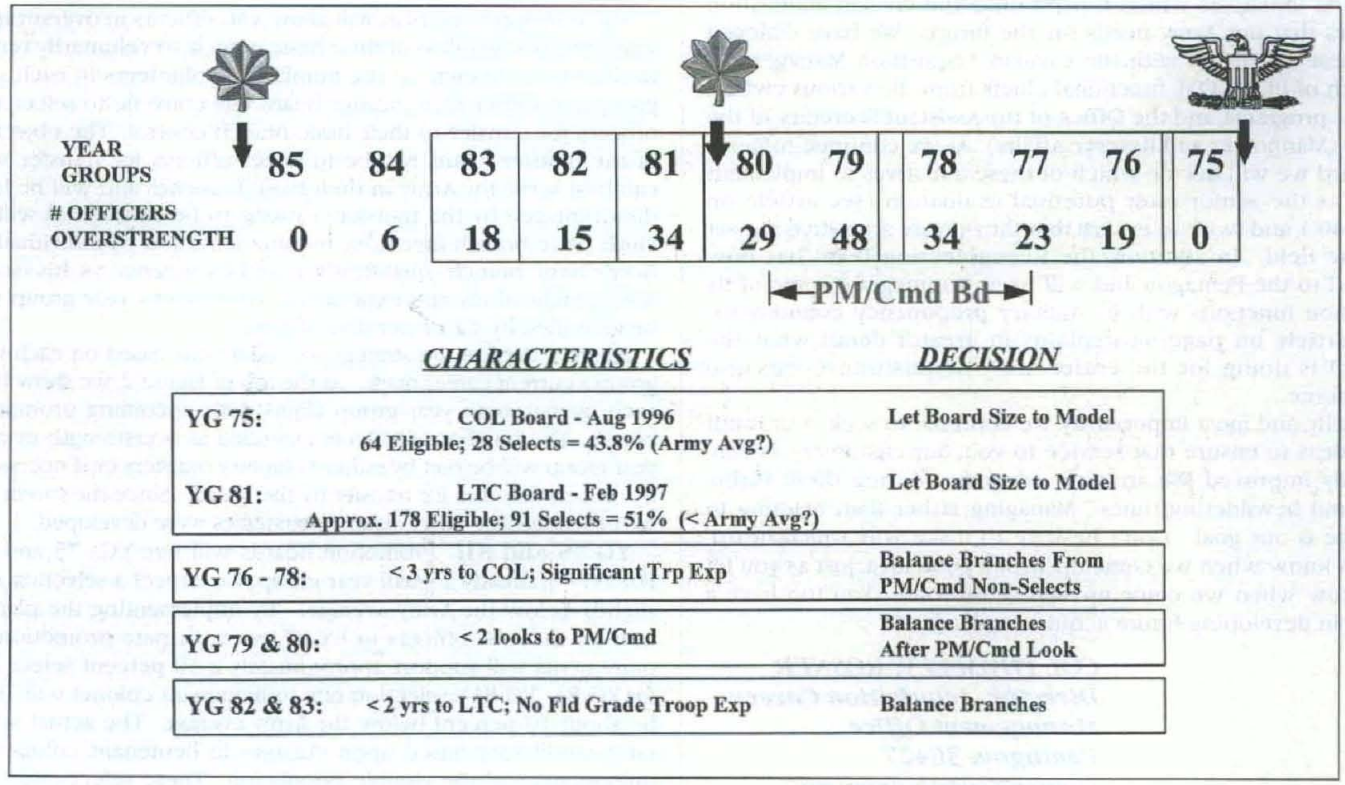

Figure 2.

boards. The eligible population will come from officers who have either declined PM/CMD, not been selected for a PM/CMD, or not in the upper 1/3 of the PM/CMD alternate list.

YGs 79 and 80: Officers in YGs 79 and 80 have had either one or no looks for PM/CMD. They will be allowed to go before the December 1996 PM/CMD board with officers not selected, or not in the upper 1/3 of the PM/CMD alternate list, becoming the eligible population for a transfer board scheduled for June of next year.

YGs 82 and 83: All majors in YGs 82 and 83 will be considered for transfer based on basic branch requirements and their determined ability to contribute to their basic branch based on recent experience and training.

YGs 84 and 85: YGs 84-90 have been properly sized through accessions and involuntary officer reductions are not anticipated.

When Will The Transfer Boards Meet?

The plan calls for two transfer boards. Board 1 will convene Nov. 18, 1996, to consider YGs 76, 77, 78, 82, and 83. Board 2 will consider YGs 79 and 80 in June, 1997. Figure 3 shows the Transfer Board Schedule.

What Can An AAC Officer Expect In The Future As A Result Of Downsizing Overstrength Year Groups?

Figure 4 shows the expected result of downsizing overstrength year groups. Majors can expect to get promoted largely based on their performance in basic branch assignments. With continued quality accessions, we expect to see AAC promotions

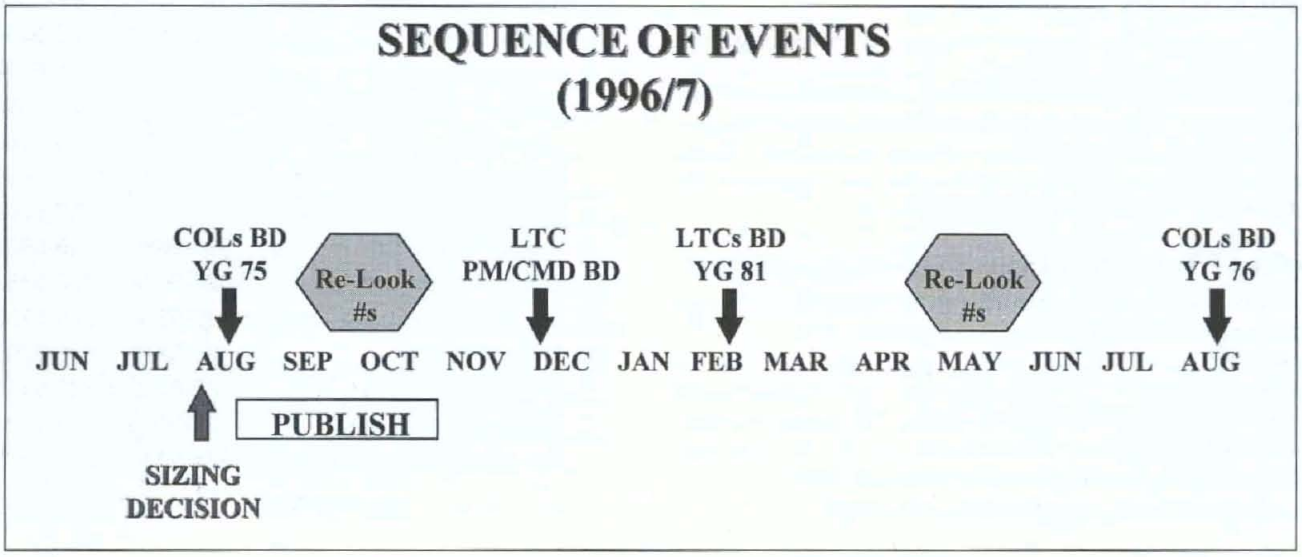

Figure 3.

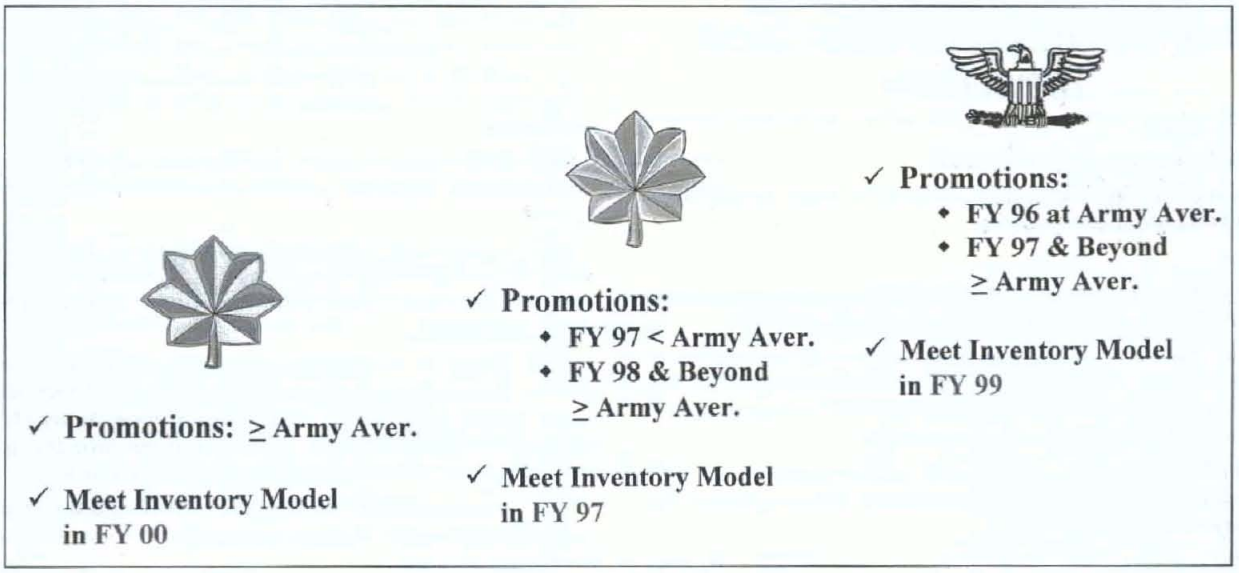

Figure 4.

to major at or above the Army average. Once YGs 82-76 are properly sized, we expect promotions to lieutenant colonel and colonel to be at or above the Army average.

What Will Happen If I Am Selected For Transfer?

You will be notified approximately three weeks after the board adjourns and your file will immediately be transferred back to your basic branch for assignment consideration. Officers who are selected for transfer by the board can expect to begin discussing their next assignment with their branch managers upon notification. Current stabilization rules are not affected by this transfer action. Officers will normally be allowed to complete 24 months at their current location before they are reassigned. Officers may elect to move sooner to fill branch qualifying positions.

Should I Contact My Basic Branch Career Manager To Discuss What Branch Assignments Are Available?

Yes. For many officers, this is an opportunity to serve again in challenging basic branch assignments. In branches with severe shortages, branch qualification as a major may remain possible. Volunteering may also open up the opportunity to serve in geographical locations other than those offered by the AAC. There may be some advantage to officers who volunteer and begin discussing possible basic branch assignments early.

Who Can I Talk To If I Have Other Questions?

Contact your AAC or basic branch career manager. Telephone numbers are provided in the listing on the right.

The preceding article was written by MAJ(P) Jesse M. Stone, the FA 53 and 97 LTC Assignment Officer at the Total Army Personnel Command. He holds a B.S. degree in business administration from The Citadel, an M.S. in materiel acquisition management from the Florida Institute of Technology, and an M.B.A. from Monmouth College.

PERSCOM
CAREER MANAGER PHONE NUMBERS
Commercial: (703) 325-xxxxx
DSN 221-xxxx

AAC	Majors	LTCs
FA51	325-3128	325-3129
FA53	325-3128	325-3124
FA97	325-3128	325-3124

Branch	Majors	LTCs
Air Defense Artillery Branch	325-0025	325-0026
Field Artillery Branch	325-5375	325-5374
Infantry Branch	325-5522	325-5524
Armor Branch	325-5530	325-5531
Aviation Branch	325-5669	325-6194
Special Forces Branch	325-3169	325-3169
Chemical Branch	325-5687	325-5686
Engineer Branch	325-5697	325-5696
Military Intelligence Branch	325-5503	325-5504
Military Police Branch	325-5689	325-5689
Signal Branch	325-5684	325-5683
Adjutant General Branch	325-5270	325-5272
Finance Branch	325-5293	325-5293
Ordnance Branch	325-8119	325-8119
Quartermaster Branch	325-5267	325-5266
Transportation Branch	325-5280	325-5279

Frequently Asked Questions About The Army Acquisition Corps Drawdown

Size And Shape Of The AAC

Q: ***Is the current requirement for 215 Army Acquisition Corps (AAC) colonels stable?***

A: Yes.

Q: ***Will the 215 AAC colonel positions erode if civilians are selected as the result of "best qualified" boards?***

A: No. There is a constant demand for colonels to fill good acquisition vacancies. The number of military colonel-level PMs may go down slightly, but the opportunities for PM/Command will remain significantly higher than most branches.

Q: ***Will there be an adjustment of the numbers of officers in each of the three AAC functional areas—FA 51, 53, and 97—after the downsizing?***

A: The U.S. Total Army Personnel Command (PERSCOM) does not anticipate the need to balance the functional areas after the transfer board. To date, there has not been an exodus from any one AAC functional area. As part of the transfer board process, the distribution of officers selected for transfer will be examined to determine if one functional area has been disproportionately affected by the transfer process. Although we do not anticipate it, the board could make minor adjustments, if necessary, to balance the functional areas.

Q: ***If the entire Army end strength is cut after the November 1996 elections, will the AAC have to go through this again?***

A: Current AAC downsizing efforts allow us to withstand another 10 percent (50K) cut in the Army. If the Army is cut by more than 50K, reduction plans for the rest of the officer corps will also apply to the AAC.

Q: ***Won't we need more AAC officers to acquire new superior technologies if we downsize the Army and move more of our Operations and Maintenance, Army (OMA) and Military Personnel, Army (MPA) dollars into the Research, Development, and Acquisition (RD&A) accounts?***

A: Not necessarily. The downsized AAC and the Army Acquisition Workforce (AAW) have enough capacity to handle increases to the RD&A accounts.

Year Group 81

Q: ***The YG 81 AAC population will be "sized" by the lieutenant colonel (LTC) promotion board in February 1997. Aren't volunteers from YG 81 being accepted for transfer back to their basic branches?***

A: PERSCOM will consider requests for branch transfers from YG 81 officers prior to the February 1997 LTC promotion board. The FY 81 officers should understand, however, that the probability of selection to lieutenant colonel in an officer's basic branch is lower without a branch qualifying job (i.e., BN XO/S-3) as a field grade officer.

Q: ***When will the FY 97 LTC promotion board results be announced?***

A: Early June 1997.

Q: ***Will YG 81 officers not selected for promotion to LTC be offered selective continuation?***

A: We don't know yet. We hope that selective continuation will be offered and that the AAC funtional areas will be included. However, there is no guarantee that selective continuation will be available to any branch. We expect the decision to be made shortly before the February 1997 promotion board.

Early Retirement

Q: ***If early retirement were offered, wouldn't some of the overstrength year groups size themselves? Will early retirement continue?***

A: By law, Temporary Early Retirement Authority expires in FY 99 and indications are that early retirement won't be offered beyond FY 97. However, we are hopeful that this will change. Officers with questions can contact PERSCOM's Retirements Branch at (703)325-5704 for the latest information and for assistance in making retirement decisions.

Transfer Boards (YGs 76-80 And 82-83)

Q: ***Will calls be made to officers "in jeopardy of transfer" before the boards meet (similar to calls before a selective early retirement board)?***

A: PERSCOM may call officers in shortage branches if volunteers are insufficient in a particular year group. The purpose of the call would be to have officers with the greatest potential for success in their basic branches consider the benefits of voluntarily returning to their basic branch.

Q: ***Who will sit on the transfer boards?***

A: An AAC brigadier general or major general will serve as the president of both transfer boards. Board members will include one AAC colonel from each of the three AAC functional areas—FA 51, 53, and 97—and four officers representing the shortage basic branches. The composition of the second board will include one additional FA 51 colonel representative.

Q: ***Can we conclude from the branches of the non-AAC colonels on the boards that these branches will benefit from the transfer?***

A: No. The board is charged with selecting officers who have the best potential to serve in their basic branch after considering Army and AAC requirements, and the effect of a transfer on the officer. The intent of basic branch representation on the boards is to represent the interests of the entire Army and not a specific basic branch.

Q: ***What guidance will be given to the boards?***

A: The board will be instructed to identify those officers with the best potential to serve in their basic branch and those who will be least disadvantaged by the transfer. Selection will not necessarily be based upon the strength of an officer's file. The board will then consider shortage branch requirements. The board members must carefully balance the interests of the Army, the AAC, and the individual officer in deciding which officers will be returned to their basic branch.

Q: ***Isn't "manner of performance" being used as a criteria for transfer?***

A: Manner of performance is only one of many criterion that may be used. Clearly, basic branch inventory requirements and an officer's branch qualifications and experience versus his or her AAC qualifications and experience will be the primary criteria used to decide which officers have the greatest potential to serve in their basic branches. If performance is used, it should be used as a means of comparing how an officer performed in his or her basic branch, as opposed to performance in the AAC.

Q: ***Isn't time in a PM shop viewed as better than time in an R&D position?***

A: Not necessarily. The AAC officers with a broad base of experience in program management, contracting, and R&D do well because they have well-rounded acquisition careers.

Q: ***When will board results be announced?***

A: The first board could finish as early as Nov. 22, 1996, or as late as Nov. 27, 1996 (the day before Thanksgiving), and results should be announced three weeks later.

Q: ***Will there be an appeal process?***

A: Yes. Officers can submit appeals to the Commander, PERSCOM. For appeals to receive favorable consideration, substantial and compelling justification must be documented in the appeal package.

Q: ***Will resident versus non-resident Command and Staff College (CSC) be a discriminator in selection for transfer?***

A: We do not expect the board to use CSC selection as a discriminator to select or not select officers for transfer. Boards have, however, traditionally used resident selection to CSC as an indicator of an officer's performance as a company grade officer.

Assignment After Transfer

Q: ***What is being done to get field grade level branch qualifying jobs for majors selected for transfer?***

A: PERSCOM will work to get officers reassigned as necessary to locations where opportunities for branch qualification exists, and will communicate directly with the gaining organizations prior to the officer reassignment to verify vacancies exist which can fill the officers' needs in a timely manner. As required, the Army will waive the 24-month rotation rule to get officers into these locations. Also, some branches, such as AD and SC, are already seeking volunteers to fill battalion XO and S3 jobs.

Q: ***Some transferred officers won't get an OER before their next promotion board. Moreover, what guidance will be given to future promotion and selection boards about transferred AAC officers?***

A: Future boards will be instructed not to penalize former AAC officers with non-standard career paths. The boards will be told that the transfer action was necessary to respond to a reduction in requirements for AAC colonels and the need to fill critical field grade vacancies in selected basic branches. Also, this transfer action reflects no downturn in performance nor lack of success as an acquisition professional.

CAREER DEVELOPMENT UPDATE

Q: ***The PERSCOM Commanding General made a commitment to the Army Chief of Staff to send a supportive letter to gaining commands for all officers transferred back to their basic branches. Will such letters really help or actually hurt the officers?***

A: The Director, Officer, Personnel Management Directorate will send letters directly to MACOM commanders requesting their assistance in placing former AAC officers into branch qualifying jobs. Although not a guarantee, a commitment from the senior leadership of the Army should encourage field commanders to aggressively help former AAC officers obtain branch qualifying jobs where possible.

Q: ***Why not give field grade branch qualifying credit for AAC experience?***

A: Branch qualifying jobs at the field grade level are battalion XO and S3 positions which are not found in the AAC. Promotion boards interpret the qualifications of officers by reading the ORB and OERs on the officer's fiche. Successful completion of a battalion XO/S3 job equates to branch qualification at the field grade level. Therefore, there is no practical way to award branch qualifying credit to AAC officers.

Q: ***Is there a plan to identify branch school combat development jobs or similar positions where former AAC officers might best serve?***

A: While there is no overarching plan, this is already being done with volunteers and will certainly be considered after the transfer boards.

Command Boards

Q: ***Will AAC officers competitive for battalion command be given an opportunity to compete for basic branch commands, on a one-time basis? How about the approximately 50 ROTC/Garrison and Installation Commands that will be selected during boards this fall?***

A: Since command board eligibility has already been established and announced via worldwide message, AAC officers can't compete in any category other than the product manager and acquisition command categories. Officers in YGs 79 and 80 can go before other command boards if they elect to transfer back to their basic branch prior to the convene date of their branch command board. Basic branch assignment officers say that officers who have not had branch qualifying jobs as a field grade officer are not competitive for basic branch battalion command selection. Therefore, only those AAC officers with branch qualifying jobs as a field grade could benefit from a branch transfer prior to the basic branch command board. To ensure that AAC officers in YGs 79 and 80 are afforded every opportunity to succeed, PERSCOM will scrub the two year groups and identify those officers who have held branch qualifying positions and will confer with the basic branch assignment officers on those officers whose files appear to be strong enough to be competitive for basic branch command. If the basic branch believes there is even a remote chance the officer might be competitive, PERSCOM will call the officer and offer him or her the opportunity to transfer prior to the basic branch command board.

The Acquisition Career Management Office

Developing The People Who Develop The Systems

Introduction

The Acquisition Career Management Office (ACMO) manages the Army Acquisition Corps (AAC) and assists in the development of the Army Acquisition Workforce (AAW). But what does that mean for you, the AAC/AAW member? This article provides insight into the mission and functions of the ACMO and what the ACMO does for the members of the AAC/AAW.

Mission

The mission of the ACMO is to provide for the professional health, welfare, education, training, and career development of the entire Army Acquisition Corps. Working with the functional chiefs of the civilian career programs, the ACMO assists in the performance of similar functions for the AAW. The AAW totaled 26,539 military and civilian professionals as of July 1, 1996. The AAC, those individuals certified to fill critical acquisition positions as defined in the Defense Acquisition Workforce Improvement Act (DAWIA), is a subset of the AAW and numbered 5,263.

Philosophy Of Management

The ACMO's philosophy of management can be summed up as follows:

"Achieve one integrated acquisition corps—
—focus on identifying and developing promising military and civilian acquisition leaders and
—provide comprehensive career management programs with clearly established career paths."

—AAC Process Action Team
September 1995

What Are The Functions Of The ACMO?

There are five core functions of the ACMO: proponency; education and training; career development programs and management; information management and analysis; and external communications. Each function is discussed below.

- ***Proponency.*** The ACMO must integrate acquisition experience, education, and training with military and civilian personnel assignment policies and procedures to ensure that all AAC/AAW personnel meet statutory certification requirements and to produce future acquisition leaders. The ACMO oversees and manages all aspects of the personnel life cycle and defines competitive acquisition career development paths for both military and civilian members of the AAC. As required, the ACMO interprets existing policies and recommends new policies regarding acquisition experience, education, training, and personnel life cycle management. The ACMO maintains the Military and Civilian Acquisition Position Lists (MAPL/CAPL) that identify the approved acquisition positions. The ACMO constantly evaluates the size and career field alignment of the AAC and recommends adjustments to support MAPL/CAPL authorizations and force structure changes. Last, but not least, the ACMO, working in conjunction with the civilian career program functional chiefs, communicates with and advises AAC/AAW members on their careers and fights to enhance their career opportunities.
- ***Education and Training.*** The ACMO plans, develops and implements a variety of high quality education and training opportunities for members of the AAC/AAW to meet certification, career progression and to enhance professionalism. The ACMO administers all aspects of the Army's participation in mandatory acquisition training through the Defense Acquisition University (DAU) consortium of schools. In addition, the ACMO is the Army's single interface for acquisition education and training with regional civilian personnel operating centers and local civilian personnel advisory centers, the U.S. Total Army Presonnel Command (PERSCOM), and DAU consortium schools. The ACMO recently began managing a new continuing education program for AAW members.

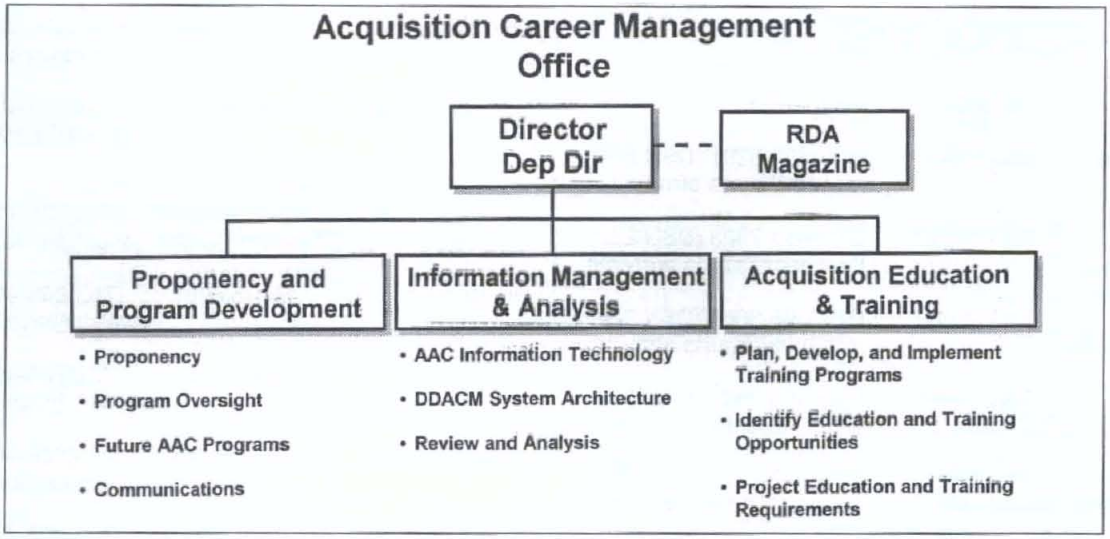

Figure 1.

• ***Career Development Programs and Management.*** The ACMO develops an AAC/AAW strategic management vision and long range plans. The ACMO and the civilian career program functional chiefs working together develop, test, and coordinate implementation of new career development and management policies and programs, standardizing acquisition-specific career development across the AAC/AAW. The ACMO works hand-in-hand with the ASA(MR&A), the functional chiefs of the civilian career programs, the Deputy Chief of Staff for Personnel, and PERSCOM in development of these acquisition career programs.

• ***Information Management and Analysis.*** The ACMO is enabled by information age technologies to process information faster, better, and at least cost. The ACMO staff prides itself on customer support through rapid and accurate response and no bureaucratic red tape. The ACMO collects education, acquisition training, acquisition experience, and other demographic data from the AAC/AAW, reduces this data to meaningful information, compares this information against established measures of effectiveness, analyzes trends, and reports to the Army leadership and the civilian career program functional chiefs. The ACMO develops and manages the AAC Management Information System (AACMIS) and Director, Acquisition Career Management (DACM) applications and architecture to support this process.

• ***External Communications.*** The ACMO defines, establishes, implements, and maintains effective multipoint communications via various media to communicate policy, procedures, programs, and a multitude of acquisition-related information to leaders, AAC/AAW, and acquisition-related organizations. The ACMO develops and maintains a DACM communications architecture across the entire AAC/AAW and promotes unity of effort by ensuring integration and consistency of information before release.

Evolving/Sustaining ACMO

The evolving, and what is currently envisioned as the sustaining, ACMO is shown in Figure 1 (Acquisition Career Management Office). The ACMO was organized according to its core functions. Note that several tasks that together make up the *External Communications* function are distributed among all organizational elements, yet overall responsibility for a coherent, single message to the AAC/AAW remains focused in the proponency and program development section. A current listing of ACMO personnel with phone numbers and e-mail addresses is on page 56. The Director, Deputy Director, and Proponency and Career Program Development section of the ACMO are located in room 3E427 of the Pentagon. The Information Management and Analysis section, Acquisition Education and Training Division, and *Army RD&A* magazine section are located in building 201 at Fort Belvoir, VA.

Several offices support the ACMO. The Director, Acquisition Policy, Office of the Assistant Secretary of the Army (Research, Development and Acquisition) is the single office responsible for promulgation of AAC/AAW policy developed by the ACMO. The Assistant Secretary of the Army (Manpower and Reserve Affairs) (ASA(M&RA)) provides policy and program development guidance for management of both the military and civilian components of the AAC/AAW. PERSCOM executes personnel actions for AAC/AAW military, and facilitates execution for AAC civilians, and selected AAW civilians based upon the Director, Acquisition Career Management guidance and direction, which is usually transmitted to PERSCOM through the ACMO.

Conclusion

The ACMO is a **customer-oriented,** external and **future-looking** organization with an **Army-wide perspective.** Its mission is to identify and develop the people who develop the systems for the Army. The evolving and sustaining structure of the ACMO reflects its core functions and integrates both military and civilian acquisition career management to best support the AAC/AAW.

AAC Civilian Playbook Available

Patterned after the *Military Acquisition Corps Playbook '96,* published for Army Acquisition Corps (AAC) military officers, a playbook is now available for civilian members of the AAC and the Army Acquisition Workforce (AAW). We've created this playbook as an annual publication to help you understand the building blocks for a successful career in acquisition and learn more about the unique and exciting opportunities available as an acquisition professional. Next year, we will publish one playbook addressing both military and civilian members of the AAC and AAW. Hard copies may be requested by contacting Peggy Mattei at commercial (703)614-3725, DSN 224-3725, or e-mail: matteip@sarda.army.mil. The playbook will also be available soon on the AAC homepage at: http://www.army.mil/aac-pg/aac.htm.

CAREER DEVELOPMENT UPDATE

ACMO ROSTER

Name/Position	Location	Phone/E-mail
COL Tom Rosner Director	PNT 3E427	(703)697-6291 (DSN 227) rosnert@sarda.army.mil
Mary Thomas Deputy Director	PNT 3E427	(703)693-7323 (DSN 223) thomasm@sarda.army.mil
Pat McNabb Liaison, ASA(M&RA)	PNT 3E427	(703)695-3664 (DSN 224) mcnabbp@sarda.army.mil
Tony Echols Proponency Officer, ACF G, H, L	PNT 3E427	(703)695-0508 (DSN 225) echolsa@sarda.army.mil
Gary Winkler Proponency Officer, ACF R, S	PNT 3E427	(703)695-7265 (DSN 225) winklerg@sarda.army.mil
LTC Earl Rasmussen AAC FA 53 Proponency Officer	PNT 3E427	(703)695-7265 (DSN 225) rasmusse@sarda.army.mil
Peggy Mattei Proponency Officer, ACF S, T	PNT 3E427	(703)614-3725 (DSN 224) matteip@sarda.army.mil
Kathy Mills Proponency Officer, ACF K, L	PNT 3E427	(703)614-3727 (DSN 224) millsk@sarda.army.mil
LTC Bill Fast AAC Proponency Officer	PNT 3E427	(703)695-7264 (DSN 225) fastw@sarda.army.mil
Karen Walker Proponency Officer, ACF A, K	PNT 3E427	(703)697-0472 (DSN 227) walkerk@sarda.army.mil
LTC Bill Gavora AAC FA 51 Proponency Officer	PNT 3E427	(703)697-0472 (DSN 227) gavoraw@sarda.army.mil
MAJ Vicky Diego-Allard AAC FA 97 Proponency Officer	PNT 3E427	(703)697-6293 (DSN 227) diegoalv@sarda.army.mil
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LaVerne Jones Chief, Education & Training Division	Belvoir 201	(703)805-4160 (DSN 655) jonesl@aim.belvoir.army.mil
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Diane Schaule	Belvoir 201	(703)805-4042 (DSN 655) shauled@aim.belvoir.army.mi
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Careka Squire	Belvoir 201	(703)805-4167 (DSN 655) squire@aim.belvoir.army.mil
MAJ Jim Ralph Chief, Information & Analysis Division	Belvoir 201	(703)805-4158 (DSN 655) ralphj@aim.belvoir.army.mil
Neil Nelson Liaison, RDAISA	Belvoir 201	(703)805-5212 (DSN 655) nelsonn@aim.belvoir.army.mil

KEY

- ACF - Acquisition Career Fields (per DODI 5000.55)
- ACF A - Program Management
- ACF C - Contracting
- ACF D - Industrial Property Management
- ACF E - Purchasing and Procurement Assistant
- ACF G - Manufacturing and Production
- ACF H - Quality Assurance
- ACF K - Business, Cost Estimating and Financial Management
- ACF L - Acquisition Logistics
- ACF R - Communications - Computer Systems
- ACF S - Systems Planning, Research, Development, and Engineering
- ACF T - Test and Evaluation Engineering
- ACF U - Auditing

Correction

Due to editorial errors in our September-October 1996 issue, incorrect information appeared in the article, "Enhanced Armor Using the Vehicular Intercommunication System," by Georges R. Garinther and B. Wayne Anderson.

- On page 33, third column, the first full sentence should read, "Since the passive attenuation of the tanker helmet is sufficient at frequencies above 1,000 hertz but is insufficient at lower frequencies, ANR provides complementary attenuation at those low frequencies where greater attenuation is required to reduce the total noise level below 85 *dBA*." (Not 85 *hertz*, as incorrectly stated in the article.)
- On page 34, second column, the first two full sentences should read, "When operating at about 30 mph, the M109 howitzer (Paladin) is 108 dBA, the M1 tank is 110 dBA, and the Bradley is 115 dBA. *To minimize hearing loss, these levels must be reduced to less than 85 dBA* when measured at the ear."

Army RD&A apologizes for these errors.

OASARDA Issues Call For IMAs

The Office of the Assistant Secretary of the Army for Research, Development and Acquisition (OASARDA) is seeking a reserve officer with a skill identifier of 4Z for a vital and robust Individual Mobilization Augmentee (IMA) program. With more than 50 officers contributing to Army RD&A through the IMA program, majors and lieutenant colonels are being accessed, trained and utilized in many OASARDA directorates.

Vacancies are anticipated in the near future in the directorates and military occupational specialties indicated below. These vacancies will be caused by the mandatory removal date of the officers currently assigned to the positions. If you are interested in challenging assignment as an IMA, you should contact COL Peter A. Hadley, Director for Reserve Affairs, at 703-697-4440 or (DSN) 227-4440, or e-mail hadleyp@sarda.army.mil.

- Directorate for Plans, Programs and Resources — 51A004Z 51A00
- Directorate for Procurement Policy and Acquisition Reform — 51A00
- Directorate for Special Programs — 35G51
- Directorate for Program Evaluation — 49A00

PERSCOM Notes. . .

Year Group 90 Accession Board

The Year Group (YG) 90 U.S. Total Army Personnel Command (PERSCOM) Acquisition Candidate Accession Board (PACAB) is scheduled to convene in early March 1997. This board will be reviewing the applications of officers from all branches of the Army for accession into the Army Acquisition Corps (AAC).

A MILPER Message was sent in October 1996 notifying officers in the primary year group of the basic requirements for accession. Additionally, each YG 90 officer will be sent a personal memorandum from the Chief, Military Acquisition Management Branch (MAMB) informing them of the opportunity to apply to become a member of the AAC.

This memorandum will be sent to each YG 90 officer's home address, as maintained in PERSCOM's data base. If the memorandum is returned to the MAMB, it will be sent to the officer's official military mailing address (office address).

Each memorandum contains: a brief description of the AAC; a brief description of the functional areas that comprise the AAC; a questionnaire to indicate which functional area you would like to be awarded; and a self-addressed envelope to respond back to the MAMB.

The accession board is comprised of senior AAC officers, normally five current or former product manager/acquisition commanders, and is chaired by the Chief, Functional Area Management and Development Division. This board, like other selection boards in the Army, will review records consisting of: a current Officer's Record Brief (ORB); a current copy of the officer's performance microfiche; and an official photo. Officers are permitted to submit a letter to the president of the board outlining the reasons they desire to become a member of the AAC. If you have any letters of recommendation, you must include a statement requesting that these letters be added to your accession packet. Officers who are in command should seek an endorsement from their senior rater supporting their potential for success. Officers selected for command, but not yet in command, should seek an endorsement from their senior rater supporting his/her intent to place them in command.

As with any Army selection board, you should ensure that your ORB, photo, and fiche are current. It is highly recommended that you review your ORB and have your local MILPO correct any errors well in advance of this board. Further, you may wish to request a current copy of your microfiche to ensure your Officer Efficiency Reports (OERs), Academic Efficiency Report (AERs) and other pertinent data are correctly reflected on your microfiche. Finally, your photo is your chance to make a "first impression" on the board. If there has been significant change since your last photo, e.g. you were promoted to the rank of CPT, your photo is in black and white, or your awards do not match what is on your ORB, it is time for a new photo. The Army states that your photo is current for five years, however, having a updated photo provides a good first impression.

The accession board will select officers from each of the basic branches in proportion to the branch's representation in the officer corps. For example, if the Ordnance Corps makes up 5 percent of officers in the force, they will be required to provide 5 percent of the accessions.

Initial accessions from a year group will be limited to 80 percent of the target year group. This provides the opportunity for those officers who have not had a company command, and desire to be accessed into the AAC, to apply in later years. For example, there are currently requirements for 19 YG 88 and 39 YG 89 officers.

Officers in year groups 91 and 92 who have completed their company command and wish to be considered for accession into the AAC, should send a memorandum to the MAMB at: U.S. Total Army Personnel Command, ATTN: TAPC-OPB-E (Mr. Yager), 200 Stovall Street, Alexandria, VA 22332-0411. In addition, an information copy should be sent to your basic branch, requesting accession. Very few officers are accessed early.

Officers in more senior year groups desiring accession should send a memorandum to the MAMB stating their desire for accession into the AAC. There are very few allocations for the more senior officers. However, each application is voted on its own merit.

For more detailed information on the Army Acquisition Corps, you are encouraged to read DA PAM 600-3. If you have any questions, contact Rick Yager at DSN 221-3127, or e-mail to yagerr@hoffman-emh1.army.mil.

FY 96 Senior Service College Board Results

The Military Acquisition Management Branch, at the U.S. Total Army Personnel Command, recently completed an analysis of the FY 96 Senior Service College board results. A total of 30 officers were selected to attend Senior Service College in August 1997. The select rate for Army Acquisition Corps officers was 5.9 percent and for Army, the select rate was 6.1 percent. The accompanying chart shows the year group and functional area of the officers selected.

It is important to note that all 30 officers were either former or serving (CDPL) product managers or acquisition commanders. This confirms what PERSCOM has stated previously: the path to Senior Service College selection includes a successful (CDPL) product manager/acquisition command tour.

Year Group	FA51	FA53	FA97
1975	2	2	1
1976	8	0	3
1977	7	3	1
1978	1	0	1
1979	1	0	0

Officers Selected To Attend Senior Service College

LTC JAMES ADAMS
LTC ROBERT ARNONE
LTC MICHAEL ASADA
LTC DAVID BENNETT
LTC HOWARD BRAMBLETT
LTC STEPHEN BROUGHALL
LTC SAMUEL CANNON
LTC MICHAEL COX
LTC ROBERT LEES
LTC CHRISTOPHER LESNIAK
LTC TIMOTHY LINDSAY
LTC DAVID LUDWIG
LTC EDWARD MAJOR
LTC MICHAEL MCCHESNEY
LTC DAVID MERIWETHER
LTC JAMES MORAN
LTC PAUL DRONKA
LTC BRUCE GAGE
LTC JOHNNY GARRETT
LTC JOHN GROBMEIER
LTC ROBERT JACKSON
LTC MARY KAURA
LTC THOMAS KELLY
LTC RONALD NELSON
LTC PATRICK OREILLY
LTC CARL OWENS
LTC PATRICK SHORT
LTC LAURENCE THOMAS
LTC BRYON YOUNG
LTC AUDIE ZIMMERMAN

New Arrivals At MAMB

The Military Acquisition Management Branch (MAMB) recently welcomed two new officers to PERSCOM. LTC Ron Flom has taken over duties as the Chief, MAMB and CPT Ruthann Murff will take the Functional Areas 97 and 53 Captains' Assignment Desk when CPT Scott Bosse departs in December 1996.

LTC Flom comes to PERSCOM from the Industrial College of the Armed Forces and has served in a variety of acquisition positions. He most recently served as the Defense Contract Management Command's Commander at Stewart and Stevenson in Sealy, TX. LTC Flom also has PERSCOM experience, having previously served as a major assignment officer in the Quartermaster Branch.

CPT Murff comes to PERSCOM having recently completed ACS in the IGRAD Program at the University of Texas at Arlington. She has served in a variety of operational assignments as a Quartermaster officer in Fort Richardson, AK, Fort Lee, VA, and Fort Riley, KS. Additionally, she served as a FA 97 procurement analyst for the Defense Commissary Agency.

The accompanying chart provides updated phone numbers and e-mail addresses for MAMB personnel.

Electronic Mail/ Telephone Numbers

	Name	USERID	Phone Number
Chief, MAMB	LTC Ron Flom	FLOMR	221-3131
AAC Colonels Assignments	LTC Mark Vaughn	VAUGHNM	221-3090
Distribution Manager	MAJ Carlton Gayles	GAYLESC	221-9383
LTC FA51 Assignments	MAJ John Tidd	TIDDJ	221-3129
LTC FA97, 53 Assignments	MAJ Jesse Stone	STONEJ	221-3124
MAJ Assignments	MAJ Jake Hansen	HANSENJ	221-3128
MAJ Assignments /FRO	CPT Kathryn Westbrook	WESTBROK	221-5479
CPT FA51, Assignments	MAJ Nick Guerra	GUERRAN	221-2800
CPT FA53, 97 Assignments	CPT Scott Bosse	BOSSES	221-1474
Certification Manager	CPT Scott Bosse	BOSSES	221-3130
Advanced Civil Schooling	CPT Bob Marion	MARIONR	221-2760
Boards/Schools Manager	Mr Rick Yager	YAGERR	221-3127
AAC Auto. Information Line			221-3411
FAX			221-8111
Commercial			(703) 325-XXXX

(USERID)@HOFFMAN-EMH1.ARMY.MIL

FY 98 MAPL Review Board Announced

The Director of the Army Acquisition Corps will conduct the FY 98 Military Acquisition Position List (MAPL) Review Board on Feb. 24-28, 1997, at Fort Belvoir, VA. Please review all position requirements for AAC officers. Submission instructions were distributed to MACOMs and other MAPL organizations in October 1996. Point of contact for this action is LTC Bill Gavora, commercial (703)697-0472, DSN 227-0472, or e-mail: gavoraw@sarda.army.mil.

Have You Been Mobile In Your Career?

Army RD&A magazine has been asked to solicit input for a future article from acquisition professionals who have changed jobs during their careers in acquisition. We are especially interested in hearing from acquisition personnel who have changed career fields, commands, or who have experienced a geographic move. If you meet this criteria and would like to be interviewed for this article, please contact Tom Drinkwater at DSN 225-7653 or commercial (703) 695-7653 or e-mail drinkwat@sarda.army.mil or Gary Winkler at DSN 225-7265 or commercial (703) 695-7265 or e-mail winkler@sarda.army.mil. Please do not contact *Army RD&A* magazine directly.

PERSONNEL

Link Succeeds Oswald As COE R&D Director

Dr. Lewis E. Link Jr., former Director of the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH, has assumed new responsibilities as Director of Research and Development, U.S. Army Corps of Engineers, following the retirement of Dr. Robert B. Oswald.

Prior to joining CRREL as Technical Director in 1986, Link had served in numerous assignments at the U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, including Assistant Chief of the Coastal Engineering Research Center and Chief of the Environmental Systems Division of the Environmental Laboratory.

After receiving a B.S. degree with high honors in geological engineering from North Carolina State University in 1968, he earned an M.S. degree in civil engineering from Mississippi State University in 1973, and a Ph.D. in civil engineering from Pennsylvania State University in 1976. Additionally, he has served as an adjunct professor with the Mississippi State University Graduate School, and graduated from the Federal Executive Institute in 1985.

Link has served on numerous technical and advisory committees, is chairperson of the Advisory Board, Environmental Research Institute, Pennsylvania State University, and U.S. delegate to the International Permafrost Association. A Certified Professional Hydrologist, he has published more than 95 technical papers and reports.

A recipient of Army R&D Achievement Awards in 1982 and 1985, Link was named a Presidential Meritorious Executive in the Senior Executive Service in 1990 and 1995, and a Distinguished Executive in 1992.

From The Acquisition Reform Office...

Army Strategy For Acquisition Reform

The Army Strategy For Acquisition Reform is: to empower acquisition professionals to continuously find smarter ways of doing business; to enable them to buy better goods and services cheaper and faster; and to field a technologically superior Army XXI on time with reduced costs of ownership by:

- ***Defining Desired Outcomes.*** A critical step in the strategy is to clearly define desired outcomes. At top levels, fielding Army XXI requires acquisition reform outcomes such as streamlined management and efficient organizations, shortened development and fielding cycles for new technology, reduced overhead and life cycle costs and increased use of commercial products and services. These outcomes may vary by command level.
- ***Removing Barriers To Business Judgment.*** An underlying principle of the strategy is to eliminate barriers to the use of good business judgment.
- ***Providing Acquisition Reform Tools.*** Acquisition reform provides the tools for smarter ways of doing business. It must be supported so the workforce can choose an array of tools that fit the specific circumstances.
- ***Putting Metrics In Place To Measure Progress.*** Elaborate reporting and feedback systems are counterproductive, but a few key metrics are necessary to focus efforts and determine progress.
- ***Empowering Individuals To Use Their Own Judgment For Business Decisions.*** Trusting professionals to find smarter ways of doing business and achieve the desired outcomes is the central thrust of the strategy.
- ***Managing For End Results.*** Changing the old risk-aversion culture and rule-driven acquisition system requires a sharp focus on end results.

Reinvention Laboratory For Army XXI

The Secretary of the Army approved the designation of a Reinvention Laboratory for Army XXI Acquisition Reform on July 1, 1996. This Reinvention Laboratory is different from most in that the laboratory is a **process,** not an organization. The purpose of the Reinvention Laboratory is to integrate the materiel successes of Force XXI, and specifically, the results of the Advanced Warfighting Experiments (AWEs) ending in Spring 1997, with the best practices of acquisition reform to quickly and economically acquire the equipment necessary to field the first Army XXI Division by September 2000.

Acquisition Reform Activities Save More Than $8 Billion

Army Acquisition Reform and streamlining initiatives have yielded cost reductions of more than $8.7 billion. These reductions include both savings and cost avoidances for systems programs, as well as other acquisition activities which realized cost reductions. Major acquisition activities yielded $6.1 billion, non-major programs yielded over $2.1 billion and other acquisition activities yielded nearly $4.0 million. The cost reductions cover entire program periods, both within and beyond the POM years.

DOD Enterprise Acquisition Metrics Program

On July 16, 1996, the Principal Deputy Under Secretary of Defense (Acquisition and Technology) issued a memorandum which

implemented the DOD Enterprise Acquisition Metrics Program which will measure process changes brought about by instituting acquisition reform initiatives. Improvement in DOD acquisition processes will now be measured through an initial set of enterprise level acquisition metrics for measuring cost, schedule and training. A slate of six metrics has been approved and a seventh metric which measures performance will be forthcoming. The initial metrics are:

- ***Purchasing Cost Per Dollar Purchased.*** Personnel data translated into purchasing cost by using salary and fringe benefits data from the Service personnel offices, OSD, and DOD agencies. Purchasing dollar value is calculated based on procurement contract awards.
- ***Selected Acquisition Report (SAR) Annual Rates of Program Cost Change.*** The annual rate of cost change is calculated for each fiscal year by summing the total cost change of common programs between the prior fiscal year and the current fiscal year, adjusting for quantity and economic changes and dividing by the total current estimate of the common programs of the prior fiscal year.
- ***On-Time Deliveries.*** Measures the percent of contract line items which are on schedule in accordance with their original contract terms. Data includes line items from major weapons systems to consumables. Defense Contract Management Command (DCMC) will incorporate data on ships, conventional ordnance, and other Single Item Manager Programs (measured against the current contract terms).
- ***Product Realization-Acquisition Phase Time.*** Represents the average time for a system to progress through its milestones from program initiation to IOC. The metric is an aggregate average of all programs and is calculated based upon milestone dates and Acquisition Program Baselines (APBs).
- ***DAWIA Certification.*** Captures the trend in DAWIA certification for the acquisition workforce at all three levels. It compares the total number of people certified at each level to the number of coded positions requiring certification at each level.
- ***MDAP APB Breaches.*** Identifies the total number of APBs in breach status each month. The number of breaches resolved, as well as new breaches, will be shown each month.

Reduced Price Initiative Produces Savings At MICOM

The U.S.Army Missile Command (MICOM) has participated in the Department of the Army-sponsored Reduced Price Initiative (RPI) program since January 1994. The intent of the RPI program is to entice field units to buy new items at a reduced price rather than repair old items when multiple years of stock are on hand for the new items. The goals of the program are to reduce total Army inventory of long supply items; insure the overhead costs of selling long supply stocks are captured (surcharge); provide an incentive to the field Army to weigh benefits of a reduced buy vs. local repair; and maximize shrinking OMA dollars. MICOM's program presently includes 55 National Stock Numbers (NSNs). Sales for FY94 yielded more than $239,000 with a cost savings of $1.3 million to the customer. FY95 sales yielded $3.8 million with a cost savings of $15.5 million. Sales for the first three quarters of FY96 have yielded $2.4 million. For additional information about the RPI program contact Max McClellan, DSN 227-3122 or email: mcclem@hqda.army.mil.

Streamlining Contract Data Requirements

The Under Secretary of Defense (Acquisition and Technology) asked the Army to lead an interagency group, with appropriate Office of the Secretary of Defense (OSD) and Defense agency support, to review contract data requirements development guidelines with the objective of both minimizing contract data requirements and streamlining data requirements generation. The group submitted the following recommendations to both minimize contract data requirements and streamline data requirements generation:

- Services and DOD agencies continue their efforts to cancel or revise current Data Item Descriptions (continuous).
- Army revise AMC Pam 70-25 into a DOD handbook to account for current military specifications and standards reform policies and to include business functional areas (December 1996).
- OSD CALS Office publish a brochure on Streamlining Contract Data Requirements (December 1996).
- OSD CALS Office publish the revised manual on Data Management (March 1997).

In order to promote performance-based contracting for data, the working group recommends the following:

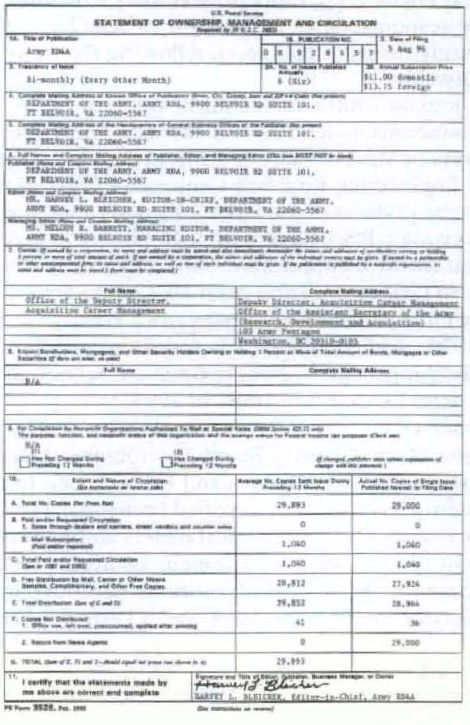
- Defense Acquisition University train DOD component data management and user personnel in DOD-unique data requirements and relevant industry data practices. Establish appropriate training plans by October 1996.
- OSD CALS Office modify the current data acquisition process to accommodate the widest range of contractor-proposed and DOD-accepted contract data requirements (October 1996).
- DOD components develop and implement performance-based contract data requirements in solicitations (October 1996).
- DOD components encourage bidders to propose industry data practices and to respond to DOD-unique data requirements with alternative, cost-effective data proposals (continuous).

For additional information contact Maxwell Westmoreland at commercial (703)697-4382. Specific questions on the "From The Acquisition Reform Office" section should be addressed to LTC L. Hooks, SARD-PPR, (703) 697-2558, or e-mail: hooksl@SARDA.army.mil.

CONFERENCES

ARL Announces Telecommunications Conference

The Army Research Laboratory's Federated Laboratory in Advanced Telecommunications and Information Distribution Research Program will host its annual conference Jan. 21-22, 1997, at the University of Maryland Conference Center in College Park, MD. Open to all Department of Defense personnel interested in advanced telecommunications and information distribution, the conference will feature guest speakers, panel discussions and invited papers. For additional information, contact Bob Karig at (603) 885-5414 or Dr. Jay Gowens at (404) 894-3136.



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Purpose

To instruct members of the RD&A community relative to RD&A processes, procedures, techniques and management philosophy and to disseminate other information pertinent to the professional development of the RD&A community.

Subject Matter

Subjects of articles may include, but are not restricted to, policy guidance, program accomplishments, state-of-the-art technology/systems developments, career development information, and management philosophy/techniques. Acronyms should be kept to a minimum and, when used, be defined on first reference. Articles with footnotes are not accepted.

Length of Articles

Articles should be approximately 1,500 t o 1,600 words in length. This equates to approximately 8 double-spaced typed pages, using a 20-line page.

Photos and Illustrations

Include any photographs or illustrations which complement the article. Black and white is preferred, but color is acceptable. Graphics may be submitted in paper format, or on a 3 1/2-inch disk in powerpoint, but must be black and white only, with no shading, screens or tints. We cannot promise to use all photos or illustrations, and they are normally not returned unless requested.

Biographical Sketch

Include a short biographical sketch of the author/s. This should include the author's educational background and current position.

Clearance

All articles must be cleared by the author's security/OPSEC office and public affairs office prior to submission. The cover letter accompanying the article must state that these clearances have been obtained and that the article has command approval for open publication.

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July-August	15 April
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Authors should include their address and office phone number (DSN and commercial) with all submissions. In addition to providing a printed copy, authors should submit articles on a 3 1/2-inch disk in MS Word, or ASCII format. Articles may also be sent via e-mail to: bleicheh@aim.belvoir.army.mil

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