Headquarters Department of the Army
PB-70-94-5

ARMY RD&A BULLETIN

SEPTEMBER - OCTOBER 1994

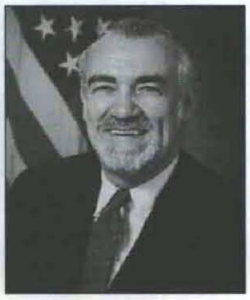
AVOIDING AMERICA'S HIGH NOON COMPLEX

An industry CEO cautions against putting defense on the back burner

ALSO IN THIS ISSUE

- New Medical R&D Organization
- Medical Command CG Interview
- Marketing Army Lab Concepts

From the Army Acquisition Executive . . .



The Vice President's National Performance Review reflects a government-wide determination to create a government that works better and costs less. The review team focused on how successful organizations made savings and efficiencies. The four key conclusions were: cut red tape; put customers first; empower employees to get results; and cut back to basics.

The Army research, development and acquisition (RDA) community has been at the forefront of this ambitious effort. We are changing to a leaner, more flexible system based on commercial specifications and standards—reducing paperwork and overhead and putting more of our RDA budget into programs. Let me highlight our significant achievements and ongoing work under the four principles of the National Performance Review.

• *Cut Red Tape.* The Army is fully committed to increasing the market share of Non-Developmental Items (NDI). A success story is the TH-67 Creek (New Training Helicopter). After a rigorous scrub, the solicitation for Creek consisted of only 96 pages and contained no military unique specifications or standards. Other examples of Army NDI acquisitions and related savings include the following: 105mm M119A1 Light Towed Howitzer, $15-30 million in Research, Development, Test and Evaluation (RDT&E) cost avoidance; Rough Terrain Container Crane, $120 million in project savings; Modular Causeway, $24 million in project savings; Landing Craft Utility (LCU) 2000, $4 million in RDT&E cost savings and $53.5 million in overall project savings; and the Clean Burn Diesel Forklift, $56 million in program savings over five years.

Army policy since October 1988 has required the elimination of military specifications and standards (milspecs and standards) and the reduction of functional requirements and data items whenever possible. Now, the Secretary of Defense insists on it. In August 1993, Secretary Perry directed that a Process Action Team (PAT) be established to streamline the purchasing practices of the Department of Defense (DOD), and turned to the Army for help. Darold Griffin, the former Principal Deputy for Acquisition in the Army Materiel Command, chaired the team that included representatives of all the Services and appropriate Defense agencies. Their work became the model for overall DOD milspec and standards reform. Last June, Secretary Perry held a press conference announcing that a significant milestone in acquisition reform had been achieved and signed a memorandum implementing the major PAT recommendations. He praised Mr. Griffin and gave the Army credit for leading the way.

Our Secretary of Defense is unambiguously and clearly devoted to acquisition reform. It is imperative that we remove unnecessary requirements from our solicitations. Low value added requirements and unique milspecs and standards limit the number of companies willing and able to do business with us, add unnecessary cost, and often preclude or delay our ability to acquire leading edge technologies for the soldier. In addition, always remember that justification of functional requirements lies with the functional proponent.

We now use commercial quality standards within DOD. Program offices use the American National Standards Institute/American Society for Quality Control (ANSI/ASQC) Q90 and the International Organization for Standardization (ISO) 9000 series model quality system standards in contracts for new programs, for follow-on efforts to existing programs, and for current contracts on a case-by-case basis.

As part of the Army's continuing effort to take advantage of modern commercial products and technologies, all solicitations which may result in the use of microcircuits will contain language to encourage the use of Plastic Encapsulated Microcircuits (PEMs) to meet system performance specifications.

We killed or transferred an additional 11 Army regulations this year for a total of 19 eliminated. This still leaves too many, but we will get to them all.

To ensure a bold modernization program for the future, we requested that the Deputy Secretary of Defense establish three current programs as "Army Lead Programs for Streamlining and Reform." The programs are the Joint Surveillance and Target Attack Radar System (JSTARS) Common Ground Station (CGS), the Advanced Field Artillery System/Future Armored Resupply Vehicle (AFAS/FARV), and the Patriot Advanced Capability (PAC-3) Missile. We seek reduced regulatory requirements; streamlined oversight; stabilized funding; and savings reinvestment.

Because a significant portion of our money is spent on large, major weapon systems, DOD has identified to Congress pilot programs to demonstrate that savings and benefits can be achieved on large programs just as they can on small programs. The Fire Support Combined Arms Tactical Trainer (FSCATT) is the Army's selection for the Defense Acquisition Pilot Program.

• *Put Customers First.* We continue to increase communication with industry at all levels to enhance access to the commercial market place, its products and manufacturing "know-how." Establishing and maintaining a cooperative partnership with industry through a continuing dialogue remains a top priority. We participate in a number of government-industry symposia.

One of our hallmark initiatives to reform both our acquisition process and the ways we interact within it is the series of briefings known as "Road Shows." More than 4,500 Army and industry acquisition personnel have been briefed and trained during Road Shows I, II and III. Request for Proposal (RFP) scrubs are taught and demonstrated during Road Show Training. More than 28 formal RFP scrubs have been completed.

• *Empower Employees to Get Results.* We have a strong three tier reporting chain, Program Managers (PMs) to Program Executive Officers (PEOs) to the Army Acquisition Executive, that is working well. Our PEOs are responsible for budget preparation, submission and execution of assigned programs. PM resources are allocated to the PEO directly from Headquarters. PEOs are responsible for program execution and have authority to reprogram funds within established thresholds. They also have great authority to implement the acquisition reform measures, such as streamlined RFPs and elimination of milspecs. Our challenge is to incentivize them to use this authority to the "nth" degree.

• *Cut Back to Basics.* Defense planning guidance required the review of our organizational structure to reduce about 20 percent of the staff from RDT&E activities. The effort is ongoing through 1999. We continue lab and Research, Development and Engineering Centers (RDECs) restructuring to revitalize the Army's laboratories and strengthen our ability to perform world-class research.

Since 1987 the PEO structure has been constantly screened and streamlined. There were 22 PEOs and three direct reporting PMs in July 1987. Today, there are 10 PEOs and one direct reporting PM.

We have a streamlined acquisition schedule to lower the cost and reduce the time to acquire AFAS/FARV. We encourage prospective contractors for AFAS/FARV to use NDI at the subsystem and component level to the maximum extent practical to meet defined system performance requirements. Only the main gun system, which uses liquid propellant, will be specified. This provides prospective contractors with design flexibility similar to development of commercial products. Likewise, the RAH-66 Comanche helicopter program is capitalizing on initiatives to streamline the acquisition process, remove duplication of efforts, take maximum advantage of commercial practices and remove any specifications, standards, policies or regulations that do not add value.

Clearly, we are making progress.

Gilbert F. Decker

SEPTEMBER–OCTOBER 1994
PB 70-94-5

To contact the Bulletin's Editorial Office: Call (703) 805-4215/DSN 655-4215. Articles should be submitted to: DEPARTMENT OF THE ARMY, *ARMY RDA BULLETIN*, 9900 BELVOIR RD SUITE 101, FT BELVOIR VA 22060-5567. Our fax number is (703) 805-4218.

Army RD&A Bulletin **(ISSN 0892-8657) is published bimonthly by the Office of the Deputy Director, Acquisition Career Management. Articles reflect views of the authors and should not be interpreted as official opinion of the Department of the Army or any branch, command, or agency of the Army. The purpose is 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. Private subscriptions and rates are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 or (202) 783-3238. Second class official postage paid at Fort Belvoir, VA and additional offices. POSTMASTER: Send address changes to DEPARTMENT OF THE ARMY, ARMY RDA BULLETIN, 9900 BELVOIR RD, SUITE 101, FT BELVOIR, VA 22060-5567. Articles may be reprinted if credit is given to Army RD&A Bulletin and the author. Unless otherwise indicated, all photographs are from U.S. Army sources. Approved for public release; Distribution is unlimited.**

This medium is approved for the official dissemination of material designed to keep individuals within the Army knowledgeable of current and emerging developments with their areas of expertise for the purpose of enhancing their professional development.

By order of the Secretary of the Army:
GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:
MILTON H. HAMILTON
Administrative Assistant to the Secretary of the Army
07157

ARMY RD&A BULLETIN

Research Development Acquisition

Professional Bulletin of the RD&A Community

FEATURES

DEPARTMENT

COVER

Norman R. Augustine, CEO of Martin Marietta Corporation, talks about America's historic reluctance to recognize the need for a sustained and viable military. He appeals to government and industry leaders and the American public to break this "High Noon" complex.

From Industry . . .

AMERICA'S *HIGH NOON* COMPLEX

By Norman R. Augustine

Editor's Note: The following remarks, which were originally presented before the National Press Club in Washington, D.C., on June 7, 1994, have been edited for publication here. Norman Augustine is chairman and chief executive officer of the Martin Marietta Corporation.

Americans have generally been reluctant warriors, and the desire to avoid even preparing for the possibility of war has been prevalent throughout our history. Despite George Washington's assertion in his first address to Congress that "to be prepared for war is one of the most effectual means of preserving peace," the size of the Army was reduced from about 11,000 in 1778 to the grand total of 80 soldiers some six years later.

Even our cultural icons reflect this basic aversion. Like the townspeople in the movie *High Noon,* we strenuously avoid conflict, are slow to react to obvious danger, and rise to defend ourselves and our allies only when it becomes unavoidable. Time after time, despite our best efforts, we have found ourselves at war. The pattern is quite predictable:

- **Step One:** The United States wins a conflict, having fielded a superior force usually with the most numerous and occasionally most capable equipment. Our country stands as a leader of the world's democracies, setting terms for the peace to follow.
- **Step Two:** The prospect of enduring peace causes us to disarm to a point where our military capabilities become incompatible with our ambition to influence international events.
- **Step Three:** Growing tensions among other peoples create frustration as we try, through moral suasion or economic pressure, to mediate disputes and change deep-seated attitudes.
- **Step Four:** Belatedly, we respond to the increased international danger, only to be shocked by unexpected violence, such as the surprise attack at Pearl Harbor or the invasion of an ally, as in Kuwait or Korea.
- **Step Five:** Finally roused to action, the country mobilizes and, after the loss of precious lives, emerges victorious—thus beginning the pattern yet again.

Throughout U.S. history, our reluctance to recognize the need for a sustained, viable military has severely handicapped our fighting forces. In World War I the majority of American troops reached Europe in British transports, fought with French and British artillery pieces, fired French ammunition, flew Allied planes, and manned French tanks. Of the 23,000 U.S. tanks on order, only 76 had been completed by the time of the armistice—*after* we had slogged across Europe and lost 117,000 lives.

Following World War I, we reduced our military capability drastically, believing that we had fought the "war to end all wars." This, of course, proved tragically incorrect as World War II unfolded against a backdrop of broken promises and repudiated treaties.

After losing more than 400,000 lives in World War II, we yet again slashed our forces. And barely five years later, we were nearly chased off the Korean Peninsula by a third-rate military force. We had a new generation of armor on the drawing boards, but very few tanks of *any* generation in inventory. Decommissioned M-26 Pershing tanks sitting on concrete pedestals around Fort Knox were actually taken down from their mounts and shipped directly into combat! By the end of that war, the cost was 54,000 lives.

Today, the familiar pattern appears to be happening once again. Step One was the combined victories over Communism in Eastern Europe and the Soviet Union and over Saddam Hussein in the Persian Gulf. Step Two was the precipitous cutting of the defense budget, which has caused procurement dollars to plummet by 67 percent in real terms since the mid-1980s—almost 80 percent in the case of the Army—and brought defense spending, as a percentage of GDP, to its lowest level since just before Pearl Harbor. Step Three was recently attested to by *Jane's Defense Weekly,* which counted 27 military conflicts in the world, 12 flash points and 31 areas of tension.

Step Four—the half-hearted build-up to overcome earlier excessive reductions in order to deal with an emerging threat—is not yet here, but a call for our forces to enter combat could come at any time. A month ago, Senate Armed Services Committee Chairman Sam Nunn publicly suggested three possible threats: a Libyan biological weapons attack on the U.S. Capitol, a nerve gas missile assault by a resurgent Iraq on Kuwait, or, a North Korean nuclear attack on our 37,000 troops in South Korea.

One can think of many other scenarios. The Indian minister of defense recently commented that the real lesson learned from Desert Storm is: "Never fight the Americans without nuclear weapons."

Some dismiss these and other hypothetical events as sufficiently remote that they should be disregarded—and they may even be right. But who among the world's leaders could have predicted the assassination of Archduke Ferdinand, the invasions of Korea, Kuwait, Afghanistan, or the Falklands, or the attack on Pearl Harbor?

Yet the *New York Times* recently urged billions of dollars in additional cuts in the U.S. defense budget, saying, "[After the success of Desert Storm it's obvious] U.S. weapons systems are unrivaled, so production of new tanks, planes, and ships can be put off for a decade or more." Ironically, these are the same weapons we had been told for many years were too complicated, too expensive, and too poorly designed to perform in battle.

What is so often overlooked is the fact that in today's era of the "come as you are" war, where outcomes can be decided in a matter of days, the only equipment available to our troops will be that which was planned for and acquired during the decades before. The systems that performed so well in the Persian Gulf largely represented the technology of the 1960s, the development of the 1970s, and the production of the 1980s—all utilized by the people of the 1990s. That is, the decisions of the 1970s to a considerable extent determined the casualties in the Persian Gulf.

We have espoused a strategy of minimizing casualties as well as offsetting a smaller force—America's Army is now tied with Pakistan's as the eighth largest in the world—by fielding the most modern military equipment. In actuality, our military hardware is now on a replacement cycle of about 54 years—this in a world where technology typically has a half-life from two to 10 years.

Today, as America seemingly repeats its High Noon cycle, three key paradigm shifts further complicate our national security planning. The first of these is the interconnectedness of the world economy. While the threat of a full-scale military assault on *Main* Street remains highly unlikely, targeted assaults on *Wall* Street and other key economic resources are a good deal more plausible. In my personal opinion, the principal threat in the years ahead is posed by a renegade nation holding a city hostage with a nuclear weapon; attacking the world's energy, monetary, or transportation systems; or,

as a variant, abusing our humanitarian instincts to such an extent that we feel we cannot remain detached. In each of these cases, we would be faced with nuclear weapons, which drastically raise the price of any response we may wish to consider.

The second key difference is, in fact, the potential ability of many more countries to field weapons of mass destruction. A recent *Wall Street Journal* article noted that unemployed Soviet engineers were "quitting their jobs for the more lucrative profession of street peddler." The Vice Prime Minister of the Ukraine at one point threatened to sell any nuclear warheads on his soil "to the highest bidder." And the North Korean government is reportedly developing a new missile with a range of 1,800 miles, capable of reaching most of Japan and parts of China and Russia.

The third key difference today is the telecommunications revolution which has made instantaneous news a way of life. On the one hand it brings the promise of freedom into places where tyranny has dominated. On the other hand, it has become an effective intelligence and publicity resource for Third-World despots.

So what does this all add up to? Obviously the world is still a dangerous place. This may seem to be a lead-in to the predictable call from a defense industry executive that we are not spending enough on defense. But I would be the first to argue that the end of the Cold War has fundamentally changed the nature of the threat and further that America should not spend money on defense simply to preserve jobs. It's clear that in the post-Cold War world, America can afford to safely shrink its defense posture. And we are doing that, with the one-millionth defense worker, by my calculations, due to lose his or her job on about July 4th this year.

This reduction in defense expenditures has made it possible for our nation to reap a long-sought peace dividend. One measure of this dividend is that more than $400 billion in real purchasing power has already been diverted from defense budgets to other purposes since the fall of the Berlin Wall.

Disappointment over what some have characterized as the seemingly modest impact of this reduction stems from the fact that non-defense federal spending is now growing at a rate which far outstrips any plausible reductions in defense spending. The entire defense budget is now roughly equal to the *interest* on the national debt or about one-third of the cost of health care. America should, of course, spend no more on defense than it needs, but America *can* afford whatever defense it does need. Today, we spend more on legalized gambling than we do on defense, more on beer and pizza than we do on the Army, more on tobacco and soft drinks than we do on the Navy.

What America should spend on defense depends upon the national objectives we wish to seek—and importantly, forgo; what risks we are willing to take; and what resources we are prepared to devote to national security. I would note with some concern that we seem to be in the process of inventing a *new* type of hollow military force ... one whose funds for modernization are so out of balance with the size of that force that it will ultimately find itself ill-equipped ... just as in the past we have built forces that were ill-trained or ill-supported. But choices regarding national objectives and risks are the province of government policy makers acting on behalf of the American public, not of defense industrialists.

Thus, I would like to address in my remaining few minutes not *what* we devote to national defense, but *how* we spend it. In particular, given the basic aversion of Americans to think about and plan for conflict, and given the reality of sharply constricted defense budget, and given the growing turmoil among nations, how do we avoid another High Noon ... and, more specifically, what can those of us in the defense industry do to prevent it?

In that regard, I would like to send an urgent message to my industry colleagues that we must *reinvent the defense industry* in the same manner that the Administration has called for reinventing government.

First, we must get on with the job of building a newer, smaller, more efficient, but still effective industrial base. Too many companies continue to practice "rear view" forecasting. If we want to achieve the critical technological advancements that will be needed as well as avoid the burdensome costs of half-filled factories, we will have to speed up the process of consolidation and downsizing; we will have to decide whether our companies best serve the nation, our stockholders and our employees by being buyers, sellers, consolidators, or independents. These are tough, emotional decisions not without risk. But they are decisions best made in anticipation of, not in response to, market pressures and national security needs. The "muddle of the road" approach is simply no longer viable.

Second, the industry must display the discipline and courage to make substantial investments in research and development, even in the face of smaller contracts, growing cost pressures, and impatient markets. Every breakthrough in the history of warfare, from the stirrup to the crossbow, from the jet engine to stealth, has spawned newer technologies to counteract the original innovations.

And third, while we modernize equipment and products, we must also modernize our management. We have to empower our employees to give them the authority to make operations more efficient while continuing to improve quality. We must ensure that, despite the loss of so many experienced workers, we do not lose the most precious resource we have—the irreplaceable human skills and expertise that provide our technological edge. And we must find ways to more rapidly transfer technologies both to and from the commercial marketplace.

Now, if industry is to accomplish these objectives, it will need some assistance from its principal customer, the government. Among the needed steps are: First, escalate the current effort to fix the $100 billion acquisition process, which everyone knows is needlessly complex and inefficient.

Second, we must continue to push for revision of the antitrust laws to foster greater industry consolidation while preserving at least a minimum level of competition wherever possible. Third, our government should be prepared to share with companies willing to make investments that produce savings to the government a portion of those savings. Fourth, we should not cut funds for defense-related research, exploratory development, and prototyping—particularly high-risk/high-payoff pursuits of the type which helped make American technology the best in the world. Fifth, we need to restore "truth in funding" so that American people can be assured that funds included in the defense budget are actually spent on defense. Sixth, we must stop the *de facto* nationalization of defense that has occurred in recent years as more and more maintenance and repair operations are being expropriated by the armed forces at the expense of private sector companies. And finally, we should build on the recent effort to "level the playing field" with our international competitors, which have traditionally enjoyed highly favorable relationships with their own governments.

There is also a role for the average citizen to play in redefining our national security posture. The American people need to better understand the dangers that lurk today throughout the world, posed by people that would do us grave harm if given the opportunity. We are no longer—if we ever were—an island unto itself. It is no longer acceptable, for example, for two-thirds of the American public to believe we are protected by ballistic missile defense when in fact we have none. We must be vigilant to see that our national security interests are addressed, while at the same time exercising great discipline in assuring that our commitments and interventions are never allowed to exceed our realistic military capabilities.

I would close my comments on a message of hope. I do believe we can break the High Noon cycle we have been caught in throughout the two centuries of our nation's history. But to do so requires dedicated efforts by my own industry, by our government, and by the American people.

Recalling D-Day, which has dominated our recent thoughts, I can think of no better advice to give defense reformers than General Eisenhower's order that launched the most massive military action in history: "OK, let's go."

INTERVIEW WITH BG RUSS ZAJTCHUK COMMANDER U.S. ARMY MEDICAL RESEARCH, DEVELOPMENT, ACQUISITION AND LOGISTICS COMMAND (PROVISIONAL)

Q: In what ways does the Army's new medical R&D organization reflect a change in mission?

A: As you may know, the whole Army medical department is reorganizing and the R&D Command has undertaken logistics for the Army medical department, so USAMMA [U.S. Army Medical Materiel Agency] has also become part of our command. We are now responsible for the projection of logistics support for the Army medical department. In addition, we have also undertaken some functions related to installations, such as construction. Essentially, we are mirroring the Army Materiel Command.

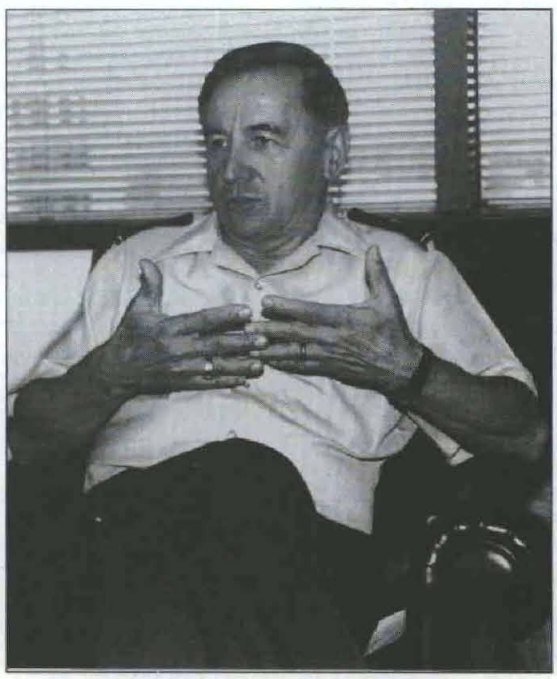
Q: What would you like to achieve during your tenure as the USAMRDALC commander?

A: I would like to position the Army medical department so it can support Army Chief of Staff General Sullivan, as we prepare to enter the 21st century. I believe that a lot of work needs to be done to modernize the Army medical department and this command is prepared to do all that is necessary to achieve those goals.

Specifically, in the area of advanced technology we want to make sure that our communication is as good as the rest of the Army. We want to bring in some technologies that will enable our medics to provide quality care to our soldiers, both on the battlefield and throughout the echelon of care, including the tertiary care facilities.

Historically, we have made great progress in decreasing the mortality of our soldiers once they reach the hospital, but the number killed in action is still quite high—around 20 percent—and this has not improved over the past 150 years. I sincerely believe that by introducing such concepts as teleconsultation, telementoring, and telepresence that we will be able to decrease mortality on the battlefield, and make a big difference.

These advanced technologies that we are working on are moving very rapidly. One example of this technology is the personal status monitor, a device placed on the soldier's wrist, in the form of a watch, that will allow us to locate a wounded or sick soldier very quickly through a geo-positioning system. It will have the capability of measuring vital signs and transmitting to the hospital or aid station so medics can start thinking about the casualty before they even get there. In addition, once the medic gets there, he or she will be able to use other enabling technology such as telementoring to call for assistance from a better-trained individual. This mentorship could come all the way from a medical center, for example, from a professor. So, in the area of advanced technology these are some of our goals and aspirations.



I also want to introduce new research methodologies. We want to use more computer modelling and simulation, and hopefully shorten the time to produce or develop vaccines for our soldiers, which is very important in preventing diseases. In a time of diminishing resources it is very important to find new ways of doing research and development.

In addition to that, during my tenure as commander, I want to be sure that we mentor our scientists so that we continue to replace ourselves and don't leave the command without adequate professional scientists and researchers. So, we will be placing a great deal of emphasis on mentoring. One other goal I have is to concentrate on research for the soldier because we have limited resources and we need to make sure that money and other resources are spent on things no one else can do. Therefore, we will probably eliminate some research that could be done elsewhere, and beef up the areas which will bring the most good to our armed forces.

Q: What impact is the DOD downsizing effort having on the Army's medical R&D programs?

A: It's rather challenging right now to manage and command when there is uncertainty about the budget and which laboratories will be operational and which will not. But, it's not an unsurmountable task. We are planning to become more efficient and, by consolidating certain functions, I think we can still accomplish all that is necessary for our soldiers. We will not decrement the research areas of prevention, sustainment, and treatment for our troops.

Q: How do you view the inclusion of members of your command in the Army Acquisition Corps?

A: I think that including our folks in the Acquisition Corps will help us do a better job for the Army and DOD and will also be a wonderful opportunity for our staff to develop. So I view it as a positive thing.

Q: Could you discuss how your command is working with other DOD and Army activities in areas such as chemical and biological

As we deploy
around the world
in all types of environments,
it is important
to understand
what each environment demands
and how we can get
our soldiers to perform
to a maximum
without becoming ill.

defense, and environmental protection and cleanup?

A: We always look for ways of using partnerships and we play supporting roles as well as leveraging against other organizations. Let me start out, for example, with ARPA—the Advanced Research Projects Agency. Some of our advanced technology development is in partnership with ARPA, and much of the funding for this development actually comes not from our command, but from ARPA.

We are also looking for partnerships with the Department of Energy, and with Health and Human Services, so leveraging is very important to us; partnership with various organizations is very important to us. As far as the environmental agency is concerned, we, of course, have the Army Environmental Hygiene Agency that is charged with doing analysis and looking for environmental problems. We are putting some additional preventive medicine assets into that organization so they can take on additional missions. The Medical Command is going to work very closely with the environmental agency to ensure that they accomplish their mission. This effort, in turn, will support us in various neurological and other studies. Again, I personally believe that it is not good to box people in, but to have people cross-utilized between various organizations.

Relative to the chemical and biological areas, we, of course, are charged with developing vaccines and treatments for chemical and biological exposures. Other agencies are charged with developing equipment for detection. It will be even more important for us to work more closely with them because, for researchers to develop better detecting equipment, they need to understand the threats and problems associated with biological and chemical exposures. By understanding each other's concerns, we both benefit and become mutually supportive. We are concerned with getting the most done with limited resources.

Q: What are some of the ways your command is helping to "sustain and protect" the force?

A: In the area of protection we have some very good scientists working on various vaccines, such as the development of a malaria vaccine. We have a great tradition in developing numerous vaccines to protect our forces, and we plan to continue doing that.

We're also looking for ways to protect against various biological and chemical agents. We have scientists working on a number of experiments to continuously improve treatment and look for ways of prevention. In areas of sustainment, at Natick, MA, near Boston, we have scientists working on environmental hazards such as cold, heat, and high altitude. They are also trying to determine nutritional requirements, and evaluate the performance of soldiers in various hazardous conditions. As we deploy around the world in all types of environments, it is important to understand what each environment demands and how we can get our soldiers to perform to a maximum without becoming ill.

Q: What do you believe are priority areas for Army medical research?

A: As I stated earlier, we are putting a great deal of emphasis on advanced technology. We are following the lead of the Army chief of staff. We want to digitize our hospitals and make use of information management and modelling so that we can do more advanced research at a reduced cost. As I also noted earlier, we want to use a great deal of simulation before going into a developmental process. A priority for Army medical research, again, is to concentrate on areas unique to the Army, that no one outside the Army can do. Our focus will be on research for the soldier.

I want to stress that some types of medical expertise don't exist outside the military. Therefore, we are unique in that regard. That's why it is very dangerous to dismantle any of our efforts until we are sure that someone else can pick up the mission. Again, research for the soldier involves three areas: prevention, sustainment and treatment. To recap what I said, prevention involves vaccines and various antidotes against nerve and biological agents. Sustainment includes enhancement of performance, maintaining health in hazardous environments, and combat casualty care. All of this makes a difference in treating our casualties, all the way from early identification to development of better resuscitation products, blood products, and medicines in order to sustain a wounded soldier longer before he or she gets to a treatment facility. So we have some visions that are quite advanced and innovative, and we are certain that we will make a difference in the next couple of years.

Q: Critics of the Army's R&D process have stated that contracting out a good portion of current in-house research would be more cost effective. What is your response?

A: Most people don't realize that the Army Medical Research and Development Command already spends half of its authorized money on outside contracts. In other words, we realize that if we don't have the expertise to develop military-unique products and solutions, we must seek it in industry and at universities. Certainly, if there is an opportunity to get something done cheaper we're all for it because we don't have unlimited resources. However, I want to point

out that some of the things we do no one wants to do. Let me give you a specific example. You won't find much interest in developing an anthrax vaccine, because it has no peacetime application. There is no profit in it for industry; therefore there is no outside interest in doing this work.

Also, we have asked NIH to take a look at our work and see whether they would be interested in picking up some of it. We did that specifically because people have asked us whether NIH could take on some of our research, particularly infectious disease and biological research. NIH put a panel together and looked at what we do. They have stated that the research should remain within the military. So, what we do is not more costly than contracting it out. This is because there is nothing to compare it to—no one else is doing it, or is interested in doing it. However, it is still very, very important because if we don't do it we are telling our soldiers we don't want them to have the best care if sent into harm's way. We can't afford to do that.

Q: Are there any cooperative efforts with other countries?

A: We have some cooperative efforts on certain projects, for example with Israel and Sweden, and we are looking at other countries to develop relationships. We have a great deal of interest in the Russian Federation, for example, in the areas of tele-medicine and pharmaceuticals. This is obviously a very complicated issue which has to be evaluated by a number of individuals. But, yes, I think our philosophy is that we ought to know what is going on throughout the world. Although this nation is a leader in almost every area of medical research, in my opinion, there are certain places that have expertise that we don't have, and we want to capitalize on it. There is always something we can learn, regardless of which country we are working with.

Q: Could you comment on the suggestion that all the military Services consolidate their medical R&D efforts?

A: As I alluded to earlier, we already have a number of consolidated functions, such as our AIDS and HIV research, which is a tri-Service cooperative effort. We also have a number of other projects like cooperation with the Navy in malaria research. When talking about consolidation, it is important to clarify what is meant. Are we talking about simply consolidating into one building, or consolidating functions? I think it's important to look at consolidation of functions and work together as a team, rather than two or three groups working independently and not communicating. We don't have that problem. We communicate across Service lines and work in partnerships with the other Services and civilians. In the future, there will certainly be an opportunity to see if we could do even more joint projects. But there are certainly Service-unique requirements—and we want to make sure we don't do away with those. There aren't many Service-specific requirements in medicine, but there are some, so I want to be cautious.

In addition, as we consolidate, we want to be sure that we don't put functions in a place that later gets closed and then lose the capability. So, as the BRAC process evolves we want to be sure we don't put our eggs in a basket that's not going to be there. It's a very complicated issue and we must be very careful not to jump into the swimming pool until we're sure there is water in it.

Q: In comparison to the civilian community, how extensive a problem is AIDS in the military, or at least in the Army?

A: Since we began testing the armed forces for HIV, we are of course not letting people into the Service who are positive, so we have decreased the accessions who are already infected. However, we still have a problem with people contracting AIDS. We are doing a reasonable job in education and training within the Service, so my feeling is that we're a little better off than the rest of the population. Our Service men and women are more aware of the problem and are probably taking better precautions. However, since we deploy around the world into areas where there is greater prevalence of it than in our country—as of today I suspect we have Service people in 70 different countries—they will be exposed to this. Therefore, we are also interested in developing vaccines to protect our troops.

Some people may ask why the Army or military Services should be involved in AIDS research. In many ways it is the same as working on a vaccine for Malaria. We certainly don't want to be lopsided by putting more into AIDS research than is necessary, but we should continue putting effort into prevention, education and training. Some of the institutes such as NIH are more interested in treatment, so they are doing research on the more advanced stages of the disease.

Wouldn't it be wonderful if the Army or the Armed Services came up with a cure or treatment for AIDS? As I mentioned, our focus is on research for the soldier, but there's nothing wrong if there are spin-offs which benefit the rest of our citizens. We're not losing sight of our primary mission, but at the same time we would be happy to make a contribution to the rest of the country—we are a part of the rest of the country.

Q: Is there anything else you would like to comment on?

A: Yes. In spite of downsizing and reductions in personnel and the budget, I am very optimistic about the future of the Army medical department, as well as the rest of the Army. I think we have quality people—the people who are remaining in the Service are dedicated and embody all of the values of the Army: commitment, competence, candor and courage. I am very confident that, at least in this command and the rest of the Army medical department, we will reach new heights of excellence. I am most grateful to have been given the opportunity by the Army chief of staff to command this wonderful group of people.

ARMY REORGANIZES MEDICAL R&D COMMAND

By Chuck Dasey

The U.S. Army Medical Command (provisional) was established on Oct. 1, 1993. The provisional status of the command lasts until Oct. 1, 1994. The surgeon general's mandate to establish a more efficient and effective organization has been fleshed out incrementally during the transition year.

Major goals of the reorganization are to design an accessible, deployable, accountable and integrated Army Medical Department (AMEDD). Lines of authority are simplified and clarified. Principles of Total Quality Management and good business practices are emphasized. People are organized around work, working on the right things at the right level.

Reorganization of the Army's medical research and development program is occurring as part of the overall AMEDD reorganization. The U.S. Army Medical Research, Development, Acquisition and Logistics Command (USAMRDALC) (provisional) was established March 1, 1994, in a ceremony at Fort Detrick, MD. The provisional status of this command also lasts until Oct. 1, 1994.

The new command includes the former U.S. Army Medical Materiel Agency (USAMMA) at Fort Detrick, and the U.S. Army Health Facilities Planning Agency (HFPA), located at the Office of the Surgeon General.

The USAMRDALC is a major subordinate command of the U.S. Army Medical Command (Provisional). The USAMRDALC expands the medical materiel development mission of the USAMRDC to include the USAMMA mission of procuring, fielding and sustaining medical equipment for the Army. The new command also assumes the HFPA mission of planning, programming and budgeting for construction of new Army medical facilities. Consolidation of the USAMMA and the USAHFPA into the USAMRDALC is consistent with the AMEDD reorganization goal of consolidating all the field operating activities in a customer-focused, business management control system.

The medical logistics mission is a complex addition to the medical research and development mission. The USAMMA is the AMEDD's power projection platform. It focuses on materiel requirements of both fixed facilities (hospitals in CONUS and Europe), and deployable field hospitals. The USAMMA is the lead agent for AMEDD advanced technology initiatives, particularly the Medical Diagnostic Imaging Support System (MDIS), and telemedicine. It is the Army's war reserve manager for Class VIII supply, the AMEDD's operational executor for medical logistics programs worldwide, and the tri-Service agent for medical catalog development. For its medical logistical support of Operations Desert Shield and Storm, the USAMMA received the Army Superior Unit Award.

The mission of the USAMRDALC is to plan, program, coordinate, manage, direct, execute and review the Army Medical Department Research, Development, Test and Evaluation (RDTE) Program, the Army Medical Department Logistics and Medical Materiel Program, and the Army Health Facility Planning/Construction Program.

According to the proposed concept plan for the new command, the commander, USAMRDALC, will be dual-hatted as the deputy for medical systems in the Office of the Assistant Secretary of the Army for Research, Development and Acquisition (OASA(RDA)). This two-star position mirrors the deputy for combat service support within the OASA(RDA), which is a dual-hat for the Army Materiel Command's deputy chief of staff for research, development and engineering. This position supports the acquisition management reorganization mandated by the Goldwater-Nichols Act.

The concept plan further states that the deputy for medical systems will serve as the conduit for medical acquisition-related business within the OASA(RDA), enhancing day-to-day operations and communication. The position improves the Army Medical Department representation within the Secretariat and the Army staff by providing a knowledgeable presence in the OASA(RDA).

The deputy for medical systems will be the direct link between the Army Acquisition Executive (AAE) and medical programs. He will be responsible for executive program management and implementation of acquisition policy for medical products and equipment.

The USAMRDALC will retain contracting authority for medical research and development, and for medical logistics support. The Medical Command has a separate contracting authority for health services.

The concept plan lists these specific functions of the deputy for medical systems:

- Exercise program management oversight for the AAE for medical programs;
- Provide the principal programmatic focal point within OASA(RDA) for medical programs;
- Conduct periodic programmatic/resource assessments;
- Ensure timely conduct of milestone decision reviews;
- Review all Planning, Programming, Budgeting and Execution System (PPBES) submissions for medical programs and assist USAMEDCOM is preparing PPBES submissions;
- Prepare and present Congressional testimony in justification and defense of assigned programs;
- Serve as the initial entry point for acquisition plans and justification and approvals for medical programs; and
- Serve as the focal point to Congress, the Office of the Secretary of Defense, the media and the USAMEDCOM for justification and defense of medical programs.

The major advantage of this realignment is the consolidation of all stages of medical materiel development, acquisition, and fielding, from basic research to delivery and sustainment—complete life cycle management of materiel—under one command.

The headquarters of the new command will remain at Fort Detrick. Approximately 1,285 military and 1,450 civilian personnel are assigned to the command. In addition to five units at Fort Detrick, the command operates units at the Walter Reed Army Medical Center in Washington, DC; Aberdeen Proving Ground, MD; Natick, MA; Fort Rucker, AL; and Fort Sam Houston, TX. The Walter Reed Army Institute of Research also operates four overseas laboratories, in Germany, Kenya, Thailand and Brazil.

CHUCK DASEY is the public affairs officer at the U.S. Army Medical R&D Command. He holds a B.A. degree in English from Fordham University and is a graduate of the Army's Advanced Public Affairs Course.

Army training helicopter, TH-67.

ARMY AIRCRAFT ACQUISITION BY COMMERCIAL STANDARDS

By James M. Procyk

The successful best value acquisition of the Army's new training helicopter, the TH-67A Creek, was done by commercial standards. In this context, commercial standards included the full range of non-military documents applicable to the commercial aviation marketplace. The government's purchase description was a streamlined 14-page system specification that used commercial standards as the basis for describing the customer's priority system performance requirements. The TH-67 is a good example of appropriate consideration of circumstances in the application of standards, and shows that commercial standards can be successfully applied to acquisition of military aircraft if, and only if, you understand their limitations.

Ultimately, successful acquisition is dependent on communication leading to full understanding of requirements by all parties, in accounting for the customer's priority requirements without undue restriction of design solutions, and in employing risk management throughout the acquisition process. Standards are, after all, a tool, not a substitute for communication, understanding, and risk management.

The Army has been flying UH-1 Hueys as an interim trainer. The UH-1 proved to be an effective trainer, but its main drawback is operating cost. A market survey indicated that a non-developmental item helicopter could do the job and provide a net cost savings. The new training helicopter program was initiated with this imperative— reduce core initial entry rotary wing training cost by displacing the current primary trainer with a commercial off-the-shelf helicopter that has lower operating and support cost, but does not degrade training effectiveness. The contract was awarded in March 1993, the first aircraft was delivered in October 1993, and the first class of students using the new trainers started in April 1994.

Circumstances which favored a non-developmental item and commercial standards for the TH-67 began with the similarity of initial entry flight training to commercial use. Commercial helicopters can perform all the maneuvers needed to learn and practice basic flying. The flight environment at Fort Rucker is similar to a small hometown airport, except for the larger volume of traffic. The training helicopter does not need weapons or other combat mission equipment characteristics unique to military specifications.

These helicopters will always remain at Fort Rucker where the ambient weather environment is temperate southern United States. This temperate environment is typical of commercial standards in lieu of the extreme environments typically incorporated in military standards. In addition, the single stable location was compatible with contractor maintenance by a Federal Aviation Administration (FAA) certified repair facility and commercial wholesale parts supply. The TH-67 did not need the military support system's unique logistics capabilities. Commercial standards for technical manuals were suitable for Fort Rucker's contracted certified repair facility.

The initial entry rotary wing training mission requirements were to perform basic flight maneuvers using standard helicopter controls

and carry an instructor, student pilot and observer. Mission requirements were well within range of commercial mission requirements and available commercial helicopters. Only minor modifications were required to basic standard commercial aircraft. One modification was an avionics suite to meet navigation and communication performance that included the military radio frequencies in use at Fort Rucker. The other two required modifications, crashworthy seats and fuel system, were to commercial standards that were in the process of being imposed for new systems.

Commercial standards as used in this article fall into three groups: "industry standards," "manufacturer's standards," and nonmilitary "government standards." Industry standards are generated by industry associations, and technical societies. They represent the lowest common denominator of agreement by their constituents which sometimes results in incomplete definition or loopholes. Some establish standards for testing which enables a common basis for claiming superior performance and others establish minimum accepted professional safety standards, not for the user's protection so much as, for their own indemnity from liability.

Manufacturer's standards are internal to the company and often incorporate proprietary processes which give rise to competitive claims of superior characteristics, but the question is are they the characteristics of real value to the customer's priority requirements?

The primary government standards applicable to the commercial aviation market are the Federal Aviation Regulations. These are intended to assure a minimum level of safety and safe operating limits, not necessarily an indication of mission performance. One other significant difference between commercial and military standards is that military standards usually measure performance at environmental extremes, but commercial performance is commonly measured at favorable, ambient conditions.

On the positive side, commercial standards, including the Federal Aviation Regulations, are very design solution independent, compared to many military standards. This design freedom encourages innovation, fosters competition, enables dual use (both civil and military) of basic aircraft designs, and enables performance growth, all of which can lead to superior performance. However, the buyer beware, there is more risk involved in this. The solution is through understanding of the customer's priority system requirements, and managing the risk of other unexpected characteristics, rather than resorting to safe old design solutions.

The most significant challenge to specifying the requirements for best value acquisition of the new training helicopter was defining just what our customer, the school at Fort Rucker, considered high value training performance. The real challenge was not an issue of complexity, but to successfully communicate across cultural environments. The training effectiveness definition had to be equivalently understood in the instructor pilot's student learning, the engineer's physical performance data, and the acquisition authority's dollar value cultural environments.

The definition, also, must be communicated to the manufacturer to be understood by both the engineer's physical performance data, and the business manager's dollar value cultural environments. Ideally, the definition should provide a common vision, common experience basis for verbal communication, and neither favor nor exclude any of the cultural environments. The process for developing such a definition is show, tell, and listen. Show a picture of the definition, tell about it in terms that are believed to be a common experience base, and listen to determine if it was understood and can be related to the other cultural environments.

The process was begun between the engineers and the instructor pilots, then cycled until everyone understood each other. Initial communications with the instructor pilots identified the first priority of an effective trainer was a safe learning environment. The system specification defines it as follows: "Safe Learning Environment is an aircraft flight envelope large enough to provide the necessary skill exposure and accommodate the initial student response errors (e.g. range of control motion) expected when practicing all basic flight skills. The aircraft envelope allows the student to make mistakes; learn and recover without incident." The engineers second face to face with the instructor pilots identified a formula and figure which communicated the characteristics that would provide a safe learning environment.

As shown in the Altitude Rate Example in Figure 1, the formula is: The system limit must be equal or greater than: the required skill value, plus the student margin, plus the instructor's margin. Assume the flight training guide requires the student to demonstrate a 50 feet per minute climb. Starting from the bottom up in the Altitude Rate Example, the arrow shows that 50 (feet per minute) is the required skill value. From 50 to 60 on the scale is the student margin. "Student Margin is a safe excursion area around the training standard with a magnitude equal to the expected student overshoot when initiating and executing the prescribed maneuver." From 60 to 65 on the scale is unallocated extra. This can be used to increase the standard, allow

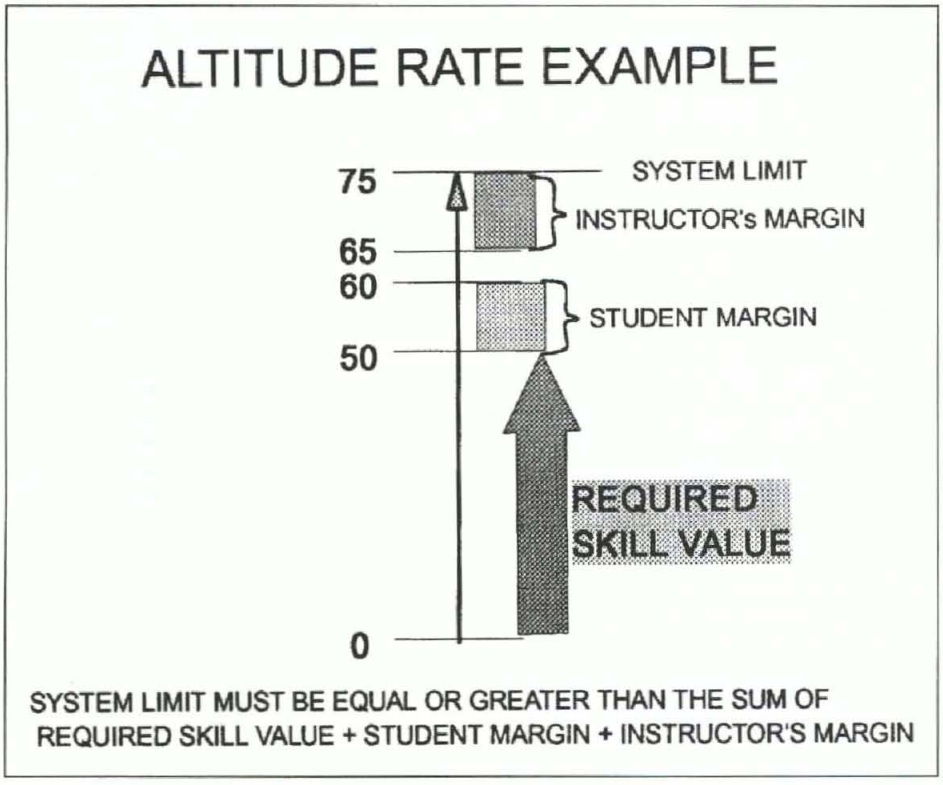


Figure 1.

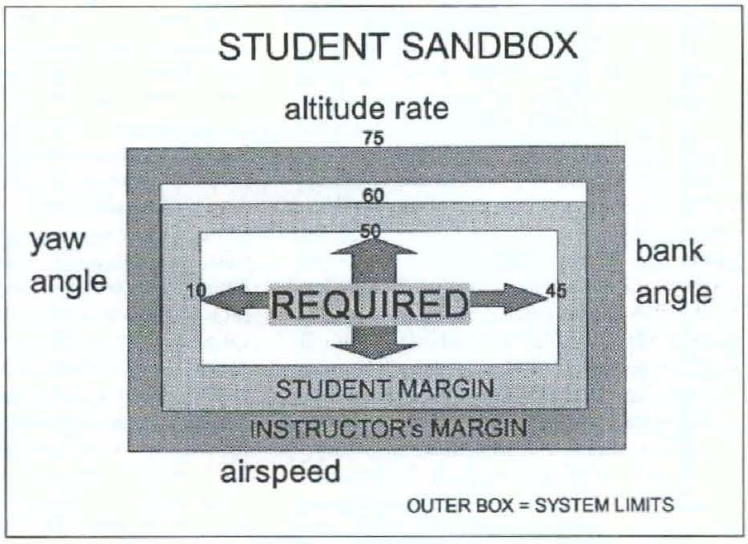


Figure 2.

more error or increase the instructor's margin. From 65 to 75 on the scale is the instructor's margin. The instructor's margin is the safe area just below the system's limit necessary for the instructor to recognize that the student is out of control, react, and recover control without incident. The system limit is the safe operating limit for the system. The specification breaks these definitions down further into aircraft control and human factors characteristics.

Figure 2 is called the "Student Sandbox" because it represents a "safe learning environment" for the student pilot to practice piloting skills just as a child's play sandbox is a safe learning environment to practice eye-hand coordination skills. The figure shows four-sided boxes where each side quantifies a characteristic counting from the center outward. Thus, the distance up, down, left, and right of center represent values of flight performance characteristics. From the center upward represents the Altitude Rate Example. To the right represents a bank angle control skill with a 45 degree required skill value. The left is a yaw control skill with a 10 degree skill value, and down from center represents airspeed control. In this notional example, bank angle, airspeed and yaw angle are optimum for training. Altitude rate has a little extra, as described in the previous example.

There are more than four flight characteristics in the flight training guide, but four is a reasonable number to draw and demonstrates the necessary combination of characteristics to determine a safe learning environment and in turn training effectiveness. By drawing student sandboxes for each proposed aircraft it was possible to portray the four maneuvers representing critical combinations of the customer's highest priority characteristics, and a visual overview of their training effectiveness. The characteristics were measured by ratings and comments by 20 instructor pilots who flew each proposed helicopter in performance of the critical maneuvers prescribed by the flight training guide. Statistical plots for each maneuver and the student sandbox were the communication tools that closely linked instructor pilots, to evaluators, and the decision makers and kept all of them involved throughout the process. Since training effectiveness was the most important criteria, this evaluation by the customer, for the customer, was the heart and soul of the new training helicopter acquisition process.

The system specification was streamlined by priority specification of the customer's performance requirements. The only specific design solutions were a five strap safety harness, conventional controls and turbine engines which the customer required. Everything else was a performance requirement further prioritized and identified as critical, non-critical and optional. In short, critical meant mandatory, non-critical meant serious but not individually an automatic disqualification, and optional meant we would consider it, if available. The specification included two industry standards, the Federal Aviation Regulation airworthiness standards, and not one single military standard or specification.

The exclusion of military standards and specifications was a lot easier said than done. Many engineers were sent back to determine what important performance requirement resulted from imposing MIL-xxxx. Only performance requirements would be considered for inclusion in the specification, subject to acceptance and prioritization by the customer. The offerors added their own company standards in proposing specific models features, quality processes and performance. With the offerors addition, the proposals contained all three types of commercial standards.

The new training helicopter's technical performance requirements, and Federal Aviation Administration airworthiness certification, then represented a filter of minimum performance that had to be met in order to participate in the customer evaluation. This filtering was one risk management tool in the acquisition, and assured the safety of the instructor pilots conducting the user evaluation. The potential offerors were given several opportunities to contribute via draft Requests for Proposal, Pre-Solicitation, and Pre-Proposal conferences and an opportunity to observe an actual training session at Fort Rucker. Good communication is another risk management tool.

The user evaluation also served as a risk management tool. We were very dependent on the user evaluation to weed out any design solution that did not work or caused an unexpected and unacceptable problem in the training environment. The customer did in fact find such problems in the Training Effectiveness User Evaluation which the evaluation criteria allowed us to consider as part of the basis for award. Besides operating in the training environment, a revealing maintenance demonstration was conducted including an engine, transmission and tail rotor drive shaft removal and replacement. The user evaluation results, good and bad, were all accounted for in the best value evaluation.

In summary, intelligent application of standards is the key to successful acquisition, not the type of standards utilized. Nothing can replace the intelligent understanding and description which fully communicates the customer's priority system performance requirements. Uninformed blanket application of any type of standard is the road to catastrophe.

JAMES M. PROCYK is chief of the Development Branch in the Directorate for Engineering at the Aviation Research Development and Engineering Center (AVRDEC), U.S. Army Aviation and Troop Command. He holds a B.S. degree in electrical engineering from the University of Illinois, Urbana, IL, and is a member of the Army Acquisition Corps.

ARMY HOLDS 19TH SCIENCE CONFERENCE

By William K. Brower Jr., David Seitz, and David A. Davison

The Army research community must abandon conventional thinking and become entrepreneurs to help the Army draw on all the scientific resources available in the nation.

The Honorable Gilbert F. Decker, assistant secretary of the Army (research, development and acquisition), delivered this message to Army scientists and engineers at the 19th Army Science Conference held last June in Orlando, FL. In his keynote address at the awards banquet, Decker said that declining research, development and acquisition budgets and future emphasis on dual-use technologies means the Army must capitalize on external efforts to the maximum extent possible.

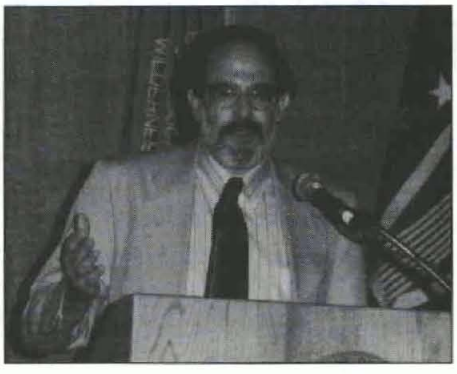
"Each one of you must become a scientist 'schizophrenic'," he told those at the banquet. "You must think about military relevance as you define your research project. You must simultaneously think about the work with respect to industrial applicability. No longer can any of us think in one dimension," Decker said. Decker praised the past track record of Army research and added that the Army must continue relevant world class research to provide direction in technology and advanced concepts for Force XXI.

He highlighted three of the Army's critically important areas in science and technology:

- *Battlefield Digitization*, which he termed "critical to the Army's efforts to win the information war and maintain a small armed force capable of decisive victory";
- *Horizontal Technology Integration*, packaging new technologies so that they can easily be integrated into current battlefield weapon systems to result in cost savings; and
- *Advanced Concept Technology Demonstrations* for the Rapid Force Projection Initiative/Enhanced Fiber Optic Guided Missile and the Precision Rapid Counter Mobile Rocket Launcher. "These two programs, and others like them, are at the essence of acquisition reform. In order to do them, a strong science and technology base is critical," commented Decker.

Decker's comments echoed the theme of the conference, "Assuring the Competitive Edge." Sponsored by the Office of the Assistant Secretary of the Army for Research, Development and Acquisition, the conference is held every two years with the objective of showcasing leading scientific accomplishments within Army laboratories and centers, primarily through the presentation of technical papers, posters, and exhibits. The conference aimed to enhance networking among those at the state-of-the-art; share accomplishments with academia, industry and the Army leadership; and give recognition and appreciation to Army scientists and engineers. The conference was unclassified and open to industry, academia, and foreign nationals. A total of 811 individuals attended the conference. Of these, 42 were from academia and 66 from industry. Foreign nationals representing Portugal, Israel, Australia, Italy and Canada also attended.

Conference attendees were able to view a technology showcase featuring 55 exhibits demonstrating the latest technologies from Army laboratories, RD&E centers, commands, and Defense agencies. Many of the displays included interactive hands-on demonstrations of new technologies. The conference also featured distinguished scientists and leaders from academia, industry, and government as keynote speakers at each of 12 concurrent technical sessions and at the lunch and dinner functions.



Dr. Harley D. Balzer, director of Russian area studies, Georgetown University, was the keynote speaker at the Research and Development Achievement Awards Dinner.

Keynote luncheon speakers were Norman R. Augustine, chairman and chief executive officer (CEO) of Martin Marietta Corporation and a former under secretary of the Army, and Dr. Roger L. McCarthy, CEO of Failure Analysis Associates, Inc.

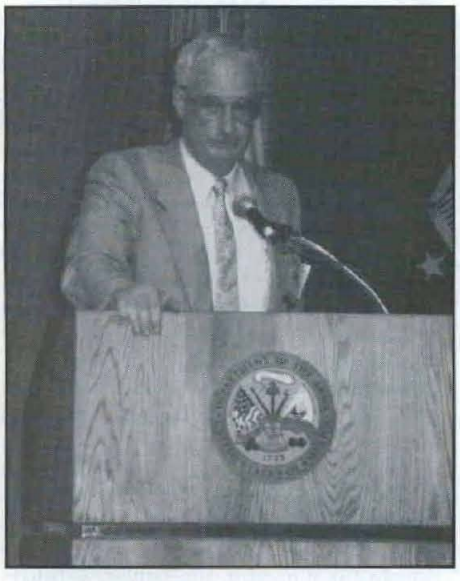
Augustine stressed the importance of research and development during a time when the Army is downsizing. He said the most important priority should be breakthrough technology. He warned against complacency and cutting funding due to the success of weapon systems during the Persian Gulf War by pointing out this was a war of unusual circumstances that probably won't apply in the future. Augustine stressed the need for researchers to take risks but warned against making systems so complex and user-unfriendly that they become unusable. He pointed out that wars are not won in laboratories and that the key to success is getting technology to the battlefield.

McCarthy gave a highly entertaining visual presentation on work performed by his company which is a unique engineering firm devoted primarily to the analysis of catastrophic failures. He presented a number of examples where human influence culminated in a catastrophic disaster and emphasized that man-in-the-loop systems without mechanical back-up will eventually result in disaster. He noted that system designers and builders should be alert that single-point human designs need mechanical back-up to allow for fault tolerance. If not, he said, the failure rate should be included in the performance specifications since failure will eventually occur.

Dr. Harley D. Balzer, director of Russian Area Studies at Georgetown University, provided the keynote address at the Research and Development Achievement Awards Dinner. The Awards Dinner honored the winners of the 1993 R&D Achievement Awards, previously announced in the January-February 1994 issue of *Army RD&A Bulletin*. During Balzer's address, he detailed the financial and ecological problems that have arisen in the Russian scientific community since the break-up of the Soviet Union.

Two panels composed of technology leaders from within the DOD were held on the last day of the conference. During the panels, each panelist provided a brief presentation on their aspect of the topic. Following

ARL scientist Dr. Mitra Dutta, principal author of the winning research paper, accepts the Paul A. Siple Memorial Award from the Hon. ASA (RDA) Gilbert F. Decker.



Dr. Richard Chait, director of research, Office of the Deputy Assistant Secretary (Research and Technology).

the presentations, the panelists responded to question cards submitted by attending individuals. The format provided the scientists and engineers the opportunity to receive information on subjects of particular interest to them.

George T. Singley III, deputy assistant secretary of the Army (research and technology), chaired a panel on "Maintaining Technology Alliance: Technology Transfer-Dual Use." Singley emphasized the importance of technology transfer to the Army today, telling the scientists and engineers in attendance that technology transfer can not be accomplished without their help. Panelists stressed the need for the Army to build partnerships with commercial industry to take advantage of their technology development. Cooperative R&D Agreements; the Defense Technology Conversion, Reinvestment, and Transition Assistance Program; Small Business Innovation Research Program; and other programs were discussed as methods to achieve technology transfer.

Panel members included: MG Thomas L. Prather Jr., deputy chief of staff for research, development and engineering, Army Materiel Command (AMC); Dr. Kenneth J. Oscar, principal deputy for acquisition, AMC; Dr. Robert W. Lewis, technical director, Natick RD&E Center; Thomas L. House, technical director, Aviation RD&E Center; Dr. H. Lee Buchanan, director, Defense Sciences Office, Advanced Research Projects Agency; Dr. Lance A. Davis, deputy director, Defense research and engineering for technology transition; Dr. Robert B. Oswald Jr., director of research and development, Corps of Engineers; and COL John Frazier Glenn, executive assistant to the commander, Army Medical Research, Development, Acquisition and Logistics Command.

Dr. Richard Chait, director of research, Office of the Army Deputy Assistant Secretary (Research and Technology) chaired a panel on "Research Quality: Striving for Excellence." Panelists highlighted methods to measure, obtain, and maintain excellence. Items discussed included roles of peer review, research staff exchange, management and leadership, publications, recognition for accomplishment, facilities and equipment, and involvement of the customer in the planning process, among others. Management's responsibility to provide a working environment where researchers can take risks was stressed along with the need to recruit and retain the best people. Panel members included Dr. John W. Lyons, director, Army Research Laboratory (ARL); Dr. Gerald J. Iafrate, director, Army Research Office; Dr. Arthur Ballato, principal scientist, Army Research Laboratory's Electronics and Power Sources Directorate; Dr. Edgar M. Johnson, director, Army Research Institute; Dr. Robert B. Oswald and COL John Frazier Glenn.

A total of 225 papers were presented during the conference. These papers were selected from 594 abstracts through a highly competitive peer review process and represent the Army's best research in science and technology. Poster presentations of 175 selected papers were displayed throughout the conference area.

In addition to the paper and poster presentations, each of the 12 concurrent sessions featured a keynote address that set the tone of each session. Session topics and the keynote speakers were as follows: Materials and Manufacturing—Professor Eric Baer, Case-Western Reserve University; Biotechnology—Professor Lynn Jelinski, Cornell University; Photonics and Power Technology—Dr. Charles M. Bowden, Army Missile Command; Environmental and Geosciences—Dr. Robert B. Oswald, Jr., Army Corps of Engineers; Sensors and Signatures—Dr. Rudolf G. Buser, Army Communications-Electronics Command; Large Scale Scientific Computing— Professor Paul Woodward, University of Minnesota; Engineering Sciences—General Glenn K. Otis (U.S. Army Ret.), Coleman Research and Engineering; Signal and Image Processing—Dr. Clayton V. Stewart, Science Applications International Corp.; Knowledge Base Computing Systems—Professor Anil Nerode, Cornell University; Advanced Propulsion Technologies—Professor Phillip S. Myers, University of Wisconsin; Life, Medical and Behavioral Sciences—Dr. Garth Green, Harvard School of Public Health; and Microelectronics and Power Technology—Professor George I. Haddad, University of Michigan.

Of the 225 papers presented, 15 were selected for recognition. A silver medallion, three bronze medallions and 12 session certificates were awarded at the awards banquet by the Honorable Gilbert F. Decker, assistant secretary of the Army (RDA).

A team of scientists from the Electronics and Power Sources Directorate of the Army Research Laboratory, Fort Monmouth, NJ, received the first place Paul A. Siple Memorial (silver medallion) Award. Drs. Mitra Dutta, Jagadeesh Pamulapati, Michael Wraback, and Monica Taysing-Lara, all of ARL; and Dr. Hongen Shen, Geo-Centers, Inc., Lake Hopatoong, NJ, co-authored the winning paper titled "Very High Contrast, High Speed, Novel Polarization Sensitive Normal Incidence Light Modulator." The paper describes a high speed, high contrast multiple quantum well light modulator for signal/data processing that achieves an extraordinarily high contrast ratio of 7000:1.

Three other papers were selected for outstanding achievement and awarded bronze medallions.

- Scott Hayes and Andrea Mark, ARL, Adelphi, MD, were honored for their paper titled "Controlling Chaos for Communication, An Application of Information Theory to the Control of Chaos."
- Dr. Walter Bryzik, Tank-Automotive RD&E Center, Warren, MI, and Professor Naeim Henein, Wayne State University, were honored for their paper titled "Fundamental Cold Start Phenomena Within

Advanced Military Diesel Engines."

• Dr. James W. Mink, Army Research Office, Research Triangle Park, NC; Dr. Felix K. Schwering, Army Communications-Electronics Command, Fort Monmouth; Dr. P.L. Heron, Dr. M.S. Steer, G.P. Monahan, A. Schuenemann, and S. Zeisbert, North Carolina State University, Raleigh, NC, were honored for their paper titled "A Hybrid Dielectric Slab-Beam Waveguide, Theory and Experiment."

An additional 12 papers were selected as the top papers in each session.

• Advanced Materials and Manufacturing—Drs. Frank J. Owens and A.G. Rinzler, Armament RD&E Center, Picatinny Arsenal, NJ; Z. Iqbal, Allied Signal Inc., Morristown, NJ; and T. Datta, University of South Carolina, Columbia, SC, were recognized for their research documented in a paper titled "Synthesis and Characterization of Highest Temperature Ambient Pressure Superconductor, Hg-Pb-Ba-Ca-Cu-O."

• Biotechnology—Dr. David E. Lanar, Lisa A. Ware, Matthew C. Sequin, LTC W. Ripley Ballou, COL Gerald C. Sadoff, Walter Reed Army Institute of Research, Washington, DC; Drs. John A. Tine, Charles de Taisne, and Enzo Paoletti, Virogenetics Corp., Troy, NY, were recognized for their research documented in a paper titled "Construction of Effective Vaccines Against Malaria Using an Attenuated Vaccinia Virus Vector."

• Photonics and Power Technology—Dr. Charles M. Bowden, Army Missile Command RD&E Center, Redstone Arsenal, AL; and Dr. Govind P. Agrawal, University of Rochester, NY, were recognized for their research documented in a paper titled "Generalized Maxwell-Bloch Formulation for Semiconductor Lasers: A Summary."

• Environmental and Geosciences—Dr. Ilona J. Fry, Ronald T. Checkai, Megan Lynch, Dennis Rohrbaugh and Joseph J. DeFrank, Edgewood RD&E Center, Aberdeen Proving Ground, MD, were recognized for their research documented in a paper titled "Bioremediation of Oil-Contaminated Soil by Microbial Inoculation of Surfactant Treatment."

• Sensors and Signatures—Vincent Sabio, Lynn Happ and CPT Keith A. Sturgess, Ph.D., ARL, Adelphi, MD, were recognized for their research documented in a paper titled "Army Research Laboratory Ultra-Wideband SAR: System Overview and Results of Resonance-Based Target Recognition Studies."

• Large Scale Scientific Computing—Dr. Roger A. Wehage, Tank-Automotive RD&E Center, Warren, MI, was recognized for his research documented in a paper titled "Development of Symbolic and Numerical Methods for Real-Time Vehicle Simulations."

• Engineering Sciences—Dr. Jubaraj Sahu and Charles J. Nietubicz, ARL, Aberdeen Proving Ground, MD, were recognized for their research documented in a paper titled "Application of Chimera Technique to Projectiles in Relative Motion."

• Signal and Image Processing—Dr. A. Brinton Cooper III, ARL, Aberdeen Proving Ground, MD; and Professor Brian L. Hughes, Johns Hopkins University, Baltimore, MD, were recognized for their research documented in a paper titled "Coding for Improved Tactical Channel Sharing."

Hon. Gilbert F. Decker, assistant secretary of the Army (Research, Development and Acquisition), listening to a presentation on one of the exhibits featured in the technology showcase.

• Knowledge Based Computing Systems—CPT David A. Dampier, U.S. Naval Postgraduate School, Monterey, CA; MAJ Ronald B. Byrnes and LTC Mark R. Kindl, Software Technology Branch, ARL, Atlanta, GA, were recognized for their research documented in a paper titled "Computer-Aided Maintenance for Embedded Real-Time Software."

• Advanced Propulsion Technologies—Drs. John A. Vanderhoff, Anthony J. Kotlar and Steven H. Modiano, ARL, Aberdeen Proving Ground; M. Warfield Teague, Hendrix College, Conway, AR; and Gurbax Singh, University of Maryland-Eastern Shore, were recognized for their research documented in a paper titled "Solid Propellant Combustion Diagnostics Via Multichannel Absorption Spectroscopy."

• Life, Medical and Behavioral Sciences—Dr. R. Paul Schaudies and Lee D. Nelson, Walter Reed Army Institute of Research, Washington, DC; Dr. Denis Nonclercq, Dr. G. Toubeau, J. Zanen and Dr. Guy Laurent, Universite de Mons-Hainaut, Belgium, were recognized for their research documented in a paper titled "Increased Soluble Epidermal Growth Factor Precedes Increased DNA Synthesis Following Ischemia-Induced Acute Renal Failure."

• Microelectronics and Power Technology—Dr. F. Barry McLean, Dr. James M. McGarrity, C. Wesley Tipton, Charles J. Scozzie and W. Merle DeLancey, ARL, Adelphi, MD, were recognized for their research documented in a paper titled "Silicon Carbide Transistors for Radiation-Hard High-Temperature Electronics."

Other awards included the Best Poster presentation which went to Robert L. Wade, Army Missile Command, Huntsville, AL, and CPT Gregory W. Walker, Aviation and Troop Command, Hampton, VA, for their presentation titled "Fuzzy Logic Adaptive Controller-Helicopter (FLAC-H): A Multi-Platform, Rotary-Winged Aerial Robotic Control System"; and the Best Exhibit which went to the Army Research Laboratory for its exhibit on Digitizing the Battlefield."

Also presented at the conference were the Small Business Innovation Research (SBIR) Phase II 1994 Quality Awards. These awards recognize SBIR companies for their technological achievement and contributions. In the first of what will become annual awards, the Army presented five small business companies and their sponsoring Army laboratories with an award in recognition of the excellent technology provided to the Army by the small business community under the SBIR program. Award winners were selected on the basis of originality and innovativeness of the technology; relevance of the technology to the Army and its mission; and the immediate commercialization potential of the technology. Those receiving awards and their sponsors were as follows: Analytic Power Corp. for innovative fuel cell technology sponsored by the Army Research Office; Elcatech, Inc. for a system to detect very low concentrations of dangerous toxins such as those which cause botulism sponsored by the Army Medical Research Institute of Infectious Diseases; Iterated Systems, Inc. for development of fractal image compression techniques sponsored by the Army Research Laboratory; Ralcon Corp. for a full color, stereo helmet-mounted display sponsored by the ARL; and Yankee Scientific, Inc. for a diesel-fueled refrigerator sponsored by Natick RD&E Center.

WILLIAM K. BOWER JR. is a project engineer for the Tank-Automotive RD&E Center and is on an intern assignment to the Office of the Deputy Assistant Secretary of the Army for Research and Technology. He holds a B.S. degree in agricultural engineering from the Virginia Polytechnic Institute and State University.

DAVID SEITZ is a member of the Technology Integration Office at the Army Research Office. He holds a B.S. degree in chemistry from the University of Georgia.

DAVID A. DAVISON is a public affairs specialist for the Army Research Laboratory in Adelphi, MD. He holds a B.S. degree from Youngstown State University.

DOD NUTRITION RESEARCH PROGRAM

By LTC Nancy King,
COL Eldon W. Askew,
and Gerald A. Darsch

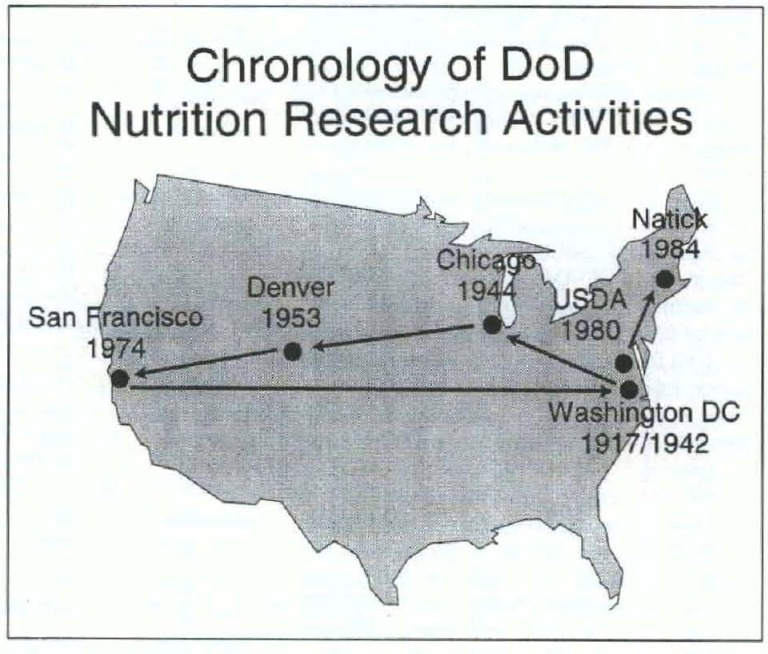
Introduction

As part of the Department of Defense (DOD) Nutrition Research Program, new and improved rations are tested for soldiers' acceptability, nutritional adequacy, and their effect on human health and performance prior to their introduction into the military supply system. This process is part of the unique relationship between the U.S. Army Research Institute of Environmental Medicine (USARIEM) of the U.S. Army Medical Research, Development, Acquisition and Logistics Command (USAMRDALC) (provisional) and the U.S. Army Natick Research, Development and Engineering Center (Natick RD&E Center) of the U.S. Army Aviation and Troop Support Command (ATCOM). Working together at Natick, MA, these agencies ensure the nutrition allowances and standards (AR 40-25/NAVMEDCOMINST 10110.1/AFR 160-95) are met for all operational rations, thus ensuring optimal nutritional support of combat operations for all U.S. military Services.

The primary responsibilities are divided as follows: Natick RD&E Center performs operational ration development and determines acceptability of both food and packaging. USARIEM performs human nutrition research on soldiers, testing new rations and nutritional supplements developed by the Natick RD&E Center.

These two mutually supporting functions, operational ration development and medical research, are accomplished under the DOD Food and Nutrition Research, Development Test, Evaluation and Engineering (RDTE&E) Program and the USAMRDALC Army Systems Hazards Research Program. These programs manage RDTE&E on new food and food packaging, food service equipment, and complete food service systems as well as biomedical nutrition research related to human health and performance.

Figure 1.



Background

DOD nutrition research activities began in 1917, when the Nutrition Division was first established in the Office of The Surgeon General (OTSG) of the Army in Washington, DC. Although the nutrition laboratory moved to various locations throughout the United States (see Figure 1), the major objectives of military nutrition research were retained in order to determine actual food consumption versus waste, and to determine if the food provides the proper amount and distribution of nutrients to support the unique nutritional requirements of military personnel. This tri-Service responsibility remains an important consideration today and is discharged by the surgeon general of the Army, and the USAMRDALC, a subordinate command of the U.S. Army Medical Command (provisional).

Prior to 1963, the food RDTE&E program was conducted by the Quartermaster Food and Container Institute in Chicago, IL. From 1963 to 1970, the mission was moved to what is currently known as the Natick RD&E Center in Natick, MA. Until 1970, the RDTE&E

program was concerned primarily with supporting the U.S. Army's requirements.

The DOD Food RDTE&E Program was established as a joint Service program at Natick, MA, in 1970 to provide for a coordinated and integrated program supporting the requirements of the four Services and other DOD components. Efforts conducted by the Natick RD&E Center provide the science and technology base as well as the engineering support to satisfy the unique feeding requirements of each military Service. The food program encompasses the design, development and evaluation of operational rations, packaging, food service equipment, and feeding systems.

Established by DOD Directive 3235.2 in 1983, the DOD Food and Nutrition RDTE&E Program provides a science and technology base to support the formulation and execution of food service system management decisions in both the established dining facilities and the military operational environment. It also provides the scientific base for military ration design, e.g. what may be desirable functionally, operationally and nutritionally under a variety of operational situations. The food and nutrition RDTE portion of the program provides a research base for investigation and establishment of needs, including nutritional aspects for all subsistence items introduced into the Defense Logistics Agency inventory and the military Services' supply system.

Program Management

To insure a single, responsive food and nutrition research and engineering program, the DOD Food and Nutrition RDTE&E Program is conducted by the Army as the Executive Agent for all DOD components. The under secretary of Defense for research and engineering (USDR&E), in concert with the Office of the Assistant Secretary of Defense (Comptroller (OAS(C)), apportions funds for food and nutrition research to the Army using the annual food and nutrition research and engineering plan.

Nutrition research is included in Program VI (Research and Development) under 6.1, 6.2, and 6.3 categories. The 6.1 category consists of basic research in nutrition; 6.2 includes nutrition exploratory developments such as applications of nutrition standards to food development, assessment of prototype rations, and performance factors related to food intake; and 6.3 comprises nutrition advanced developments. Some 6.3a category can be initiated by government scientists without an approved military requirement as exploratory research while the 6.3b category can only be initiated in response to an approved military requirement, such as a Service requirement for the development of a specialized ration.

Food and Nutrition Board

The Food and Nutrition Research and Engineering Board (FNREB) was established under the deputy under secretary of Defense (for advanced technology) (DUSD(AT)) by DOD Directive 3235.2. The board is chaired by the director of environmental and life sciences/director for Defense research and engineering (DDR&E)/Office of the Under Secretary of Defense (Acquisition and Technology (OUSD(A&T)). Its purpose is to integrate all food and nutrition research and engineering requirements into the DOD Food and Nutrition RDTE&E Program. Board membership consists of Army, Navy, Air Force, Marine Corps, and DLA personnel, each agency having one vote in establishing food and nutrition research priorities. A representative from the Office of The Surgeon General of the Army, usually the chief dietitian of the Army, attends the meeting as a non-voting advisor. The DOD Food Program is reviewed and updated by the FNREB semiannually and approved by DUSD (AT).

From 1978 to 1984, the DOD Food Program did not have a human nutrition research component. This activity was eliminated from USAMRDALC in 1978 as a cost-cutting measure. This proved to be unsatisfactory in light of sweeping changes being made in military rations and field feeding systems. As a result, in 1984, the Nutrition Task Force was organized at USARIEM (to facilitate close coordination with the operational ration developers collocated at Natick) to conduct an extensive medical evaluation of the New Combat Field Feeding System (now the Army Field Feeding System (AFFS)). This was the largest evaluation of the AFFS in U.S. history, and it led to the development of the current field feeding doctrine, FM 10-23 *(Basic Doctrine for the Army Field Feeding)*. In 1986, the temporary Military Nutrition Task Force at USARIEM was replaced by the current Military Nutrition Division and given the mission to conduct military nutrition research and to advise the Army surgeon general on military nutrition research issues.

Major Army Programs Supported by Military Nutrition Research

- Army Science and Technology Objectives
- Medical Technology Base Master Plan
- Soldier Modernization Plan
- Army 21 Wartime Feeding Plan
- Air Land Battle 2000
- Army Health Promotion (AR 600-63)
- DOD Health Objectives for the Year 2000
- Army Nutrition Initiatives

Figure 2.

Military Nutrition Research

All studies conducted by the Military Nutrition Division at USARIEM are in direct support of the Army surgeon general—as the DOD executive agent for nutrition. The requirement and authority for the Army surgeon general to act as executive agent for nutrition is found in DOD 1338.10 and 1338.10M, *DOD Food Service Program;* AR 70-3, *DOD Food RDTE Program;* and AR 40-25/NAVMEDCOMINST 10110.1/AFR 160-95, *Nutrition Allowances, Standards and Education.* The mission of the Military

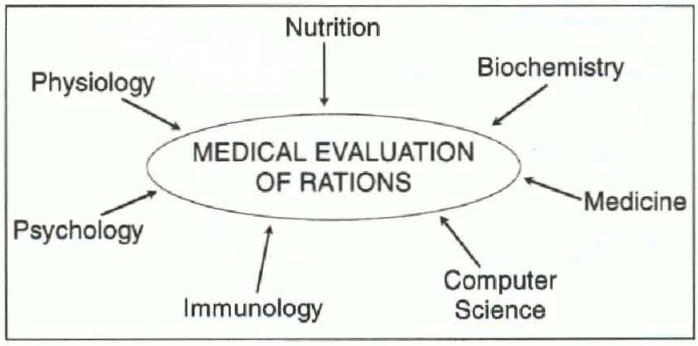


Figure 3. Medical evaluation of rations involves various scientific disciplines.

Nutrition Division is to:

- define the nutritional standards for operational rations;
- perform nutrition research in support of the DOD Food RDTE Program;
- medically evaluate rations and feeding systems for effects on nutritional status, health and performance; and
- develop nutritional strategies to support and enhance military performance in environmental extremes. Components of several major Army programs are supported by military nutrition research (Figure 2).

Operational Ration Development

The development of operational rations is a concerted effort between the Natick RD&E Center and USARIEM. When a decision is made to develop a new operational ration, the necessary RDT&E support is programmed by the Natick RD&E Center and carried out in the RDT&E portion of the program. Based upon current U.S. recommended dietary allowances and relevant military nutrition research, the nutritional standards for rations are defined, taking into account factors such as environment (heat, cold, altitude), biomedical (acclimation, training/fitness/health, nutrition and hydration), and mission (task and work rates, microenvironments, sustained performance requirements), that may impact military operations. The ration developers use the nutritional standards recommended by OTSG as one of the key elements in the design of a ration prototype.

USARIEM is the lead laboratory for medical testing of the capabilities of the military field feeding system to deliver adequate nutrition to military personnel in temperate and extreme environments. Metabolic and/or limited scope field testing is performed by USARIEM scientists using prototype rations. The prototype ration is further refined and the operational ration is field tested in temperate and extreme environments. The medical evaluation of rations involves an amalgam of scientific disciplines (Figure 3) which permits a biomedical evaluation of the ration/soldier health and performance interface. Assessments are made of actual nutritional intakes, changes in body weight, body composition (e.g., percent body fat and fat-free mass), hydration, blood chemistry, immune function, and mood states.

In addition to developmental testing of rations, current fielded rations and the Army Field Feeding System are evaluated on an annual basis. This program of cyclical testing of fielded rations was initiated in 1990 at the request of the Army vice chief of staff and the deputy under secretary of the Army, operational research (DUSD, OR) to ensure that the current Army Field Feeding System and rations are capable of supporting military field operations in all extreme operating environments.

Recently, tests were conducted in extreme cold (Fort Greely, AK), at high altitude (Potosi, Bolivia), for a long duration (30-day Meal, Ready-to-Eat (MRE) test at Fort Chaffee, AR) under high physical activity and stress (Ranger Training, Fort Benning, GA; Fort Bliss, TX; Dahlonega, GA; Eglin AFB, FL) and in a hot, humid environment (Special Operation Forces Assessment Course, Camp Mackall, GA).

Nutrition research studies at USARIEM are usually published in USARIEM laboratory technical reports (available through the Defense Technical Information Center) as well as in the open scientific literature. These technical data are also reported to the OTSG where the results are used to set nutrition policy and make nutrient recommendations to the operational ration developers.

Joint Science and Technology Objective

The Natick RD&E Center and USARIEM are collaborating on a science and technology objective (STO) on performance-enhancing rations. This is an example of the close cooperation between the operational ration developers and the nutrition scientists collocated at Natick. Programs and projects on this STO are intended to enhance physical and/or mental performance by supplementing field rations with nutrients that are especially effective in the environment in which the soldier is conducting his or her mission.

Nutrients currently under consideration and testing include: tyrosine to enhance performance in cold and high altitudes; glycerol to enable hyperhydration prior to cold or heat exposure; caffeine to enhance physical activity or mental alertness; carbohydrates to permit prolonged periods of physical activity; choline to enable sustained periods of intense physical activity; and glutamine to help the immune system cope with high stress situations that depress immune function. Once scientists at USARIEM establish that one or more of these nutrients is effective in enhancing military performance, Natick RD&E Center food scientists will engineer the nutrient into a food supplement or ration component before field testing. This collaborative research program began in 1992 and is scheduled to continue through 1996. The discovery of new nutrient functions and food products may make this joint engineering research a useful and continuing adjunct to the ration development process.

Summary

The objective of the DOD food program and military nutrition research is to utilize nutrition as an effective performance enhancer (combat extender). For our soldiers, sailors, Marines and airmen, the end products of this research program are: enhanced effectiveness and extended performance of military personnel on the AirLand Battlefield; nutrition doctrine tailored to operational/environmental scenarios; and healthier military personnel whose fitness and performance are complemented or enhanced by good nutrition. This strategy fuels the service member to enhance battlefield performance and allows the achievement of maximum combat effectiveness.

LTC NANCY KING is a U.S. Army medical specialist corps officer and a research dietitian at the Military Nutrition Division of the Occupational Health and Performance Directorate, U.S. Army Research Institute of Environmental Medicine, Natick, MA. She holds a B.S. degree in nutrition and diet therapy from the University of Puerto Rico, an M.S. degree in nutrition from Incarnate Word College, and a Ph.D. in nutrition from Texas A&M University.

COL ELDON W. ASKEW is a U.S. Army Medical Service Corps Officer and is chief of the Military Nutrition Division of the Occupational Health and Performance Directorate, U.S. Army Research Institute of Environmental Medicine, Natick, MA. Askew holds a B.S. degree in agricultural science from the University of Illinois, and a Ph.D. degree in nutritional biochemistry from Michigan State University.

GERALD A. DARSCH is a supervisory food technologist and is chief of the Ration Systems Division of the Sustainability Directorate at the U.S. Army Natick Research, Development and Engineering Center in Natick, MA. He holds a B.S. in food science and nutrition from the University of Massachusetts, and an M.S. in food and nutrition from Framingham State College.

A CULTURE OF ACQUISITION

By MAJ Lillian A. Pfluke

Editor's Note: A response to the following article appears on page 20 of this issue of Army RD&A Bulletin.

Organizational Cultures

Thomas Peters and Robert Waterman, in their best selling book *In Search of Excellence*, identified one characteristic common to many diverse yet extremely successful companies: all members of the organization understand what the company stands for; what the value system is. The book points out the importance of a strong organizational culture. Since then, much has been written about the informal atmosphere that pervades Nike, the aggressive individualism legion at MacIntosh, and the cradle-to-grave security of IBM. Clearly, organizational culture exists and is critical to excellence.

An organization culture—shared norms that influence group and individual behavior—performs several important functions. It sets an organization apart from other organizations and conveys a sense of identity to its members. It fosters commitment to something greater than an individual's self-interest. It enhances social system stability and serves as a control mechanism to help shape the attitudes and behavior of members of the organization. Who gets promoted, what people wear, how people communicate, even how they act at the Christmas party are all reflections of the organization's culture.

An organizational culture is communicated in a number of ways, including stories, rituals, material symbols, and language. Stories inform new members about the organization, affirm important values and norms, and reveal what is unique about the organization's function in society. Rituals are repetitive activities that reinforce the key values of the organization, which goals are paramount, and which people are most influential. Symbols are the most explicit indicator of organizational culture and include dress codes, office decor, logos, emblems, and even parking space allocation. Finally, a distinct language identifies members of an organizational culture and, more importantly, attests to a member's acceptance of that culture.

The Armed Services are certainly not strangers to strong organizational culture. The uniforms we wear, the training we go through, the oath we swear to, the parades we march in and, even the specialized vocabulary we use, all reinforce what we stand for as defenders of the nation. Because of the all-encompassing nature of our profession, some would say that the cultures of the Armed Services are among the most distinct and most well-defined organizational cultures in existence.

Each of the Services has a unique yet very powerful culture. The Navy is renowned for its rich traditions and decentralized decision-making. The Marine Corps derives its strength from its powerful discipline and unquestioned loyalty to the Corps. The Air Force is oriented toward technology and the wonderful phenomenon of manned flight. The Army focuses on selfless service to country and the depth of its roots with the citizenry. These are different orientations to be sure, but each is reflected and reinforced in everything we do, from our basic training to our retirement and includes all the triumphs and challenges in between.

Within the Army, there are distinct subcultures in the different branches. To "snake-eaters" of the Special Forces, the green beret represents special teams of highly trained men capable of independent action throughout the world. The "Queen of Battle" infantry soldiers are physically fit, mentally tough warriors who take special pride in the hardships they must endure to wear the special blue braid of an infantry unit. Armor soldiers consider themselves the decisive mobile combat arm. They care for their 70 ton behemoth tanks with loving care—after all, they sleep on, cook with, shower behind and fight in them for weeks on end. Army aviators display the unique elan of pilots everywhere.

Of course, one could take this one step further and examine the distinct cultures of various units within the Army. The 82d Airborne Division is the most striking example of a strong unit culture. Their distinct and illustrious history is evident everywhere on Fort Bragg. They wear a unique uniform, engage in special training, speak a distinct language, and display an elite and confident paratrooper attitude. Similarly, cavalry units, air assault units, and light infantry units have each developed an organizational culture which emphasizes their unique contribution to the Army.

The Army Acquisition Corps

The Army Acquisition Corps is a new organization within the Army. As such, it has no heritage, no behavioral norms, no rites of passage, and hence no culture. To make matters worse, members of the Acquisition Corps, by virtue of their stringent assignment and training requirements, are physically and psychologically distanced from the culture of the

Army. A separate assignment pattern, separate schooling, separate promotion and command consideration, and separate career milestones all serve to remove acquisition officers from the mainstream Army culture. This is not good for the Army and not good for the Acquisition Corps!

The special charter of uniformed acquisition professionals is to provide an intellectual bridge between the government and contractor civilians who design and purchase our weapons systems and the soldier who uses them. If acquisition officers lose touch with the soldier they are supposed to represent, the acquisition system will not work as intended.

There are many well-meaning and intelligent people involved in the acquisition process, but most of them simply have never experienced a soldier's life the way a uniformed acquisition professional has. These uniformed acquisition professionals need to keep psychologically close to the soldiers they represent. The way to insure that this happens is to keep these officers tied in with the culture of the Army and the culture of the Acquisition Corps.

Certainly, given time, a culture of acquisition will develop. But if allowed to develop haphazardly, it may not develop along lines best suited for the long term health of the Acquisition Corps. It becomes much harder to change an established culture than to create a new one! Accordingly, current members of the Army Acquisition Corps should carefully examine the type of culture being created and make informed and conscious decisions to insure that the culture will contribute to the excellence of the organization for years to come.

What follows are a number of ideas to deal with this problem. While some are obvious and others may seem obscure, all are intended to stimulate thought and discussion for the continued development of an organization we should all take enormous pride in: the Army Acquisition Corps. What, then, will make up our acquisition culture?

Acquisition Corps Culture

First, we need a chief: a general officer who, at the peak of his or her profession, symbolizes everything that young acquisition officers aspire to be. The chief is the mentor and voice of experience for the entire corps. LTG William H. Forster is the top uniformed officer in our chain of command, but you'd never know it from his title: *military deputy to the assistant secretary of the Army for research, development, and acquisition.* Such a title surely doesn't inspire or give one a sense of belonging. Sometimes he is called the *director of acquisition career management* which, while better, still doesn't sufficiently convey his symbolism to the corps. Just as in the title, *chief of infantry,* or *chief of ordnance,* how about just the *chief of acquisition* or the *chief of Army acquisition?*

Second, we need a home. Our "basic course" is the Materiel Acquisition Management Course at the Army Logistics Management School at Fort Lee. Our "advanced course" is the Program Manager Course at the Defense Systems Management College at Fort Belvoir. Our war college is the Industrial College of the Armed Forces at Fort MacNair. Our Proponency Office is in a dark hallway of the Pentagon. Where is our home, our "center of excellence," the place we return to for information, advice, expertise? It is obviously not practical to move these schools around, but surely the Proponency Office and journal could be collocated at the Defense Systems Management College to give us some sense of home base.

Next, we need a clearly identified and properly focused professional journal. The journal of the Army Logistics Management College is *Army Logistician.* The journal of the Defense Systems Management College is *Program Manager.* The journal of the Defense Acquisition University is the new *Acquisition Review Quarterly.* However, none of these fits the bill. The journal that comes closest to fulfilling an overall unifying function seems to be *Army RD&A Bulletin,* the professional bulletin of the RD&A community. But, even this publication has some serious deficiencies to correct before it can be considered the unifying voice of the Army Acquisition Corps.

For example, the very name *Army RD&A Bulletin* is cumbersome. The bulletin is published by the Army Acquisition Corps Proponency Office, and the terms research and development are inherent in the term acquisition. Thus, we should just keep it simple and call it Army Acquisition.

What about the journal's tag line? *Army Communicator* calls itself "The Voice of the Signal Corps." *Field Artillery* is "A Professional Bulletin for Redlegs." *Quartermaster,* "Logistics Warrior" inspires. Acquisition needs a catchy tag line as well (better devised by someone more clever than I!).

On the first page of *Armor* is the "Commander's Hatch" written each month by the commandant of the Armor School to communicate directly with every member of the branch. Likewise, *Aviation* has "Warfighter 6," *Engineer* has "Clear the Way," and *Military Intelligence* has "Vantage Point." In these turbulent times, there is much that the chief of acquisition can tell us every month. Thus, a monthly column in Army acquisition is an ideal way for our chief to increase his visibility as our boss and mentor.

Finally, one of the last sections should be a "professional development update." This section should not be an occasional column listing recipients of Meritorious Service Medals as it is now in the *Army RD&A Bulletin.* Rather, it should be a comprehensive and informative set of columns written by the

The special charter of uniformed acquisition professionals is to provide an intellectual bridge between the government and contractor civilians who design and purchase our weapons systems and the soldier who uses them.

Proponency Office and the PERSCOM branch managers detailing assignment policy, promotion trends, board dates, drawdown information, and professional development information. One currently has to read *Ordnance* magazine for information from the acquisition assignment officer.

The Army leadership purposefully did not form a separate acquisition branch, in part so that officers would continue to identify with their accession branches and that associated heritage. Acquisition Corps Branch insignia is clearly inappropriate. However, there is currently no symbol on the uniform to identify someone as an acquisition specialist. Two powerful symbols are possible: a unit patch for acquisition assignments or a regimental insignia for acquisition affiliation. Both would serve as a tangible symbol of allegiance to and skill in acquisition.

Surely we could take this argument to its logical extreme and talk about an acquisition motto, hymn and battle streamers. The point is that there is very little symbolism unifying the diverse members of the new Army Acquisition Corps, and rectifying the situation is fairly easy.

Staying Close to Army Culture

The uniform itself is one of the most powerful symbols of the Army culture and way of life. It is certainly the most visible tie we have with the Army. Yet, it seems that Acquisition Corps members shed the uniform as often as possible. On business trips, in conferences, at award ceremonies, at cocktail parties, even at school, there are more business-suited Acquisition Corps members than uniformed ones. Why (other than for security reasons in some classified programs) would an Acquisition Corps officer forsake the instant recognition and credibility afforded by the uniform in a meeting with a contractor? There is no ambiguity when you are in uniform. Everyone knows who you are, who you represent, what your background is, and what you stand for.

Likewise at the Defense Systems Management College (DSMC), civilian clothes are the norm. Why? Because it is an "academic environment," to encourage "free discussion," and to be more "comfortable." On the other hand, the military fights like it trains, and the Infantry School doesn't wear REI jackets and Reeboks in their academic environment. If acquisition officers can't take on colonels or generals in a free discussion just because they are in uniform, these officers may have trouble with the vice presidents of their contractors as well. And, after 10-plus years of service, Acquisition Corps officers should all own a comfortable uniform.

Next, it seems that acquisition conferences always take place in plush hotels or fancy research parks of major cities. Why not hold them at Fort Hood, Fort Bragg or in an environment where we can take the civilian contractors on a walk and remind them who we all really support? After all, that is our special charter as uniformed acquisition personnel...to provide that intellectual bridge between the scientists, engineers, accountants, and the soldier we all serve. Such conferences could be convened at Army facilities surrounded by Army equipment, Army troop commanders to speak to, and an overall Army atmosphere (you know, where they blow retreat at 1700 and you have to get out of your car and salute the flag!). This would enable all participants to keep focused on the real mission.

We in the Acquisition Corps have the unique opportunity to create a lasting legacy in the form of a new culture of excellence.

Acquisition Unit Culture

Acquisition Corps units are somewhat unique in that they are by definition temporary program offices which manage specific systems. However, this is not a reason to abdicate any sense of heritage or symbolism. The people in the program office for the M1 tank today should take pride in their heritage which dates back to the very first Army tank.

Program offices should work with the Ordnance Corps Museum at Aberdeen Proving Ground or the Aviation Museum at Fort Rucker as well as the Army History Office in Washington, DC, to get copies of various photographs and documents to display in office hallways. Old radios, pistols, and jeeps are all a celebration of American military ingenuity and a means to trace our acquisition heritage back for many years. Acquisition offices should be full of such memorabilia.

Another way to reinforce acquisition unit culture is to hold an organization day. Every unit in the field celebrates an organization day—so should program offices. What is the date on your charter? Do you celebrate that anniversary every year? It doesn't have to be a formal dinner dance! Just some sort of ceremony to acknowledge and remember the unique history of the organization.

Who are your organization's heroes and heroines? The program office I just left had an honor roll in the front hall of everyone that had been assigned to the program since its inception. It was always motivational to see LTG Forster's name (it would be even more motivational if his title were "chief of Army acquisition"!) hanging a few rows to the left of my own. What has become of the people in your organization? Are any of them now in a regimental hall of fame or medal of honor winners or elected officials? Display them!

Everyone needs a logo—get one! Contractors are great at creating logos, and we should take a cue from them. Patches, stickers, plaques, hats and pens should all proudly show off the program and should be given out for jobs well done.

Conclusion

Organizational cultures do make a difference. They are one of the most useful ways to understand the character of an organization. The culture reveals and explains so much—yet is so easy to grasp and remember. We in the Acquisition Corps have the unique opportunity to create a lasting legacy in the form of new culture of excellence. We need to take this aspect of our profession as seriously as we do any other and systematically insure a healthy cultural start for our organization.

MAJ LILLIAN A. PFLUKE, PE, is an Army Acquisition Corps officer. She has a B.S. from the U.S. Military Academy and an M.S. in mechanical engineering from the George Washington University. She is currently attending the Marine Corps Command and Staff College in Quantico, VA.

Letter to the Editor . . .

FROM THE DEPUTY DIRECTOR FOR ACQUISITION CAREER MANAGEMENT

I read the article "A Culture of Acquisition" by MAJ Lillian A. Pfluke, which appears on pages 17-19 in this publication. Although some issues are worthy of consideration, others, in my opinion, miss the mark.

First of all, I believe the vision of MAJ Pfluke is too narrow. The Army Acquisition Corps (AAC) is far more encompassing than an organization for military project managers. The AAC encompasses large numbers of dedicated civilian employees and 10 other career fields in addition to program management. This diversity is beneficial and important in today's environment.

"Cultures," as described in her article, are both beneficial and necessary. However, even though her statement that the Army Acquisition Corps lacks a clearly defined culture may be partially true, it is a bit unfair. A proper review of Army history focusing on the Quartermaster Corps, from the very foundation of our country, and later the Air and Ordnance Corps, provides a rich culture of contracting, technology development and rapid solutions to the country's warfighting needs. The dedication to supporting the soldier has been an integral subculture of the Army since the first revolutionary war arsenal. Today, all acquisition officers share the first six to eight years of service (often as many as 10 years) in an identical assignment pattern with every other branch or functional area officer. Additionally, acquisition officers attend the same Army culture producing schools (CAS3, CGSC, AWC, etc.) with their contemporaries. Also, career milestones (i.e., promotions, central selection) remain the same. The only difference worthy of discussion might be the comparison of responsibilities for battalion/brigade commanders and project/product managers. It is important to note that the pre-command/pre-PM training is considered to be equally important and now provides for designated PMs to attend branch pre-command courses to maintain a focus on developing solutions to battlefield problems. I agree that one major benefit of the military is to represent the soldier who we all serve. Therefore, we are all working very carefully to ensure that those previous cultures are retained in the present.

It may be of interest to note that upon two recent occasions, I have personally observed the beginnings of the "Acquisition Corps culture" built upon the top of those cultures which previously existed.

I also think the Major misses the mark with regard to her comments about the director for acquisition career management. The individual in that position is not chartered to serve as a symbol for the Acquisition Corps membership but, rather, as the "commander-in-chief" and purveyor of policy for the organization. I personally think that mission is currently being performed extremely well. Incidentally, the director for acquisition career management also serves as the director of the Army Acquisition Corps in addition to serving as the military deputy to the ASA(RD&A). I am very pleased to serve as his deputy for acquisition career management in service to both the military and civilian workforce. In response to the Major's appeal for symbolism, I want to emphasize that the AAC does have its own logo, prominently displayed on the front cover of every issue of the *Army RD&A Bulletin.*

I see no reason for a major issue with the Pentagon being our "home" for acquisition proponency. This building has served DOD and the U.S. Army well over the years and continues to do so. The arguments made to create a separate place for the AAC seems to go against the earlier arguments that we must all be in the same Army. It may be noted that while our Proponency Office is on the "E" Ring of the Pentagon, the *Army RD&A Bulletin* is located at Fort Belvoir, VA.

Finally, in defense of the *Army RD&A Bulletin,* I believe it important to point out the following:

- The Bulletin does in fact have a tag line conspicuously displayed on the inside front cover of every issue—"Professional Bulletin of the RD&A Community."

- For the past 7 years, the Bulletin has included—in virtually every issue—a distinct section, titled "Career Development Update." This section includes acquisition career development information from a broad range of career management sources such as PERSCOM and the Office of the Deputy Director for Acquisition Career Management.

- A new section, titled "From the AAC Career Manager," was recently established within the Career Development section of the Bulletin to convey information specifically germane to the AAC membership.

- During the tenure of the former ASA(RD&A), Stephen K. Conver, the Bulletin began publication of a column, titled "From the Army Acquisition Executive," to convey the thoughts of the Army's senior acquisition official. The new ASA (RDA), Gil Decker, continues this column beginning with this issue of the bulletin.

With regard to some miscellaneous aspersions made, I will provide brief replies:

Broad generalities should never be made based upon a narrow base. Wearing or not wearing uniforms while attending DSMC is a personal choice, not a mandate by DSMC. Regardless of whether or not a student is in uniform, DSMC fosters a non-attribution environment and encourages the students to explore controversial issues. I am certainly not familiar with any retribution for candid expression of opinions by a uniformed officer in any DSMC classroom.

Our AAC conferences are held in numerous locations with varying degrees of comfort. This does include both civilian accommodations and military installations. In all such occasions, the civilian contractors are not included.

I agree that displays of systems memorabilia and organization days are important. Most program offices are already involved in such activities and events. I agree that more activities would be beneficial.

I agree that cultures are important. However, I believe these cultures should pull us all together, not separate us further. In summary, I believe we are making progress and I hope we can make more as we work as a team in the future.

Dr. Bennie H. Pinckley
Deputy Director for
Acquisition Career Management
Office of the Assistant Secretary
Of the Army (RDA)

ENGINEERING INFORMATION FOR FORCE XXI

By LTC John R. Grobmeier

Introduction

Fifteen years ago, most people reading this article would have relegated computers and information technology to the realm of the short-sleeved, horn-rimmed, pencil-pocketed, right-brained social outcast. Today, one would be hard pressed to find any Department of Defense (DOD) employee who does not personally own, or who does not use, a state-of-the-art personal computer which, in most cases, is also linked to some higher information sharing system.

This significant turnabout in events has occurred because modern society realizes that harnessing information is the key to success in an increasingly competitive world. Armed with the right facts, at the right time, and at the right place, an individual increases the probability of making the correct decision the first time. Making the right decision ensures the optimal and most effective application of scarce resources. This is the challenge which faces America and the DOD. The days of plenty and excess capacity are gone as America faces the rest of the world on a truly level playing field.

Information technology is one of the last bastions in which the United States still claims world leadership. It is a powerful tool America can and must leverage to its advantage. As competition for market and military superiority becomes keener, the nation which moves first, fastest, and most efficiently will secure the competitive edge required to win in future contests both on and off the battlefield.

Corporate America has recognized this fact for some time and has been retooling and rethinking how it does its business so it can remain competitive. More recently, the Clinton administration inaugurated a similar course with a National Performance Review designed to overhaul critical government functions. A key catalyst for this restructuring endeavor will be the National Information Highway initiative.

For several years, the Army has been the DOD pioneer leading the way in leveraging information technology to support a new, more efficient force. Officially recognized by DOD as the leader in business reengineering and information management, the Army has been slowed for want of one ingredient—highest level support and direction. In January 1994, that direction was announced by Army Chief of Staff GEN Gordon R. Sullivan at a meeting of the Association of the United States Army (AUSA) Institute for Land Warfare. Sullivan has been a consistent advocate of information technology's critical role in both the combat and sustaining bases. In conjunction with Secretary of the Army Togo D. West, he announced formation of a Special Task Force on Digitization which will be comprised of members of the Army Acquisition Corps (AAC), the Army Training and Doctrine Command (TRADOC), the Army Materiel Command (AMC), and the Army's Battle Labs. According to the chief, the special task force will be "dedicated to harnessing the power of the Information Age" and "will enable us to redesign the force for the 21st Century."

Providing digitization to Force XXI will be no easy task. There are numerous components which comprise the successful digitization equation. Many of those components are technical in nature; however, several are based in common sense and are applicable in almost every development discipline with the AAC. Of utmost importance, according to Sullivan, is "the ability to pass data in real-time." This article addresses four common sense parts of the digitization formula—all of which are linked to data: creating information using corporate data, identifying and defining data elements, sharing information, and real time information for real needs. Understanding these components is crucial to the success of the Special Task Force and Force XXI.

Corporate Data

The most basic building block of information is data. Data is comprised of facts and meanings. Unless both items are understood and defined up front, data in and of itself is of little value. Data may then be combined with other data in a myriad of ways resulting in information. The utility of combined data is somewhat analogous to the table of chemical elements. Every schoolboy and girl knows that if two parts of Hydrogen (H) are combined with one part of Oxygen (O), the result is Water (H_2O). Data behaves in a similar fashion. If, for example, the Army identified 400 pieces of basic data it wanted to use to form information, it could in fact create 10^{869} combinations of that data. That is a lot of information. In the past, computer based systems were built to manage all the combinations of data and it is exactly those combinations that have led to ineffective, incompatible computer systems that have resulted in information overload—information pollution.

What makes infinitely more sense is for computers to house the basic data elements, allowing the computer programs to create the many combinations of data into information as and when the user determines the information is necessary. Such an approach is designed to address the current, real needs of the users. No longer will staffs be required to spend countless nights pouring through reams of computer-generated paperwork sifting out management information. Consequently, identifying the basic data that creates Army information is the first task in supporting a digitized, information based Force XXI.

Identifying Data Elements

Identifying and defining basic data is not a trivial task. Ultimately, it involves users and technicians alike from all areas of the Army. Consider the following question: "How many seconds are there in a year?" Sounds ridiculously simple, doesn't it? Simply multiply 60 seconds times 60 minutes in an hour. Then multiply the result times 24 hours in a day and finally times 365 days in a year. Answer: 31,536,000 seconds. Unfortunately, the question was: "How many seconds are there in a year?" The real answer is 12 (there is a 2nd of January, 2nd of February, and so on).

While a seemingly absurd example, this level of review is critical to identify the basic data elements upon which Force XXI information will be engineered. DOD has spent the last three years trying to resolve issues like the one above. Only recently was the decision made that you are an individual instead of a person (or is it the other way around?) The Army Staff is still trying to sort out what a UIC is.

Once agreement has been made on the type and definition of data to be managed, the "form" of the data must also be agreed. Soldiers in-process at innumerable offices when assigned to a new station. And at each office, duplicate data is requested but not in

International Artillery Interoperability

The United States, United Kingdom, and Germany recently completed an international document, the Common Technical Interface Design Plan (CTIDP). The three nations, now joined by France, have targeted 1997 as the year to finish fielding their respective national artillery battlefield information systems using the CTIDP as the baseline for interoperability. The systems, America's AFATDS, Britain's BATES, Germany's ADLER, and France's ATLAS will represent the largest, forward deployed international C4I information sharing capability on the modern battlefield. A full test of this interoperable milestone is currently scheduled for late 1997. Among other things, the CTIDP defines the data required to achieve international artillery interoperability. The CTIDP is another example of the importance of real time data for the warrior.

a consistent fashion. The hospital may want his name—"first name followed by last name, soldier!" Later at vehicle registration it's—"last name this time, soldier, then first name." It didn't make sense then and it definitely doesn't make sense now. Such a parochial approach makes information sharing difficult if not impossible!

To date, approximately 2,100 data elements have been approved for use by DOD with over 7,000 data elements waiting in the queue for inspection.

Sharing Information

Early users of computers were usually scientists or financiers. What happened after their initial forays is basic to an understanding of the challenges to information sharing. One day over a lunch counter, the personnel director for century XX bemoaned the labor intensive nature of inputing data into the personnel system. The company treasurer overheard the conversation and suggested a better way forward. Finance could spin off a tape of data already resident in their system by writing a simple program. Personnel, in turn, could write a program stripping off the information it needed and reforming the data elements into the correct format for the personnel department.

This was a great step forward and saved time and money. Other departments developed their systems and eventually discovered the treasurer's secret to sharing information. Century XX was definitely on the leading edge of information technology. The same scenario occurred as other systems came on line.

One day, the U.S. Post Office announced that it was going to expand its zip code from five digits to nine. The century XX treasurer, keen to save money on mailings, asked how much money it would cost to upgrade the company's computer systems accordingly. Much to the treasurer's chagrin, the bill was several million dollars for what appeared an easy task. Not only did the financial system require rewriting, but so did all the systems for other departments. Files, application programs, translation and housekeeping routines all needed to be revised because each department implemented its programs slightly differently and had created band aid interfaces between systems to facilitate information sharing.

Century XX made the classic mistake of treating information as departmental property. In so doing, the same information was duplicated many times over in slightly different formats and for different purposes. This led to inconsistencies, incompatibilities, and also resulted in conflicting, unreliable information. Century XX's challenges pale compared to those of DOD.

The lesson learned from scenarios like this is that data, and the information it creates, should be universally approved, defined, and regulated. Successes using this approach are now coming to fruition (see the sidebar on International Artillery Interoperability). *A digitized Army relying heavily on information must go beyond parochial functional information hoarding and must agree upon a central information architecture—a blueprint for success.* Without it, a central information nervous system is just a dream.

Real Time Information

No doubt you have witnessed automation for automation's sake. Fortunately, this wasteful trend is going by the wayside as a generation of computer literate users are assuming the leadership helm of the nation.

But a more sinister trend has replaced automation for automation's sake. Many of the processes and functions present in the Army combat and sustaining bases have been built up over the years and once instituted, have never been revisited. Some functions have little utility, minimal return on investment, or represent inefficient duplication of efforts. Automating these functions and processes can improve how they are executed, but do not address the more important, underlying systemic problem that the process itself may require overhauling, updating, elimination, or almagamation with other processes. The procedure by which an organization accomplishes overhaul is commonly called business reengineering.

Force XXI warrants such introspection prior to applying valuable automation resources. Only the lean, efficient, and necessary should be funded.

Mike Hammer, a leading pioneer in the reengineering movement, noted that automating business processes without reexamining our basic ways of doing what we do, is akin to "paving cow paths."

This message is very important not only to Force XXI, but also to every endeavor the AAC undertakes. *Force XXI must not be built based on digitizing the past. It should be engineered with an eye to future needs.*

Summing It Up

Force XXI is the next generation in thinking and action. It will be built on the legacy of successive revolutions—Shone, Agrarian, Iron, Bronze, Industrial, and most recently, Information. America is poised to capitalize fully on the Information Age and the U.S. Army will lead the way in a digitized era.

The fundamental building blocks of information on which the Army will plan and operate all rely on data. Every member of the Army will need to understand the intricacies of data, how it is defined, engineered, and shared if it is truly serious about digitization. Using the information resulting from this effort, the AAC will be required to acquire those products and services which support the most capable fighting array on the face of the earth—Force XXI.

LTC JOHN R. GROBMEIER, a member of the AAC since 1988, is the U.S. Army exchange officer on assignment as the deputy program manager, Interoperability, with the Royal Artillery Command Information Systems Group at Larkhill, England. He is serving with Her Majesty's Forces under the provisions of the U.S./UK Personnel Exchange Program. Grobmeier served as part of the UK delegation which created the Common Technical Interface Design Plan.

MARKETING CONCEPTS FOR ARMY LABORATORIES

By Jeffrey M. Ricker

Operating Like a Business

Agencies across the federal government have resolved to operate more like a business. Reinventing government, total quality management, and now reengineering have been embraced in an attempt to gain efficiencies comparable to those enjoyed by successful American corporations. Defense laboratories, in particular, have been leaders in this change, due in part to a new-found awareness of competition. Most laboratories now realize that they can and will go out of business if they do not perform. In this environment of acknowledged competition the question arises, how far can a laboratory or any federal agency advance towards operating as a business without practicing marketing?

Marketing is a dominant character in American business practice. It is inherent to business practice, whether a company has a marketing office or not, because marketing is inherent to competing for customers. Marketing offices exist to give the marketing effort focus so that it can be constantly improved. Marketing efforts are also inherent in the practice of a Defense laboratory. Very few laboratories have established marketing offices, providing the effort no focus and, as a result, very little improvement. There are few marketing offices because very few laboratory leaders have accepted that laboratories *can* market.

The argument that Defense laboratories cannot market arises by confusing means with ends, or method with principle. Business schools have for decades developed methods and principles for private sector marketing. Although the current methods of marketing developed for corporate America have very limited applicability for a Defense laboratory, the principles of marketing are extremely applicable. The challenge is to develop new methods for Defense laboratories based on the same principles.

A Broader Concept

Marketing and advertising are not synonymous. Confusing the two is a carry-over from the Industrial Age when America's production capability did not match consumer demand. The seller's market reached a fevered pitch in the late 1950s, before German and Japanese corporations began exporting quality consumer goods. Every household demanded a car, a television, and a toaster, and they took what they could get. For a manufacturer, the challenge to making sales was increasing customer awareness—a golden age of advertising. As production eventually matched and many cases exceeded customer demands, the power within the market shifted from the seller to the buyer, from producer to customer. No longer did the household member line up for any toaster he or she heard about. The consumer could weigh the decision and choose the product that best suited his or her particular needs and expectations. The consumer became a customer.

A watershed event in this shift from consumer to customer was Ford Motor Company's debut of the Edsel in 1957. According to *Business Week*, its launching was more costly than any other product in its time. Ford succeeded in gaining the attention of the entire American public, only to disappoint it. Sales, expected to meet 200,000 in the first 12 months alone, never reached 110,000 total before the line was discontinued in November 1959. Ford lost $350 million (John Brooks, *Fate of the Edsel and Other Business Disasters*, 1964.)

American corporate leaders learned that the challenge to any business is to develop customer loyalties and satisfaction, and the key to this challenge is to focus on the customer's needs and expectations. Corporate America established a new, broader concept of marketing: to sensitively serve and satisfy customer needs (Phillip Kotler and Sidney J. Levy, "Broadening the Concept of Marketing," *Journal of Marketing*, January 1969.)

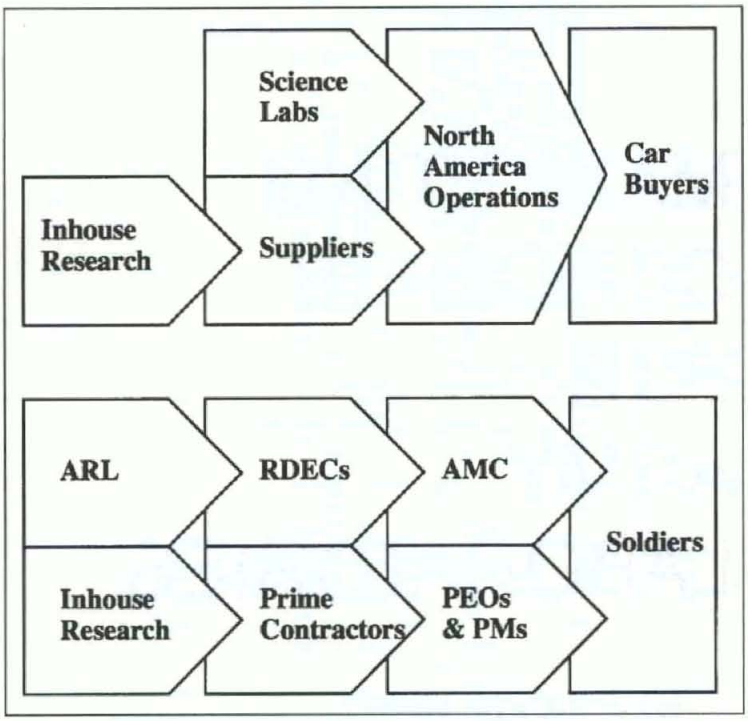
Defining Customers

This broader concept of marketing begins with a fundamental question—who is the customer? Many Army Materiel Command organizations have struggled with this question while deploying their Total Quality Management programs. Discussions about identifying Army laboratory customers have become quite heated at times because the participants struggle to define *the* customer, where, in truth, a laboratory has many customers.

One concept used in the private sector to understand different customers is the product food chain. In very few cases does a product go directly from resource to consumer. Vendors and suppliers add value to a product in succession from resource to final consumer, with each value added affecting the consumer. For instance, green beans move from farm to cannier to distributor to grocer before reaching the household. In Figure 1, a simplified technology food chain for an automobile manufacturer is compared to that of a program manager. Note that a food chain is defined by product and cash flow, not necessarily by organization. Army laboratories may have different food chains for different products.

Another, more essential concept for identifying customers is market sectoring. For sound marketing practice, customers are grouped according to buying behavior, which is defined by their priority of expectations. These groups are called market sectors. Customers are not grouped according to what is convenient to the corporate organization, such as geographic location or size. Conceivably, a marketing sector could be defined by customer location, but only if location dictated a different buying behavior. At the largest level, Army laboratories have four market sectors: soldiers, government leaders, other federal government organizations (such as program managers), and private industry. Each of these sectors can be divided into subsectors, but again, by buying behavior and not by simple convenience.

The soldier is a consumer, a final user of



Simplified technology "food chains" of an automobile manufacturer (top) and a program manager (bottom).

the laboratory's product. Congress is also a consumer, the final source of all funding. In this way, Army laboratories face the same predicament as a toy manufacturer. One customer has the purchasing power, another customer is the actual user of the product, and the two may have very different expectations of what defines a good product. It is the toy manufacturer who must resolve the difference between the parent and the child's expectations if the company is to remain in business. How can an Army laboratory dismiss its responsibility of resolution and expect to receive missions and funding?

Establishing Customer Superiority

The concept that marketing is a process of sensitively serving customer needs is a corollary to the premise that organizations exist for customers. The culture of many Army laboratories is that organizations exist for the product. This is not a subtle difference or matter of semantics. This is a complete and vital shift in perspective. Customers are not a matter of coincidence to creating products, but rather the opposite, that is, the particular product one creates is only a matter of coincidence to fulfilling a customer need.

An Army researcher recently stated to me, "I don't need soldiers in here telling me how to design a tank." Such a perspective is preposterous and, I fear, prevalent. Establishing the perspective of customer superiority is especially difficult with engineers and scientists, not just in Army laboratories, but throughout industry as well. The difficulty must be overcome.

In reviewing the Edsel debacle, it is noted that customer surveys were never consulted during the design phase. Rather than defer to the customer questions of aesthetics, answers were drawn from internal committees. This process is familiar to Army design teams. When a corporation's product developers do not satisfy customer expectations, such as the Edsel team, the corporation takes a loss. However, when military developers do not satisfy the soldiers' expectations, soldiers may die.

The American soldier is a professional and the recognized world expert in how to wage war conclusively with the least cost in human life. The U.S. Army, as Army Chief of Staff GEN Gordon R. Sullivan has stated, fights at the Ph.D. level of war. The soldier is the expert in design criteria, not the Army research engineer, because of a great disparity of experience with the product and its environment. This disparity is rare in the private sector. For instance, General Motor's Corvette design team is not composed of men and women who ride the bus to work. They drive automobiles everyday and are more than likely driving enthusiasts. Army scientists and engineers, on the other hand, do not operate M1 tanks or depend on SINCGARS radios to get to work every day. It is the soldier who has the experience to understand what is required of equipment, not the engineer. More critical than experience, however, is doctrine, and for this requirement there is no ready analogy from industry.

The Army's doctrine lies at the heart of its professional competence. It is a concise statement of how the Army intends to conduct war. Doctrine is the ends to which a certain technology is but one means of achieving. Customer superiority dictates that doctrine must drive technology.

Customer superiority cannot be over stressed in the government leader market sector. The American people entrust elected representatives and the appointed officials they approve with the common Defense. The elected and appointed in turn allocate resources to Army laboratories to execute particular elements of the common Defense. It is the people's representatives who define a quality product, not the laboratory. If the product does not meet the expectations of the Congress or DOD appointed officials, it is discontinued. The customer is always right.

Customer Expectations

Army laboratories can no longer wait passively for soldiers to define their needs and expectations. Doing so simply is not focusing on the customer. No corporation could survive with the board of directors asking such questions as, "When is the American Society of Coffee Drinkers going to publish their requirements for a coffee maker? We need to get started on designing our next model line." It would be absurd. Yet, the engineers and scientists in the U.S. Army Materiel Command sit and wait for the captains and colonels of the U.S. Army Training and Doctrine Command (TRADOC) to publish a mission needs statement.

It is not the responsibility of the customer to define his or her requirements. It is the responsibility of the product development organization to assure it knows and understands the customer's needs and expectations. Assuming such responsibility is marketing, that is, sensitively serving and satisfying customer needs.

TRADOC claims to be the soldier's representative. In reality, design engineers never deal with TRADOC, but with assigned individuals within TRADOC. No single individual can represent the entire customer base. Would a manufacturer of washing machines rely on one housewife to define the requirements of a new model? The colonel or sergeant in one of TRADOC's combat development centers has only his own experiences, perspective, and knowledge to draw upon. How much experience does a colonel have in driving an M1A2 tank?

To truly represent customer needs, TRADOC would have to conduct market research just as any corporation would. It is illogical for an organization created to train soldiers to be conducting extensive product research. Market research should be a core competency of Army laboratories.

Army laboratories will need to conduct market research for each sector and subsector. The methods used will vary. The soldier market sector is very similar to a consumer market in the private sector, so methods used for consumer goods will generally apply. The other federal agency market sector, which includes program managers, is similar to business-to-business marketing, and methods have been developed which will be applicable.

The most challenging research will be the government leader sector, for there are no readily available similarities in the private sector. Researching the government leader sector, however, is essential to resolving the toy maker's dilemma. An Army laboratory must know and understand the government leaders' needs and expectations of its research efforts. Many of these expectations do not necessarily affect the soldier in the field, but the nation as a whole. These expectations include encouraging math and science in secondary schools, assisting historically Black colleges and universities, and transferring technology that can be turned into consumer products to small businesses.

Responsibility to Communicate

If one laboratory is chosen over another to accomplish a particular research or development project simply because the customer was unaware that the unchosen laboratory was capable of accomplishing the project, whose problem is it? It is certainly not the customer's loss; he or she will receive a product. It is the loss of the laboratory not chosen. Can the laboratory staff complain that "it isn't fair?" Well, can one running shoe manufacturer complain that "it isn't fair" that customers are buying another company's product based simply on name recognition?

Just as it is an organization's responsibility to assure it knows and understands its customers' expectations, it is also the organization's responsibility to assure its customers are aware that it can meet those expectations. An Army laboratory must communicate its capabilities and accomplishments to customers. It cannot assume its customers and potential customers know what it is doing and why. The responsibility to communicate extends to all market sectors—government leaders, soldiers, other government agencies, and private industry.

Responsibility to communicate stems from the inherent competition of research and development. Boundaries that are complete and consistent cannot be drawn between disciplines of technology because no discreet boundaries exist. All disciplines are interdependent within a product's development, as concurrent engineering purports. There will always be mission overlap amongst laboratories; it is unavoidable. For example, if the Army wishes to develop a ground robot controlled by radio, does the ground vehicle laboratory get the mission or the communications and electronics laboratory? As it turns out, the missile laboratory does because it has more effectively communicated its capabilities to the customer, that is, to the government leaders who make the decision.

There are 721 federal laboratories, each having several on-going projects that require funding. The Army alone has 199 such projects. Name another market in which 721 brand names are competing. Imagine 721 brands of laundry detergent competing for your purchase. The communications challenge in the federal research community is one of the most daunting faced by any organization, and yet, the resources dedicated are among the lowest.

A Specific Concept of Marketing

American business schools have devoted considerable effort in creating mature concepts and practices for marketing in the private sector. No such attention has been given public sector marketing, nor can the public sector wait idly for the business school community to fill the challenge. The specific concept of market for Army laboratories proposed here is a simple one to be matured through discussion and shared experiences. At the concept's foundation are the premises already discussed:

- Laboratories exist because of and for customers, not products.
- It is the laboratory's responsibility to assure it understands the customer's expectations.
- It is the laboratory's responsibility to assure the customer understands the laboratory's capabilities.

Marketing is the process of sensitively serving and satisfying customer needs. From the perspective of a laboratory's marketing director, this process has three major actions:

- Find out what the customer wants (market research);
- Do what the customer wants; and
- Let the customer know you are doing what he wants (corporate communications).

The first and last actions are in essence communication and are the responsibility of the marketing director. The second action is normally the technical director's responsibility.

All effective processes have an end goal. In the private sector, the end goal of sensitively serving and satisfying the customer's expectations is to increase profits. The end goal for an Army laboratory's marketing efforts is to assure proper investment in its field of technologies. Some may dispute this as a sound goal on the basis that the natural inclination of any laboratory would be to ask for more investment than is proper. In truth, the goal works exactly because of that natural inclination.

Market forces and anti-trust laws counter any company's efforts to maximize profits, providing a balanced system that seeks efficiency. Similar forces counter a laboratory's efforts in maximizing investment, again creating a balanced system that seeks efficiency. The main counter force is that the laboratory does not allot the investment; Congress and government leaders do. Also, according to the above premises, the laboratory does not define the technology investment requirements, the soldier does. Just as a company cannot force or coerce a customer to buy its products (the essence to anti-trust), so also a laboratory cannot force or coerce investment into itself. A company can only make sales if it is able to convince customers that they will benefit from the purchase, and it does so through effective communication. The same holds true for laboratories; they must convince government leaders that the Defense will benefit from the investment.

Through market research, a laboratory determines the soldiers' expectations. These expectations are considered along with capabilities and resources to define the laboratory's sales objectives, that is, what it considers proper investment. These sales objectives in turn define the laboratory's communication objectives. Laboratory or corporate communication is a cumulative effect across many media, among them advertising. If a laboratory does not meet its sales objectives, it can be for one of two reasons; either its calculation of proper investment was wrong or its communication with the customer was not completely effective.

The natural inclination of the laboratory to maximize investment and to use marketing to effect this inclination should lead to improved definition of customer expectations and improved communication with the customer. The result is a bottom-up improvement of the Army's research and development process. Soldiers receive products that more strongly match their expectations. Just as important, government leaders gain a better understanding of the Defense research capabilities through more effective communication on the laboratories' part. Better understanding affords sounder judgment, a vital necessity in this age of decreasing Defense resources and increasing Defense technological requirements.

JEFFREY M. RICKER served as chief marketing officer of the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC) from December 1993 to March 1994. He is a reserve armor officer and holds a B.S. degree in mechanical engineering from Tulane University.

NEW AAC MEMBERS ATTEND WORKSHOP

Approximately 200 new military members of the Army Acquisition Corps (AAC) attended the Army Acquisition Corps New Accessions Orientation Workshop, May 16-18, in Atlanta, GA. Sponsored by the director, AAC, the workshop was designed to acquaint these officers with the challenges, demands and opportunities of the AAC.

Dr. Bennie H. Pinckley, deputy director for acquisition career management, Office of the Assistant Secretary of the Army (Research, Development and Acquisition) (OASARDA) opened the conference with an overview of the Army Acquisition Corps. He said, "I truly believe we are currently providing a world-class approach to acquisition. But I think we can do even better by building competency through experience, training and education." He outlined AAC experience, training and education requirements and opportunities, including those mandated by the Defense Acquisition Workforce Improvement Act (DAWIA).

A briefing on the RD&A budget was provided by Maurice R. Donnelly, director, plans, programs and resources, OASARDA. He explained that in spite of reductions in resources, the Army must be ready to respond to new worldwide threats, such as nuclear or regional dangers. To do so, he said, it will be necessary to concentrate on upgrades, such as the horizontal integration of like technology into systems that must fight together on the battlefield. Donnelly also discussed RD&A budget trends such as the substantial and professional downsizing of the military workforce.

LTC(P) John Holly, assistant to the director, acquisition education, training, and career development, Office of the Under Secretary of Defense (Acquisition and Technology), discussed DAWIA. He explained that this law focuses on providing civilian and military members of the acquisition workforce a better set of tools to carry out their day-to-day mission of placing quality equipment in the hands of the soldier. He outlined policy on the structure of the workforce, improving professionalism through means such as education and training programs, and management of the acquisition workforce.

COL William S. Taylor, program manager (PM), Multiple Launch Rocket System, gave a presentation on being a PM. He recommended treating program management as a business, stating, "Ultimately, the responsibility in this business is to provide the best service you can to the soldier and to the taxpayer." According to Taylor, PMs should also pay particular attention to their budget, leveraging money through means such as foreign military sales. He said that problems with the "ilities"—supportability, maintainability and reliability—can harm the program, while the budget can kill it.

A briefing on contracting and industrial management was given by COL Michael R. Jorgensen, acting director of contracting, OASARDA. He said that functional area 97 AAC officers should seek a broad range of assignments, avoiding positions as procurement staff officers early in their careers. Instead, he recommends work in contingency contracting. According to Jorgensen, as the Army downsizes, the contracting workload in most installations either remains constant or increases; the dollar value of contracts written is down, but the number of actions is up. Jorgensen emphasized that AAC members in any branch should take advantage of every

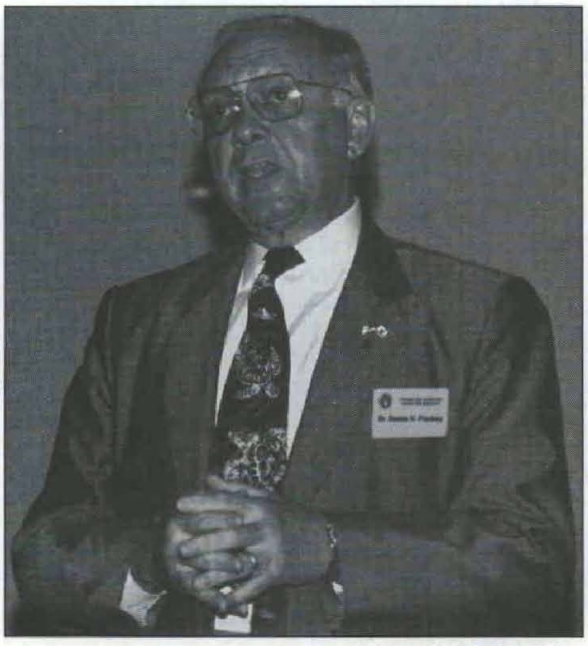


Photo by Don Parker

Dr. Bennie H. Pinckley, deputy director for acquisition career management, OASARDA, opened the conference with an overview of the Army Acquisition Corps.

opportunity they have to stay in touch with the soldier.

Commander, U.S. Army Information Systems Software Center COL Rayford B. Vaughn Jr. discussed perspectives on the AAC automation officer. He particularly emphasized the importance of technical proficiency, but added that it is important to stay current; to have relevant education such as a degree in computer science, computer engineering, or electrical engineering; and to gain experience in development. He said that the AAC automation officer must *enjoy* automation, because the field involves evening work and requires that the officer read a great deal of technical literature to stay current.

LTC(P) Rick Bailer, chief, Military Acquisition Management Branch, U.S. Total Army Personnel Command (PERSCOM), spoke on career management for the AAC officer. He explained his organization's role in representing AAC officers; maintaining their files; nominating officers for assignments; assigning them Army-wide, world-wide; and managing boards for promotion, schools, and PM positions. He said that the assignment officer tries to match an individual's skills, experience and preferences with an assignment. Bailer said that the officer's role is to ensure his or her records at PERSCOM are in order, but emphasized that manner of performance is the most important thing he or she can do to get promoted and into the best jobs.

Also on the first day of the conference, the officers broke into groups to discuss the particulars of their functional area (51, 53 or 97). Following this, PERSCOM interviews were conducted by Bailer.

MG Otto J. Guenther, commander of the U.S. Army Communications-Electronics Command (CECOM) and Fort Monmouth, NJ, opened the second day of the conference with a presentation on the role of the major subordinate command. Guenther described the materiel development community, which includes the Army Materiel Command, its major subordinate commands and laboratories, the Information Systems Command (ISC), and the Corps of Engineers. He also discussed CECOM's military professional development program for entry-level captains and majors, as well as the life cycle management system. Guenther provided many tips for succeeding as an AAC officer, such as maintaining high technical competency, understanding financial management, and staying involved with the soldier.

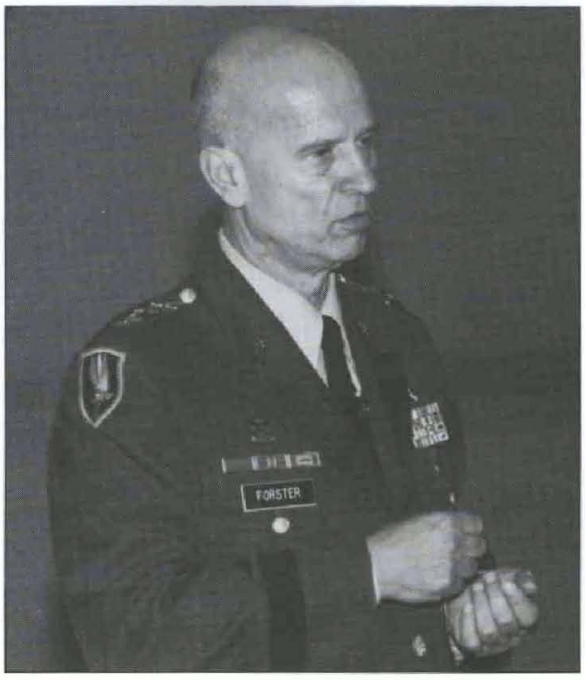


Photo by Don Parker

Director for Acquisition Career Management and Military Deputy to the ASA(RDA) LTG William H. Forster provided a perspective on Army modernization.

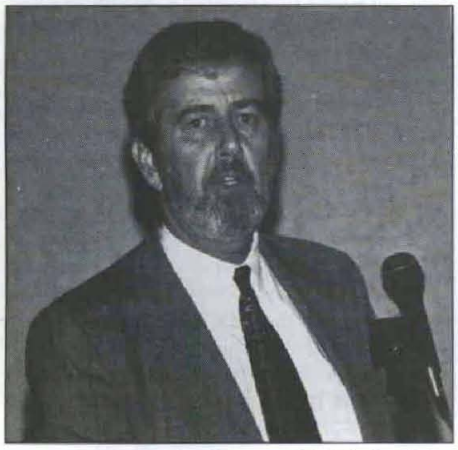


Photo by Don Parker

A briefing on the RD&A budget was provided by Maurice R. Donnelly, director, plans, programs and resources, OASARDA.

Photo by Don Parker

MG Otto J. Guenther, commander of the U.S. Army Communications-Electronics Command and Fort Monmouth, NJ, opened the second day of the conference with a presentation on the role of the major subordinate command.

COL Daniel Bartlett described his experience as a procurement commander at the Defense Contract Management Command (DCMC), a position he has held for approximately two years. Bartlett explained that DCMC's roles include managing customer interests, such as cost and quality; ensuring that the contractor is paid; and assessing the industrial base. He said, "Here is DCMC's vision: to be the provider of choice for contract management for the Department of Defense, other federal and international organizations, and a valued customer to our suppliers."

A briefing on battlefield digitization was provided by Director, Program Integration, OASARDA COL Michael Simonich. He characterizes digitization as an evolutionary process, stating "We will build some equipment, take it out and test it, use it, put it in the hands of the user and get some feedback, build the next set, and so on." Simonich commented that it takes a long time to acquire equipment from concept to fielding, and that technology changes quickly during that process. "If you're not careful, you will end up, after 10 or 20 years, buying old equipment," he warned.

COL Chuck Adams, special projects officer, Acquisition Reform Office, Office of the Secretary of Defense, spoke on acquisition reform. He said that reform is necessary because the world in which the military operates has changed so that the existing acquisition system can no longer support DOD. According to Adams, for DOD to operate in the current environment of declining budgets, rapidly-changing technology, and unpre-

Photo by Don Parker

MG Dewitt T. Irby Jr., program executive officer, aviation, gave a dynamic presentation on the life of the PEO.

> "Our bottom line is to deliver a piece of equipment to the American soldier that will save his or her life on the battlefield."
> ***—MG Dewitt T. Irby Jr.***

dictable regional threats, streamlining is necessary. Taking advantage of current and future commercial technology, using design instead of performance specifications, and replacing rigid rules with guiding principles can help bring about the necessary change, he said.

A presentation on Advanced Civil Schooling was provided by CPT(P) David Baker, who was then advanced civil schooling officer, Functional Area Management Development Division, PERSCOM. He said that universities are evaluated based on a variety of degrees, cost to the government, and quality of the program. Baker recommends that officers whose undergraduate grade point average was less than 2.5 take courses in their weak areas prior to attending graduate school.

Director for Acquisition Career Management and Military Deputy to the ASA(RDA) LTG William H. Forster provided a perspective on Army modernization, stating that the Army modernization vision is affected by a new, unpredictable security threat. Thus, the Army must be ready to fight in any environment, on any terrain, against high technology weapons, a mix of high and low technology weapons, or a rudimentary force. "We want to make the light forces more lethal and the heavy forces more deployable," he said. Forster is an advocate of horizontal technology integration—the application of common technology across all of the elements that fight together. "Don't put money into new platforms when existing equipment can be upgraded instead," he said.

Forster's speech also touched upon other aspects of the acquisition business, including acquisition reform, Roadshows, which stress to Army organizations and industry the importance of streamlining (see July-August 1992 and January-February 1993 issues of *Army RD&A Bulletin*), and PM challenges, such as integrity and discipline.

MG Dewitt T. Irby Jr., program executive officer (PEO), aviation, gave a dynamic presentation on the life of the PEO. He said, "In managing the different programs, you're down where the rubber meets the road, accountable for the weapon systems." He said that change dictated by the budget is a daily challenge. Regarding this change, Irby said, "It gives us some opportunities. It promotes creativity. It challenges the expected and the accepted and you can regain a lost edge in some leadership just by facing the reality that change is going to take place." He added, "Our bottom line is to deliver a piece of equipment to the American soldier that will save his or her life on the battlefield."

Irby also emphasized the importance of winning the information war, investing in training, and carrying out sound business practices.

COL Henry Meyer, dean, School of Acquisition Management, Army Logistics Management College (ALMC), discussed ALMC and the Defense Acquisition University (DAU). ALMC is comprised of four schools: the School of Logistics Science, the School of Management Science, and the School of Acquisition Management, all at Fort Lee, VA, and the School of Military Packaging and Technology at Aberdeen Proving Ground, MD. The DAU is a consortium of several Defense and Service schools, which includes ALMC. An overview of the Naval Postgraduate School, an accredited member of DAU, was provided by LTC(P) Albert J. Hamilton III, instructor of systems acquisition and program management. He said that the school's curriculum includes seminars given by distinguished members of the acquisition community, including LTG Forster, MG Irby, PMs, members of industry, and contracting people. He said that students graduate with a deep, broad understanding of the acquisition business.

Dr. Jerry G. Davis, director, Center for Professional Development and Training, University of Texas at Austin, discussed categories of professional development available to AAC officers. These include the Executive MBA Program, the Senior Service College Fellowship Program, scientific and technical courses, symposia, conferences and workshops, and an International Exchange Program. He said that most programs, including the MBA, are moving away from pure management and into the technical arena.

CPT Kelvin Wood, AAC Training With Industry (TWI) program manager, Proponency Office, U.S. Army Contracting Support Agency, explained the Training With Industry (TWI) and I-GRAD programs. In the TWI program, AAC officers spend 10 months (September-June) working in industry. During this time they gain varied experience and achieve learning objectives. I-GRAD is a two-year program which allows officers to participate in TWI and earn an MBA at the same time.

A description of the University of Texas at Arlington, the only school currently participating in the I-GRAD program, was provided by James E. Walther, director of graduate advising. He said that the I-GRAD program is an opportunity for officers to apply, internalize, and use what they are learning.

Dr. Bennie Pinckley provided brief closing remarks, urging the attendees to keep a field perspective. He also emphasized the importance of teamwork. "Be proud to be a member of the Acquisition Corps. We can no longer afford discussions of user vs. developer, discussions of functional area vs. functional area, discussions of PEO vs. functional support, military vs. civilian, or branch vs. acquisition. We're all in this together. It is necessary to work as an Army team," Pinckley concluded.

HELPING TO BUILD A STRONGER AND MORE EFFECTIVE PARTNERSHIP FOR MEETING TOMORROW'S ACQUISITION CHALLENGES

"BUILDING TODAY'S FOUNDATION FOR TOMORROW'S FUTURE"

PROFESSIONAL DEVELOPMENT INITIATIVES

By Dawn Massabni
and CPT Kirk Vollmecke

Introduction

The Army's Communications-Electronics Command (CECOM) and its community team partnership (Team Fort Monmouth) recently implemented a series of professional development initiatives that provide challenging and rewarding developmental assign ments and cross-functional job opportunities for its civilian and military acquisition workforce. Two such programs will be highlighted in this article. One program offers value added developmental assignment opportunities for high level civilians in our community partnership, and the other provides entry level Army Acquisition Corps (AAC) military officers the opportunity to close the experience gap and rapidly gain the tools of the acquisition trade.

Team Fort Monmouth (Figure 1) capitalizes on a proactive civilian and military training partnership that focuses on building an organization of world-class acquisition professionals. A synergistic team effort is the success mechanism that allows all activities to contribute towards a common goal.

Background

The framework of the AAC is based upon four functional areas: education and training, professional development, experience, and career management. These functional areas are the pillars of the AAC as well as the major components for the promulgation of policies and procedures for managing the AAC. In looking at this complex network of policies and procedures, the question arises, "Is there anything that an organization can do to complement the major components of the AAC?" The answer lies in creating meaningful professional development programs. Philosophically, professional development combines an investment strategy and training dynamics that focus on a combination of functional development, broadened skills and cross-functional job opportunities. It is important to realize that "professional development is not an *expense* but a *multiplier*."

In taking a proactive approach, Team Fort Monmouth established two oversight groups to facilitate a communications conduit for exchanging ideas. The first group, AAC Executive Council, gathers ideas and information

Figure 1.

in order to provide direction that enhances the professionalism of our civilian and military acquisition workforce. The other group, the Senior Professional Development Committee, provides new professional development, leadership, and educational opportunities of common interest and benefit to the community's workforce.

In concert, these steering groups have three common goals for professional development:

- Providing challenging and rewarding developmental assignments;
- Enhancing the professional knowledge of the acquisition workforce; and
- Improving long-term working relationships and better cooperative support.

With these goals, we are able to derive substantial workforce benefits such as diversification of skills and team building, while developing bold and innovative people. The net effect is to build a stronger community alliance and keep our acquisition workforce informed.

To better illustrate the multitude of professional development opportunities that have been developed in our community's partnership, let's explore two model programs that not only enhance the quality of our workforce but cultivate bold and innovative acquisition individuals. As mentioned earlier, the first program is the Civilian Professional Development Program. This program offers value added developmental assignment opportunities for our high level civilians. The second program, the Military Officer Professional Development Program, enhances the professional knowledge of our entry level military officers and better enables them to go "one-on-one" with their industry counterparts.

Civilian Professional Development Program

This program provides short-term acquisition career training, acquisition broadening, and cross-functional developmental assignment opportunities (Figure 2) for selected civilians in our community partnership. If we look at the complexity of the Defense acquisition process and the multitude of acquisition related career fields, it becomes clear why it is imperative to provide such broad-based acquisition developmental opportunities. This program crosses the imaginary boundaries of conventional stove-piping that characterized the past. Team building and diversification of skills are key ingredients for success.

The program's structure allows participants to complete a 120-day acquisition-related cross-functional assignment for the purpose of career development and enhancement. Participants are selected by the Senior Professional Development Committee. The selection process is highly competitive and participants are chosen for their high motivation and demonstrated excellence. The program is designed for GS-12 to GS-15 grade levels and offered on a voluntary basis. The program allows for flexibility and uniquely tailored developmental assignments to meet both the organization's and individual's needs.

Developmental assignments are agreed to by the participants and the organizations involved. A key point is that these agreements are individually tailored and cover a variety of career fields that are complementary to the person's acquisition career field. Not only do participants receive challenging and rewarding assignments, they also gain a greater understanding and appreciation about how organizations interface, which correlates into improved long-term working relationships and better cooperative support among the team players.

Let's consider a couple of examples which are illustrative of the benefits and success of this program.

- **Example 1:** Acquisition Center branch chief trained in a program management position at a program executive office. The Acquisition Center branch chief gained invaluable insight about the customer's vantage point and support needs.
- **Example 2:** Procurement contracting officer trained in the Defense Contract Management Area Operations (DCMAO) New York. Upon return, the contracting officer had a better understanding about the interrelationship that exists between pre-award and post-award activities.
- **Example 3:** Legal advisor trained in the Directorate of Materiel Management. As a result, the legal advisor gained a better insight into the materiel management process. Materiel management personnel also gained an appreciation for the legal considerations which must be taken as actions are generated.

These are just a few examples of many successful career broadening developmental assignments. The program is a "win-win" situation for all, and a model program that can be adapted to any organization.

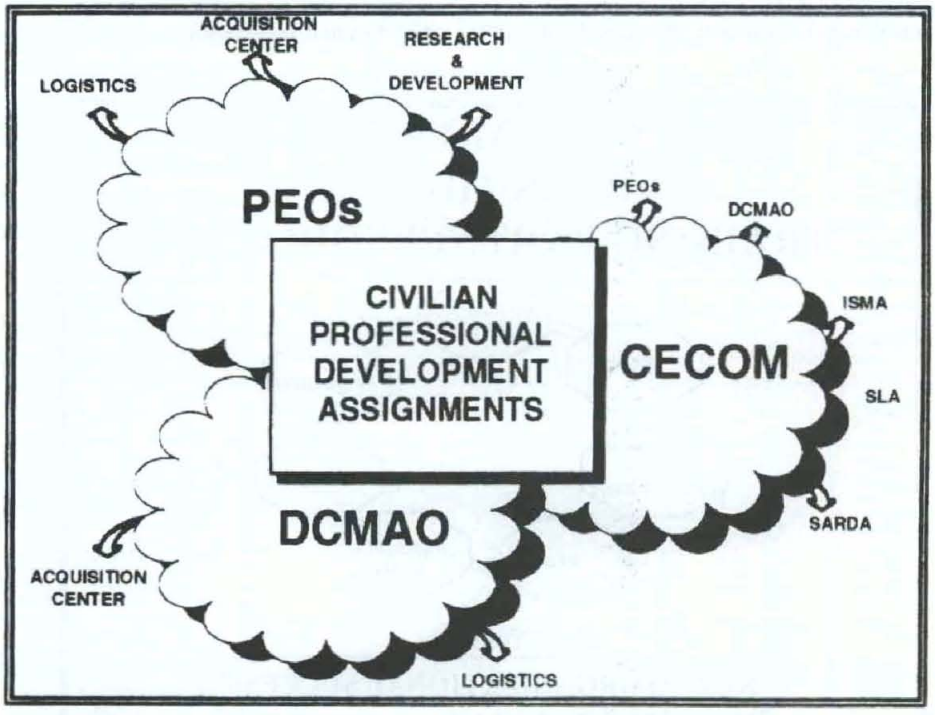


Figure 2.

Officer Professional Development Program

This program prepares an entry level military officer for the tough acquisition challenges of tomorrow. When entry level officers enter the acquisition career field, they share a common frustration and realization: they are well trained to be managers, but the requisite technical skills and experience base is missing. The focal point of this program

is to close the gap between education and the mission experience (Figure 3). This program stresses the importance of acquiring the "tools of the acquisition trade."

This program is designed for entry level captains and majors. Entry level officers are provided with broadened skills and cross-functional acquisition experiences while still supporting the acquisition mission of the respective organization.

The training philosophy is to establish a program that preserves flexibility and allows for individually tailored programs as needed. Further, the program encapsulates a degree of "mentorship" and avoids the formalities of "classroom" instruction. The program also balances all of the requirements and qualification goals mandated by the Defense Acquisition Workforce Improvement Act (DAWIA), Public Law 101-510.

With future downsizing and greater dependence on matrix support, the overarching benefit of this program is the improvement of long-term working relationships and better cooperative support among the different acquisition-related organizations within our training partnership. More importantly, the individual functional area officers (FA 97, 53 and 51) directly benefit. The different professional development experiences enhance the knowledge of the officer as well as offer greater insight and better understanding about the Defense acquisition system.

In designing the program, we recognized that the participating organizations had different size "pools" of entry-level officers and specialized needs. Therefore, the program is not a one-to-one exchange program, but rather a program tailored to meet the needs of each functional area officer. The AAC Executive Council provides oversight for this program. Each organization enrolls its newly assigned entry level officers into the program. The military training coordinator in the organization meets with the officer and immediate supervisor to determine the scope of the officer's professional development program. The Individual Development Plan (IDP) is the stepping stone or planning document that facilitates the development by carefully mapping out the officer's unique program needs and goals.

In participating, the different functional area officers follow one of the training plans. The training plans provide the baseline objectives and strategies to aid each participating organization in executing a solid reciprocal program. The majority of training is accomplished by hands-on experience. A reference training guide is provided by each organization to facilitate the officer's professional development experience. To illustrate the scope of each rotational training plan, let's consider CECOM's Acquisition Career FA 97 Officer Plan.

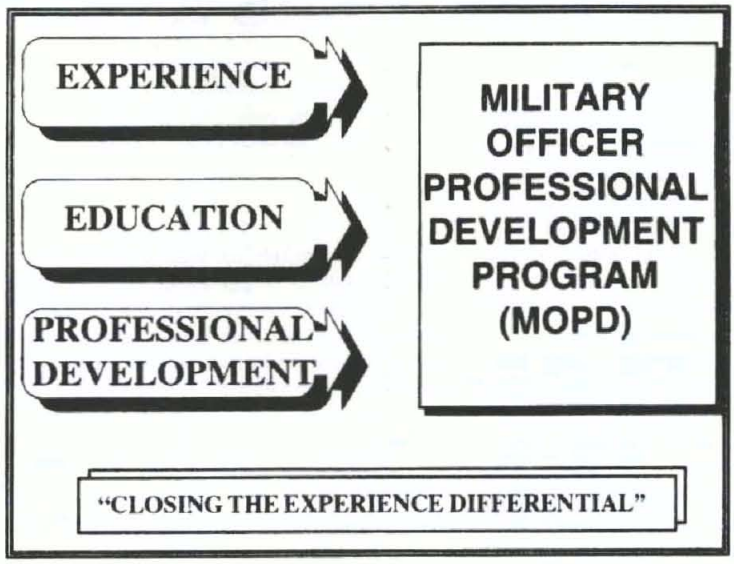


Figure 3.

This plan provides a comprehensive Acquisition and Contract Management Program that prepares entry-level FA 97 officers for warrant qualification and supervisory level positions. The training includes functional and broad based developmental assignments. Developmental assignments include going to DCMAO Springfield and a PEO/PM office. This professional development plan provides entry-level officers with the acquisition tools and experience needed to accomplish the job. Again, this program is adaptable to any organization's needs and structure. The important point to remember is that this program helps to develop top notch acquisition officers ready to meet all future challenges.

Conclusion

The intent of this article was to share the benefits that our community has received from taking proactive steps in providing professional development, leadership, and educational opportunities for our workforce. The two particular professional development programs highlighted clearly demonstrate the importance of cultivating a professional and dynamic acquisition workforce and building a stronger, more effective partnership for meeting tomorrow's acquisition challenges. The civilian and military professional development programs offer a best value approach to professional development. They are programs that invest in the future with a rate of return that has demonstrated to be greater than anticipated. Any organization can adapt these programs and other professional development opportunities to enhance the quality of its own workforce. Readers wanting additional information on the professional development, leadership, and educational opportunities at Team Fort Monmouth, please write the Communications-Electronics Command, C3I Acquisition Center, ATTN: AMSEL-ACSB-AAC, Fort Monmouth, NJ 07703.

DAWN MASSABNI is a procurement analyst for the Command, Control Communications and Intelligence Acquisition Center, HQ CECOM. She has eight years of contracting experience, and is pursuing a master's degree in management at Florida Institute of Technology.

CPT KIRK VOLLMECKE, is a contract management officer for the Command, Control, Communications and Intelligence Acquisition Center, HQ CECOM. He is currently detailed as a contingency contracting officer in the Republic of Honduras. He has a master's degree in management from the Naval Post Graduate School.

AGRICULTURE MAY HOLD KEY TO BETTER TIRES AND DIESEL FUEL

By George Taylor

A small, wild desert bush may someday become a major domestic source of natural rubber and lead to better tires, and the soybean might make improved diesel fuel possible.

That is the opinion of engineers at the U.S. Army Tank-Automotive Research, Development and Engineering Center (TARDEC), Warren, MI, who are teaming up with the U.S. Department of Agriculture to evaluate alternate sources for these products.

The rubber-producing bush is an herb belonging to the aster family and is known as the guayule plant. It reaches a maximum height of three feet in about two years and yields 10 to 15 percent rubber. In the U.S. it grows in the arid and semiarid areas of California, New Mexico, Arizona, and Texas.

It has been known for nearly 70 years that the plant produces rubber. However, this rubber contains several resins that, if not removed, adversely affect its properties, and until about 20 years ago, removal of these substances was extremely difficult and expensive. This made large-scale guayule rubber production economically impractical.

Since the 1970s, not only have methods been developed for extracting the resins, but the resins themselves have become marketable by-products, thereby making it possible to process guayule rubber for a less prohibitive cost compared to the tree-grown rubber of Asia and South America.

The resins have natural biocides that can control termites, marine borers and fungus. (A barnacle-resistant paint has been developed.) One of the cost-effective products of the rubber itself is hypoallergenic surgical gloves, replacing the often troublesome ordinary latex variety.

In the U.S., high-quality guayule rubber now available in experimental quantities was produced at a currently mothballed Firestone facility in Sacaton, AZ, on the Gila River Indian reservation. Also, shrubs are now being grown for experimental purposes in Arizona, California, Texas and New Mexico.

Gerard B. McCauley, chief of the Truck Branch in TARDEC's Systems Engineering Directorate, said the Army's interest in guayule stems from the premise that guayule rubber compounds may have superior wear characteristics over similar current compounds which use a blend of synthetic and hevea (the natural tree-grown rubber).

"Before World War II, Army tires and track pads were made of natural rubber," McCauley said. "But during the war, the Japanese took control of the countries in southeast Asia that had been supplying us with much of our natural rubber and it became scarce. So guayule plants were grown in California to produce enough rubber to get us through the war.

"This rubber worked well," he continued, "but because of its high cost at the time, its usage was abandoned, and we have since gone to the hevea rubber compound. This has been doing the job, but we are looking for better performance and durability."

McCauley said tests are now under way to evaluate guayule rubber as a replacement, and in tests conducted so far, the results have been good. The tests included comparisons of guayule and standard tires on Commercial Utility Cargo Vehicles (CUCVs) at Yuma Proving Ground, AZ, to evaluate braking, maneuvering, ride handling and stability, and laboratory tests at TARDEC. "In both the Yuma and laboratory tests," said McCauley, "the guayule and standard tires performed equally well."

According to McCauley, the final phase of tests is now under way at Yuma and is expected to be completed by the end of the fiscal year. It consists mainly of cross-country operation and is aimed at measuring the tread life of the guayule CUCV tires.

"If the tests prove that guayule rubber is better than what we have been using, we hope to achieve two goals," McCauley asserted. "One of these is to increase the average tread life from the 4,000 miles we get now on the bias-ply tires used on many tactical trucks to 10,000 miles for the new radial tires we buy for replacement. Also, we want to start using guayule rubber on our tire retreads in hopes of getting better tread life and performance than we get now."

McCauley pointed out that if guayule rubber is found to be superior to other kinds of rubber, adopting it for use in military tires would result in additional benefits. For one thing, he said that since the material can be produced domestically, the Army would always be assured of adequate supplies of natural rubber—an important consideration during wartime. Also, he added, unlike the synthetic compounds, which are made from petroleum, an irreplaceable source, guayule rubber comes from a source that can be replenished easily by planting new bushes.

The same CUCVs taking part in the guayule rubber tests are also helping engineers from the newly acquired Fuels and Lubricants Division of TARDEC's Mobility Technology Center to evaluate the performance of diesel fuel made from soybeans. (This division was formerly part of the Belvoir Research, Development and Engineering Center, Fort Belvoir, VA. Earlier this year, however, it was transferred to TARDEC as part of the 1993 round of Defense Department base closures and realignments.) Throughout the tire tread life tests, the trucks will run on a mixture of 20 percent soy diesel fuel and 80 percent JP-8, the standard military fuel.

McCauley said the purpose of the tests is to determine if soy diesel fuel could be used as a military fuel to help meet tough, new diesel exhaust-emission standards.

He explained that government and industry are facing two problems in dealing with these standards. One of these has to do with a requirement that took effect last January calling for a 60-percent reduction of particulate matter in diesel exhaust emissions. "This reduction is really drastic, and the industry evaluation is that some of the new diesel engines will require catalytic converters to be certified," McCauley said. (Unlike gasoline engines, diesels are currently not required to use catalytic converters.)

The other problem, he said, involves a standard implemented in October 1993 that requires a lowering of the sulfur content of diesel fuel to reduce particulate emissions. McCauley explained, "The low-sulfur fuel is causing a severe problem because it has less lubricity than what we were using before, and this is causing certain engine parts to wear out faster. We think that the soy diesel fuel can solve this problem by giving us better lubricity, and we already know that it produces lower particulate emissions."

When asked about the cost of soy diesel fuel, McCauley said it is currently about three times more expensive than the standard petroleum-based fuel. He added, however, that if only a 20 percent mixture of soy fuel is needed to solve the lubricity problem and allow diesels to pass emission standards without catalytic converters, it may be worth the additional cost.

GEORGE TAYLOR is a technical writer in the Marketing Office of the U.S. Army Tank-Automotive Research, Development and Engineering Center, Warren, MI.

TARDEC ACHIEVES SUCCESS BY NURTURING ITS ROOTS

By Alexander J. Farkas
and CPT Matthew J. Barr

Background

The Detroit Arsenal located in Warren, MI, was built in the early 1940s. The first M3 "Lee" tank was literally designed and built concurrently with the tank plant. In just seven months, the Army and industry had built a massive 1.3 million square foot facility. Designed by the preeminent industrial architect Albert Kahn, the Detroit Arsenal rolled out the first tanks on April 24, 1941. The location of the tank plant was chosen because of the strength of automotive technology and manufacturing in the area. Leveraging this strength, the Army was able to produce these newly-developed tanks at a pace far surpassing the world's production.

Creation of an R&D Facility

The years following World War II would set the stage for the inception of the Tank-Automotive Research, Development and Engineering Center (TARDEC). This first occurred in 1946 with the expansion of the Development and Engineering Department to include a Components Laboratories Division. This was established at the recommendation of the Chrysler Corporation.

In 1950, the commanding general invited the Automotive Manufacturers Association (AMA) to establish a committee to study future needs of the Development and Engineering Department based on experiences and advances during and after the war. The AMA's newly-formed committee consisted of the automotive industry's leading engineers. The corporate representation included Chrysler, Continental Aviation and Engineering, Ethyl, Ford, Hudson Motor Car, International, Packard, Studebaker, Timken-Detroit Axle, and General Motors.

The recommendation of this group was that Detroit, as the center of the automotive industry, would be an ideal location for this new laboratory. The committee further cited that such a facility in the area would strengthen the relationship between industry and the Army, which had been outstanding during World War II. At the same time, the existence of such a facility would supplement the commercial facilities available to the automotive industry in their own laboratories.

The committee also recommended that engineers of the automotive industry be allowed to conduct tests in the laboratory on equipment being developed for the Army. Facilities which the commercial sector did not have would be made available to the automotive industry.

The newly-created research and development facility was extremely successful. An example of collaborative work included the first heavy vehicle automatic transmission. However, as time went on, the relationship between the commercial automotive industry and the specialized military lab became more distant. A few reasons were the changing

The National Automotive Center focuses on seeking new collaborative ground vehicle initiatives, basic research, agile manufacturing, and personnel development. It serves as the catalyst linking industry, academia, and other government agencies in all aspects of ground vehicle development.

laws of contractual relationships, as well as the tendency of organizations—especially those involved in developing new technologies—to become more isolated.

The Winds of Change

As the Cold War ended, TARDEC saw the need to change its direction, and began to nurture its roots. Under the direction of Dr. Kenneth J. Oscar, the organization began to reestablish itself with those entities that helped create it. Oscar, along with his "top team," developed TARDEC's road map for the 21st century. The road map consisted of a vision, mission, and strategic goals and objectives.

One of the goals was to form a task force whose sole mission was to begin to reestablish ties with the automotive industry. The task force is now a reality, and is called the National Automotive Center (NAC). The NAC focuses on seeking new collaborative ground vehicle initiatives, basic research, agile manufacturing, and personnel development. It serves as the catalyst linking industry, academia, and other government agencies in all aspects of ground vehicle development.

The numerous successes of the NAC include the first ever exposition of government technologies to industry in Michigan, working closely with the Army Materiel Command in establishing a blanket cooperative research and development agreement (CRDA) with the automotive "Big Three," a blanket CRDA with small businesses, awarding more than 40 new dual-use technology contracts, being recognized as a "best practice" by the Federal Laboratory Consortium, and leading the Army's efforts in the president's Next Generation Vehicle.

The NAC team consists of less than 10 members. The real strength is in its amplification of the efforts of those individuals within TARDEC. Some of the accomplishments include TARDEC scientists winning the Army's Research and Development Award for three straight years, numerous awards and accolades for contributions to the engineering community, and the development and roll out of the component advanced technology test bed. These contributions culminated most recently with TARDEC being honored with the Quality Improvement Prototype Award by the Federal Quality Institute.

Future Direction

During the past five years, TARDEC has received world-wide recognition as the nation's laboratory for ground vehicle research, development and engineering. The laboratory is customer-oriented and is continually improving its quality. The bench marking of top organizations continues, as does the constant improvements to TARDEC's technologies and processes. In a short period of time, TARDEC has nurtured its roots and achieved tremendous success. This will significantly enhance our mission of automotive ground vehicle development as we move into the next millennium.

ALEXANDER J. FARKAS is the director of the Detroit Arsenal's National Automotive Center in Warren, MI. His career at the Detroit Arsenal spans three decades, with posts as director of TARDEC's Advanced Systems Concepts Office and Tank-Automotive Technology. Farkas holds a B.S. in mechanical engineering from the GMI School of Engineering and Management, and a master's degree in industrial management from Central Michigan University. A member of the senior executive service since 1989, Farkas is responsible for the planning and management of research and development programs between the government, industry, and academia to strengthen our defense ground vehicle mission and to provide dual-use technology transfer to and from industry and academia.

CPT MATTHEW J. BARR was a National Automotive Center project officer at TARDEC when he wrote this article. He is now on a Training With Industry assignment with United Defense (FMC and BMY) in York, PA. He is a member of the Army Acquisition Corps and holds a B.S. in business administration from the Florida Institute of Technology, as well as M.S. degrees in systems management, human resources management, and psychology from the University of Central Texas. Barr is also a doctoral candidate with Nova Southeastern University.

THE SENIOR SERVICE COLLEGE FELLOWSHIP PROGRAM AT THE UNIVERSITY OF TEXAS AT AUSTIN

By Dr. Jerry G. Davis
and MAJ Steven E. Lopez

Introduction

The U.S. Army has designated the University of Texas at Austin (UT) a host university for the Army's Senior Service College (SSC) Fellowship Program. The Center for Professional Development and Training (CPDT) at UT manages the fellowship, which is specifically designed to support the activities of the Army Acquisition Corps (AAC) and officers in the U.S. Army Reserves (USAR) and National Guard with similar duties and skills. Fellows reside at the University of Texas for one academic year and receive the award of Military Education Level One (MEL 1) upon completion.

This year's class included two USAR officers, marking the first time Reserve officers have attended a SSC Fellowship Program of this type. LTC Josef Schroeder commanded an armor battalion in the 100th (TRNG) Division, USAR, Louisville, KY, prior to attending the fellowship. His civilian position is operations research analyst in the Directorate of Combat Developments, Fort Knox, KY. LTC Lewis Roach commanded a quartermaster petroleum supply battalion prior to the fellowship. He is a member of the technical staff at Sandia National Laboratories in Albuquerque, NM, serving in the Transportation Technology Development Program. The remainder of the class was composed of three active Army officers, one National Guard officer and one Department of Army (DA) civilian.

The fellowship features a unique trilateral focus, with the fellows studying the relationships between national security, the Army's critical technologies, and the Defense industrial base. "The program is comprehensive, but also flexible in that it allows each fellow to tailor his program for maximum emphasis in a given area," says Jim Pollard, program coordinator.

National Security

This module places national objectives in their geopolitical content, explores all facets of national power, addresses the organizational structure for national security, examines military strategy, and reviews the force development and acquisition process. "This portion of the program gave us the perspective that we need for future assignments, and allows us to approach problem-solving from a national strategic level," said LTC Schroeder.

The core of the module is built around a series of lectures by guest speakers of national prominence. Past speakers have included: LTG William H. Forster, military deputy to the assistant secretary of the Army (research, development and acquisition) and director, Army acquisition career management; George Singley, deputy assistant secretary of the Army for research and technology; BG John Longhouser, program executive officer (PEO) Armored Systems Modernization; BG David Gust, PEO Communication Systems; MG (ret.) William F. Burns, former special envoy to states of the former Soviet Union for safe and secure dismantlement of nuclear weapons; LTG (ret.) William E. Odom, director of national security studies, Hudson Institute; and ADM (ret.) B.R. Inman, former deputy director of the Central Intelligence Agency. Fellows also audit graduate courses at the LBJ School of Public Affairs and the UT School of Government and participate in a number of ongoing conferences and symposia such as the World Affairs Council.

Critical Technologies

The Critical Technologies and Military Applications module focuses on key emerging technologies such as micro-electronics, robotics, directed energy, advanced propulsion, advanced power generation and space

Senior Service College Graduates

Seven fellows recently became the second graduating class of the Senior Service College Fellowship Program at the Center for Professional Development and Training, The University of Texas at Austin. This War College (MEL 1) equivalency program has been specially designed for Army Acquisition Corps members. The academic approach is a structured, trilateral study of relationships between national security policy and process, the leading edge technologies and the Defense industrial base and policy.

Dr. Bennie H. Pinckley, deputy director, acquisition career management, Office of the Assistant Secretary of the Army (RDA), spoke to the graduating class. Approximately 40 guests and staff members attended the June 3 graduation program, in which Dr. Pinckley served as the keynote speaker. The Fellowship program is conducted by the Center for Professional Development and Training, an autonomous organization of The University of Texas at Austin.

The 1994 Senior Service Fellowship graduates are: LTC Lewis S. Roach (Army Reserve), LTC(P) John C. Spencer (Army National Guard), LTC(P) Noble T. Johnson (Army Acquisition Corps), Jo Ann Hathaway (Army Acquisition Corps), LTC Josef Schroeder (Army Reserve), COL William D. Knox (Army Acquisition Corps), and LTC Mark W. Russell (Army Acquisition Corps). The class for 1995 has been selected and consists of the following 11 members:

Active Army, Acquisition Corps—LTC Roger L. Carter, LTC Scipio deKanter Jr. and LTC(P) Donald D. Newlin; **Army Acquisition Corps Civilians**—Roxanne C. Brown, Gordon D. Little, Garfield Boon, William N. Washington and Donald C. Barker; **Army Reserve**—COL Carol A. Miller and COL Kenneth D. Herbst; and **Army National Guard**—LTC Craig L. Lowman.

technology. A combination of professors, experts and leaders in the specific technology areas present survey courses that provide an overview of the technology and its military applications. According to LTC Roach, this module was "a real boost to my knowledge that I can directly apply to my civilian job at Sandia."

Industrial Base

The Industrial Base module explored the relationship between the government and the Defense industry. Fellows receive an orientation to industry through internships with local high technology corporations and consortium, such as Texas Instruments, Lockheed, Tracor, Trimble DAC International, MCC, Sematech, and the University of Texas Manufacturing Systems Center. "This module showed us some of the best practices of industry that we can apply to the military," said LTC Schroeder.

Political-Military-Industrial Simulation

The capstone to the program is a computer-assisted simulation exercise in which fellows serve as political, military, and industrial role players. During the simulation fellows are called upon to make political-military-industrial policy decisions as they respond to a series of regional crises.

Research Activities

The SSC Fellowship Program is product-oriented and fellows are required to submit a research paper, report, or analysis to the Army War College (AWC) in order to receive MEL 1 designation. Fellows select their own topic in consultation with the Center for Professional Development and Training and the Army War College. Fellows can use the outstanding reference sources of the University, make research related trips and conduct their own research.

Role of the CPDT

The CPDT is an autonomous element of the university with an Army mission of education and training, with emphasis in research and technology subjects. CPDT is collocated with the Institute for Advanced Technology (IAT), the U.S. Army's university research center for electric gun technology. CPDT provides full service administrative support to the SSC fellows throughout their course of study. Along with the SSC Fellowship Program, SPDT offers workshops nationwide, technical courses, and support to specialized management and technology degree programs. SSC fellows also have the opportunity to interact with a variety of distinguished scholars, scientists, and military leaders associated with CPDT and IAT.

Summary

Comments on the program have been extremely positive. "The program is a great opportunity for top level professional development and education. This class provided a great mix of active component, National Guard, DA civilian, and USAR students who gained a greater appreciation from each other's perspectives," said LTC Roach.

For more information on the program, contact Dr. Jerry Davis, Center for Professional Development and Training, (512)471-9060.

DR. JERRY G. DAVIS is the director of The Center for Professional Development and Training and assistant director for education, Institute for Advanced Technology in Austin, TX. He is a colonel in the U.S. Army Reserve and a graduate of the U.S. Army War College Fellows Program at Tufts. He holds a Ph.D. from Ohio State University and has done post-doctoral work at Harvard.

MAJ STEVEN E. LOPEZ holds an M.B.A. from The University of Texas, where he was selected for the George Kozmetsky Award as one of the outstanding graduates of the Executive M.B.A. Program. He is assigned to The Center for Professional Development and Training where he coordinates and manages special projects for the Army Acquisition Corps.

DOD AND THE EVOLUTION OF TQM

By CPT James R. Nagel

Introduction

One of the key military advantages of the United States involves producing technologically superior weapon systems to offset an enemy's numerical advantage. After the superb performance of its equipment during Operation Desert Storm, the military has a key challenge to maintain its technological and qualitative edge while facing resource restrictions in funding and personnel.

Due to this reduced funding, maximum value must be received for procurement dollars. Realizing development and acquisition procedures were outdated and seeing examples of private industry's success, the Department of Defense (DOD) adopted the philosophy of Total Quality Management (TQM) in the late 1980s.

The DOD published its "Total Quality Management Master Plan" in January 1989, outlining the goals and milestones for TQM implementation. Today's challenge is to equip a superior military with weapons that continue to provide a technological advantage over adversaries.

Product and process quality are absolutely imperative to maximize scarce resources and to produce quality, reliable, and effective equipment, which will save lives during the Army's numerous missions. Essential parts of the TQM migration consisted of the in-plant quality evaluation system, quality improvement techniques and strategies, and contractor incentives. Before discussing the TQM evolution, it is important to review the previous procurement process and the need for adapting TQM.

The Previous System

The programs and philosophy that industry and the DOD adhered to for equipment acquisition dated back to post World War II. In order to ensure efficient spending of over seven hundred billion dollars, the DOD used Contractor Quality Assurance Program methods. This system based itself on standard American industry principles, relying on product inspections at rigid intervals, detailed written process standards for contractors, and strict inspections of contractor actions. Producers certified their products as error-free by signing a Certificate of Quality Compliance. Only a few selected critical items went through source or process inspections.

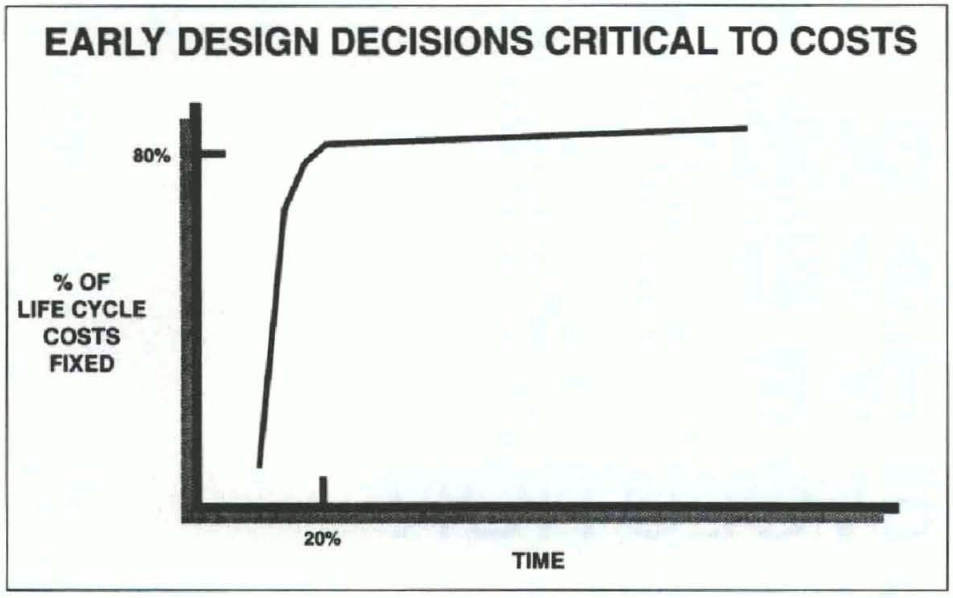
The Packard Commission's 1988 report issued grave warnings on the declining defense industrial base and the growing reliance on foreign suppliers for vital components and parts. At that time, the DOD accounted for 11 percent of U.S. manufacturing output and employed almost 4.3 million people.

In January 1987, *Aviation Week and Space Technology* reported that lack of an effective quality control program within the DOD industrial base, wasted 10-30 percent of the DOD weapons budget, as much as $10-30 billion annually! In 1987, the Defense Logistics Agency (DLA) found 79 percent of major contractors received "unacceptable" ratings for their quality control and prevention systems. This is not entirely the contractor's fault. The DOD forgot its use of statistical methods and quality control that greatly assisted the industrial effort during World War II.

These methods were considered so critical, that they remained classified as military secrets by the Allies until after the war. Following WWII and despite the warnings of men like W. Edwards Deming and Homer Sarahson, mass inspection became the common technique of ensuring quality in a product. Prevention philosophy thus gave way to acceptable quality levels (AQLs) and end item sampling, which was a contractual obligation of MIL STD-105 ("Sampling Procedures and Tables for Inspection by Attributes").

Before the early 1980s, the DOD materiel acquisition process focused on weapons system performance, with costs and scheduling sometimes neglected. Key system fielding

Product and process quality are absolutely imperative to maximize scarce resources and to produce quality, reliable, and effective equipment, which will save lives during the Army's numerous missions.



The design and development phase is crucial to controlling system costs because most of the life cycle costs occur when concurrent engineering offers the greatest assistance.

decisions often did not emphasize industrial processes of design, manufacturing, and transition from the drawing board to the production floor. Concurrent engineering was virtually nonexistent. Insufficient initial phase funding often resulted in cutting corners in the design process, leading to after-production engineering design changes and driving up the cost of the weapon system to the taxpayer.

The correct definition of quality includes conformance to correctly defined requirements that satisfy user needs. This includes the absence of manufacturing defects and meeting or exceeding all performance criteria for reliability and maintainability. However, for the military, cost can not be the only consideration. If a rifle, munitions, radar, or other item does not perform to standards, it could impact military readiness and ultimately cost lives. Six sigma performance (3.4 defects per million) means a lot when a plant produces several million rounds of ammunition or packages of Meals-Ready-to-Eat.

In-Plant Evaluation

The critical component of the TQM implementation strategy was the In-Plant Quality Evaluation System (IQUE). IQUE is implemented by government quality assurance representatives (QARs) through Defense Plant Representative Offices (DPRO). The DPRO is the customer representative for the government and ensures that only quality products are accepted.

The DPRO collocates with the civilian company and is responsible for ensuring compliance with the contract's terms and specifications, and assisting the contractor and program management personnel. The DPRO office has work sections with responsibility for contracts, engineering, and quality assurance.

Each section contributes to the IQUE system. The goals of IQUE are: customer satisfaction, continuous improvement, improved product quality and performance, and reduction of overall costs. The QARs use statistical analysis, review of contractor systems and processes, product audits, teamwork, and many other TQM principles and tools.

Quality Improvement Strategies

Statistical process control procedures are imperative to lowering costs and being competitive. The contractor and the QAR work together to discover out of control processes and determine methods to reduce variance. Previously, the contracting company was responsible for identifying deficiencies and ensuring improper materials or products did not get shipped to the government. Upon delivery, the military would conduct acceptance sampling, based on specified AQLs. Any deficient products were shipped back to the producer.

The QAR now concentrates on correcting problems at the source, working in conjunction with contractors during the design and manufacturing stages. Only if a process is found to be outside of statistical tolerances are product audits conducted. The focus is on prevention, not mass inspection. The contractor ultimately saves money when adapting the prevention strategy and can invest the savings in other areas.

Automatic machine inspection, used for specific mass-produced items, is also extremely reliable, thus reducing inspection variation and increasing product quality. Automatic sampling size varies with the number of rejects encountered under Sampling Plan CSP-T in Mil-STD-1235.

The larger the number of rejects found, the greater percentage of each lot is inspected until the problem is identified and the process brought under control. This type of inspection system and equipment upgrade proved extremely successful at the Mississippi Army Munitions Plant with the manufacture and inspection of hand grenades.

Automatic machine 100 percent inspection increased the safety and quality of the product shipped to the Army and saved the contractor $798,720 annually in rework and scrap costs. Minimizing costs from rework ultimately lowers the price to the government.

Continuous process improvement became important. "If it ain't broke, how can we make it better" is the guideline QARs operate under. Other strategies used in TQM are: user focus, concurrent engineering, just-in-time inventory management, top down implementation, communication across departments, quality function deployment, teamwork, failure mode effect and criticality analysis, statistical process control, re-engineering, and cross functional skill building.

Design development and concurrent engineering are essential for minimizing costs. Decisions made early in the development process, fix the majority of the life cycle costs. The "80/20 rule" describes this outcome, since 80 percent of the life cycle costs are usually locked in after only 20 percent of the development time. The accompanying figure depicts the 80/20 cost curve.

The technique of "basketing," which is procurement of similar items grouped into a single multi-year contract, offers flexibility and security to civilian contractors and provides the military with lower life cycle costs.

Contractors must go through on-site validation to make the DOD qualified manufacturing list. DOD IQUE teams work with private industry to develop quality management plans and then assess its effectiveness through a Baldridge Award-style analysis. Teams review actual signs of improvement, such as yield charts and cycle times, providing reliability indicators of manufacturing process reliability.

Data collection is highly stressed. For

example, the Defense Logistics Agency found in 1985 that 155 of 663 (23 percent) major MIL-A-9858A suppliers had no program for collecting and analyzing costs of scrap, rework, and repair. Pareto analysis in 1987 revealed that 40 percent of Air Force nonconformance costs came from equipment failures. As a result of the emergence of TQM, organizations began using failure cost data as an analytical tool for measuring reliability and in determining optimum preventive maintenance schedules.

Contractor Incentives

Numerous methods and incentives exist within the IQUE to enhance product quality. QARS now require contractors to specifically identify the changes to correct out of control processes. By being specific, the QARS ensure that the contractor clearly understands the problem before making any adjustments. The government now works as a member of the industry team to help improve efficiency, rather than as an inspection "policeman."

Request for Proposals (RFP), which specify product standards were once exclusively written by the government. Now the DOD builds quality up front by writing the RFP in conjunction with industry and utilizing the philosophy of concurrent engineering. The DOD eliminated unnecessary military specifications and standards that did not add any value to the final product. In several areas, commercial specifications are similar to or higher than the military's. When specifying unnecessary specifications, the DOD pays the additional cost of contractor retooling. By involving the manufacturer up front, design changes and related costs decrease in the long run.

Establishment of the Exemplary Facilities Program was designed to favor contractors who produce quality parts. Past performance, including quality, cost, and delivery play an important part in awarding contracts. Gone are the days (and the joke) of the sole criteria being the lowest bidder within generalized standards. A company receives a no-award recommendation if it fails to have a quality management system, has a history of product problems, or late deliveries. Due to the specialized nature of the defense industry, this can not always happen. The recent problems with the C-17 cargo plane illustrate difficulties in procurement with a single manufacturer.

In the past, government officials even proposed relating product quality to the contractor's profit margin. The intent of the Industrial Modernization Improvement Plan (IMIP) was to improve quality and reduce overall weapon system costs. The program allowed industry to take advantage of advance manufacturing technologies, many of which apply in critical areas such as microelectronics and advanced materials. The program guaranteed contractors a higher internal rate of return if they invested in manufacturing technology improvements and received bonuses based upon the amount of money saved through implementation of new processes.

M-1 tank engine production costs dropped at the Stratford Army Engine Plant as a result of IMIP. Unfortunately, the program was canceled in September 1992.

Quality can not be tested into a product—it must be designed. In today's environment of re-engineering, the initiatives of total quality management must be kept in place.

Key Events

Since the DOD's decision to adopt the TQM philosophy in 1988, several significant milestones occurred. In May 1988, W. Edwards Deming spoke to 500 top military officers and established a DOD senior executive TQM training course. Top industry executives and quality experts, such as Robert Galvin and Joseph M. Juran, assisted the military in its procurement quality program. Also available to the DOD are the resources of the Federal Quality Institute and the Defense Systems Management College.

The Presidential Award for Quality and Productivity, established in 1989, recognizes government organizations that achieve quality excellence. The award mirrors the private sector's Baldridge Award and applies to manufacturing and management organizations.

The Defense Science Board developed "critical path templates" for engineering and manufacturing processes. These templates describe key lessons learned on improving quality and productivity, areas of risk, and proven practices to reduce design and manufacturing problems.

Summary

A great challenge exists in equipping and maintaining a technically superior military in the face of reduced budgets and resources. The industrial base will get even smaller, but the DOD must continue to receive reliable, quality designed and produced equipment. Quality can not be tested into a product—it must be designed. In today's environment of re-engineering, the initiatives of total quality management must be kept in place.

By adhering to the TQM techniques and processes, the fiscal challenge can be overcome. The military's commitment and following of TQM philosophies, in concert with the defense contractor, will continue to translate quality goals into reality.

CPT JIM NAGEL is the infantry technology manager in the Human Engineering Directorate of the Army Research Laboratory, Aberdeen Proving Ground, MD. He has a B.S. degree in engineering from the United States Military Academy and an M.S.E. degree in industrial engineering and systems management from Arizona State University. An infantry officer and member of the Army Acquisition Corps, he has served in the 7th ID(L), the 9th ID, and the 199th Infantry Brigade.

ROBOTIC FILAMENT WINDING COMPOSITES MANUFACTURING

By Diane S. Kukich

Introduction

Composite materials offer a number of advantages for Army applications, including light weight, durability, high strength, and corrosion resistance. Researchers at the University of Delaware Center for Composite Materials (UD-CCM) are investigating a variety of composites manufacturing processes under the Center's Army Research Office/University Research Initiative (ARO/URI) Program. With the ARO/URI Program supporting the development of fundamental knowledge and technology transfer on these processes, UD-CCM is collaborating with a number of Army laboratories in the application of these findings to Army needs.

The robotic filament-winding and tape-placement processes, for example, are potentially applicable to the fabrication of components for ground vehicles, missiles, and rockets. These processes offer such advantages as automation, low capital and tooling costs, a high degree of repeatability; and the capability to build large structures.

Originally used only for thermoset materials (which are formed by irreversible chemical reactions, or cross-linking), filament winding is now being adapted to thermoplastic composites, which can be repeatedly melted and solidified. Thermoplastics eliminate the need for costly and technically complicated autoclave and/or oven cure, and they are more damage tolerant than thermosets. They also offer the potential for real-time inspection and repair to make composites more affordable for Army applications. In general, however, the technologies for processing them are less mature than those for thermoset materials. UD-CCM researchers are attempting to reduce that lag in the technology.

The Filament Winding Process

Classical filament winding for thermoset materials involves drawing fibers through a resin impregnation bath, winding them around a mandrel of the desired shape, curing the part in an autoclave, and then removing the finished part from the mandrel after cooling. However, two inherent limitations in thermoset winding—one related to the positioning of the fibers, the other to the mandrel geometry—motivated researchers at CCM to develop a technique and equipment to wind thermoplastics.

First, thermoset winding requires the fibers to follow the geodesic path, or the shortest distance between two points on a given mandrel surface. If an attempt is made to deviate from this path, the fibers will "slip;" thus, the positioning of fibers on geometries with changing diameter is limited, and the mandrel design is restricted to convex curvatures. In addition, traditional filament-winding machines are unable to wind mandrels with multiple axes of rotation, such as T-sections, so designs are generally limited to simple conical and cylindrical shapes.

Robotic thermoplastic filament winding offers solutions to both of these limitations. Thermoplastics can be consolidated on-line during winding, allowing the designer to deviate drastically from the geodesic path. Concave mandrel sections can be mastered by "welding" the new material to the mandrel or the already-consolidated substrate. And a multi-asix robot manipulator allows for great flexibility in placing the "pay-out eye" of the fiber delivery system, which means that fibers can be placed along arbitrary shapes with multiple axes of rotation.

Development of a Prototype Winding Head

Led by Assistant Director Karl V. Steiner, development of a robotic thermoplastic winding head at the Center began in 1990. A prototype head based on a hot-gas torch system was designed and constructed at UD-CCM and then used to make a variety of complex-geometry demonstration components from glass/polypropylene "prepegs" (fibers that have been pre-impregnated with a matrix resin to form a composite).

With the goal of process optimization, the researchers examined such critical parameters as consolidation pressure, temperature, and winding speed. Initially, a large number of rings were wound while the processing parameters were varied. Microscopic analysis and mechanical tests were then performed to evaluate the specimens and determine the optimized parameters. The findings of the experimental program were used in the design and construction of the next-generation head, which took the technology from filament winding to tape placement.

Tape Placement Head Development

The primary difference between the two processes is that filament winding is continuous,

while tape placement features cutting and restarting capabilities. UD-CCM's most recently designed and constructed head operates at higher speeds, can process higher-temperature composites like graphite/PEKK, and features a cut-and-restart mechanism. The latter capability enables near-net-shape manufacturing and more-varied orientation of the fibers than possible with a filament winding head.

One additional challenge with on-line consolidation of thermoplastics is the constant presence of a heat source, which can degrade the material—the hot-gas torches used to heat the tape cannot be shut down instantaneously, and they are too heavy to be moved back and forth easily. To alleviate this problem, the UD-CCM team developed an adjustable hot gas torch nozzle for rapid heating control, for which a patent application has been filed.

Process Optimization

This redesigned tape-placement head is now used at the center as a testbed for verification of advanced on-line process-control models and simulations under the direction of Associate Director John W. Gillespie Jr.

In the thermoplastic tape-placement process, incoming tape is laid down on a substrate—previously laid down material on a base plate or mandrel. The freshly laid tape is heated and then consolidated under a roller. UD-CCM has developed a set of process models for the five primary phenomena that occur during this process:

- heat transfer, which takes place throughout the process and is the dominant mechanism;
- polymer degradation, which is a cumulative effect of exposing the polymer matrix to high temperatures during the process;
- intimate contact, which refers to the removal of voids between layers;
- healing, which indicates molecular diffusion across the interface between layers (in other words, the formation of a bond); and
- consolidation/squeeze flow, a mechanism by which voids between the layers are expelled by pressure.

Models provide an understanding of the physics and chemistry involved in a process and explain the relationship between dependent and independent variables. They can help in answering "what-if" questions—for example, "What happens if we raise the temperature of the hot-gas torches?" or "What will be the effect of decreasing the pressure of the consolidation rollers?"

Models can also reduce the number of experiments that need to be conducted (or the number of production trials to be run) by identifying an optimum "process window"—i.e., the time, temperature, and pressure values that will most efficiently and cost-effectively yield the best product. Definition of the process window requires a delicate balance among these values. If the temperature is too low, for example, the material will not melt sufficiently for intimate contact to occur. On the other hand, if it is too high, the polymer will degrade or even burn. The same is true of the other critical parameters, pressure and time.

Models provide an understanding of the physics and chemistry involved in a process and explain the relationship between dependent and independent variables.

The UD-CCM researchers have used the process models developed for the five dominant tape-placement phenomena described above as the basis for a real-time process simulator. The user can interactively explore the process bounds by varying the control parameters and observing the model outputs without conducting actual experiments. The models currently serve as "soft sensors" for the computer-based simulator, but the ultimate goal is to replace them with non-intrusive sensors (ultrasonic devices, fiber optics, etc.) for on-line feedback and control of the process.

Once process models are developed, they need to be verified through experimentation and then refined. For example, if it is discovered that the tape laydown velocity "recommended" by the model is too rapid to remove voids and enable production of high-quality parts, the model will be revised accordingly. Experiments conducted thus far are in good overall agreement with the models. In some cases, the results have suggested the need for modifications to either the process or the hardware. For example, to produce a better quality part at higher velocities, which will also lower manufacturing costs, recently completed experiments show that it may be necessary to improve the mechanical performance of the workcell by stiffening the connection between the robot manipulator and the head.

Future Work

UD-CCM researchers will continue to validate and refine the process models as input to the simulation. Concurrently, they will identify and test potential non-intrusive sensors for the tape-placement process as well as for other composites manufacturing methods under investigation in the center's Composites Manufacturing Science Laboratory.

Finally, applications will be sought for the technology so that it can be transferred to the commercial and military markets. Currently, the U.S. Army plans to use the tape-placement technology for its Composite Armored Vehicle-Advanced Technology Demonstrator (CAV-ATD) Program, which is aimed at demonstrating improved combat effectiveness through integration of advanced technologies (i.e., lightweight structure, signature management, and lightweight armor). Advanced composites will be used extensively on the CAV-ATD, with a minimum of 33 percent weight reduction required.

Thermoplastic structures also offer the potential to improve the durability and damage tolerance of helicopter fuselages/tailcone structures. Plans are underway to introduce the tape-placement technology to the Army's aviation sector, with the intent of inserting thermoplastic structures on the RAH-66 Comanche through an engineering change. The center's close ties to the Army through the ARO/URI program and direct links to Army labs will contribute to the effective transfer of these technologies to end users.

For more information about the fiber placement research at the Center for Composite Materials, contact Karl C. Steiner at (302)831-6703 or John W. Gillespie Jr. at (302)831-8702. Both can be reached by fax at (302)831-8525 or in writing at 201 Composites Manufacturing Science Lab, University of Delaware, Newark, DE 19716.

DIANE S. KUKICH is editor at the Center for Composite Materials at the University of Delaware.

THE FUTURE SOLDIER SYSTEM: AN ENERGY PERSPECTIVE

By Dr. Robert J. Bunker

Introduction

The Soldier Integrated Protective Ensemble (SIPE) Advanced Technology Demonstration (ATD) has proven to be an ambitious and farsighted project. It is based on a modular subsystem approach which paves the way toward the development of a head-to-toe integrated fighting system for the dismounted infantry soldier. This system is composed of the soldier and everything worn, consumed and carried for use in a tactical environment. Having successfully proven itself, the SIPE ATD will now transition into follow-on programs which will field and demonstrate soldier system prototypes.

The implications of these SIPE follow-on programs on the conduct of war in the 21st century are staggering. *What is in some ways more significant, however, is the fact that these implications ultimately stem from a proposed future increase in non-lethal energy available to the individual foot soldier on the battlefield.* This is a form of energy increase for the foot soldier which has never before taken place and one that will provide the foundation for the follow-on programs which will help alter the face of war as we now know it.

Individual Soldier Energy

Historically, energy has proven to be the underlying factor which determines the level of technology attained by a society. This technologic sophistication, in turn, influences what form of soldier will be fielded and how war will be conducted. To support this statement, we will view the development of individual soldier energy (ISE) over the course of the last 2,500 years of Western civilization. For analytic purposes, we will say that such energy is the energy available to a soldier system for the requirements of mobility and peripheral functions such as communications, climate control and target acquisition.

The energy needs of the soldier system's weaponry will not be factored into this estimate although it can be assumed that as non-lethal energy needs have increased so have the lethal energy needs required for the functioning of more advanced weaponry. The development of individual soldier energy can be divided into three stages which correspond with the classical, medieval and modern epochs of Western civilization. These are shown in Table 1.

Classical Soldier Energy

Individual soldier energy during the classical epoch was primarily based on human muscle. The Greek hoplite and the Roman legionnaire both relied upon their own power for mobility and the use of such weapons as the pike, javelin and short sword. No form of peripheral functions existed because of the primitive level of technology which characterized this era. In estimating ISE, we can say that a classical foot soldier generated about 0.1 horsepower (hp). This was equivalent to the energy basis of classical society since the prime motive source for the economy was founded on slave energy which also produced 0.1 hp.

Classical cavalry, even though it existed in only limited numbers, should also be taken in consideration because of the great influence it could have on the battlefield. Alexander's Companion cavalry was a devastating force as was Hannibal's Carthaginian

Table 1.0 Individual Soldier Energy (ISE)

	Classical Epoch	Medieval Epoch	Modern Epoch
Individual Soldier Energy (Foot)	Hoplite/Legionnaire 0.1 hp	Non-Existent	Rifleman 0.1 hp
Individual Soldier Energy (Mounted)	Cataphract 0.66 hp	Knight 0.66 to 1.0 hp	Tank Crewmen 10.0 hp to 375.0 hp

cavalry whose performance at Cannae is legendary. Horses in the ancient world were smaller and weaker than the larger medieval breeds. For this reason, a mounted classical cataphract generated about 0.66 hp.

Medieval Soldier Energy

The medieval epoch witnessed individual soldier energy shifting away from the foot soldier and fully over to the mounted soldier. This change in focus was a result of animal energy dominating feudal society. The diffusion of the stirrup to Europe allowed the cavalry a secure platform for shock combat. Wearing heavy armor and wielding a lance and a longsword, this cavalryman developed into the feudal knight who dominated the battlefields of Europe.

The knight rode war horses which, in some cases, had been selectively bred over generations. The amount of energy generated by these war horses therefore differed and thus the energy available to this soldier was at times greater than that available to the mounted classical soldier. Normally, the speedy and agile courser, a common breed like that used in the classical world, can be estimated at 0.66 hp. The stronger breeds, such as the Belgian whose immense size and weight made it the perfect charger would, on the other hand, be able to generate 1.0 hp. Even with this increase in individual soldier energy, no peripheral functions existed during this epoch for the soldier system beyond mobility due to the low level of technology. The energy generated was equivalent to the energy utilized by the mature medieval economy which was organized around manoralism. The prime motive source of that economy was initially the ox which only generated about 0.5 hp. Later, the horse was used, generating from 0.66 to 1.0 hp as it became plentiful enough for pursuits other than waging war.

During a long span of the medieval epoch, the infantry—for all practical purposes—did not exist on the battlefield. These troops were no longer even considered soldiers, a distinction belonging now solely to knights. This was made possible because the castle had replaced the infantryman as the rallying point for cavalry and provided a refuge which was invulnerable to conventional attack.

Modern Soldier Energy

The foundations of individual soldier energy have been greatly altered during the modern epoch although this has only taken place during the last century of our era. This is because the modern world has witnessed the rise of two distinct periods of mechanical energy dominance. The initial period was based on wind and water machines which generated somewhere between 5.0 and 15.0 hp. During that period of Western civilization, great advances were made in the lethality of the soldier system although no progress was made in ISE.

The age of mercenaries and the age of limited warfare which existed in the wind and water machine period witnessed the reassertion of infantry on the battlefield and the organization of the economy around mercantilism. This was initially made possible because many attributes of classical warfare such as pike formations were resurrected. These events were ultimately overshadowed by advances in gunpowder based small arms and siege artillery. Siege artillery blasted the knight from his no longer impregnable castle. Small arms such as the arquebus, later musket, cleared the knight from the battlefield and eventually promoted the rise of linear formations of foot soldiers for its proper fielding.

The later energy period was founded on steam and then internal combustion engines and the economy was based on capitalism. These engines generated a low of about 75.0 hp for a Newcomen engine on upward to beyond 500.0 hp for a steam turbine and into the thousands of horsepower for gas turbines. Advanced, large scale turbines, in turn, generated tens and hundreds of thousands of horsepower. Late 18th and 19th century warfare issued in by Napoleonic France saw the rise of weapon lethality based on field artillery and, later, on rifles and early forms of machine guns. Railroads represented an early form of engine based troop transport providing the soldier with strategic mobility, a significant event in itself, but it was not until the First World War that a significant increase in individual soldier energy became apparent.

This increase stemmed from the development of the armored fighting vehicle of which the premier battlefield system is the tank. The tank represents a weapon system which ultimately provided enhanced mobility and full peripheral capabilities such as target imaging and ranging, air filtration and communications. Early tanks such as the French St. Chamond and British Mark IV generated between 90.0 and 105.0 hp respectively. A World War II Sherman generated 450.0 hp, a more modern M60 750.0 hp and a state-of-the-art M1 1500.0 hp. These horsepower ratings while impressive must be adjusted by dividing the horsepower generated by the size of the tank crew for determining individual soldier energy estimates. This has been done in Table 2 and yields ISE figures ranging from 10.0 hp to 375.0 hp

What is glaringly absent during the modern era is an increase in individual soldier energy for foot soldiers. These troops, while armed with semi-automatic and automatic weapons, when dismounted differ little from the classical soldier in terms of their mobility and peripheral capacity because they still only generate 0.1 hp on the battlefield. Only a select few individuals carry communication gear while climate control and target acquisition options for the foot soldier are basically non-existent. The reason for this is because internal combustion engines and turbines, our modern principle generators of energy, are too large to benefit individual foot soldiers.

Future Soldier Energy

For the future soldier system to become a reality, advanced forms of energy generation are required. A solution to this dilemma is now on the horizon because the basis of individual soldier energy is once again

Table 2.0 Modern Individual Soldier Energy (Mounted)

Tank	hp	Crew Size	ISE
St. Chamond	90	9	10
Mark IV	105	8	13
Sherman	450	5	90
M60	750	4	187.5
M1	1500	4	375

Table 3.0 Parametric Model Scenarios

Scenario	Year	Average Power	Peak Power	Total Power
1	1994	0.074 hp (55 Watts)	0.168 hp (125 Watts)	1.777 hp (1325 Watts)
2	1998	0.322 hp (240 Watts)	0.503 hp (375 Watts)	3.218 hp (2400 Watts)

1 Watt = .001341 Horsepower (hp)

radically changing. Seven candidate power sources based on either high technology batteries, engines, radioisotope, or fuel cells were outlined in "A Parametric Model for Soldier Individual Power" by Dugas, Nawrocki, and Raskovich, published in the July-August 1993 issue of *Army RD&A Bulletin*.

This article also outlined two mission scenarios which portrayed soldier system power requirements. These parametric model scenarios, as shown in Table 3, portray part of the first step toward an increase in energy available to the individual foot soldier. While the projected 0.074 hp average mission power requirement in the 1994 scenario and the projected 0.322 hp average mission power requirement in the 1998 scenario appear trivial compared to an M1 tank crewmen ISE figure of 375.0 hp, they are not. The 1994 scenario represents a 74 percent increase in ISE output for the modern foot soldier while the 1998 scenario represents a 322 percent ISE increase.

Another factor to consider is that initial tank ISE increases were minimal compared to later developments because it takes time to work out new technology. These parametric model scenarios, while portraying early soldier system energy requirements based on advanced power source potentials in their infancy, already represent immense future thresholds of energy availabile to the foot soldier.

We have witnessed that historically, during the classical, medieval, and modern epochs, the energy available to society determines what form of soldier will be fielded on the battlefield.

Summary

We have witnessed that historically, during the classical, medieval, and modern epochs, the energy available to society determines what form of soldier will be fielded on the battlefield. In the past, this process has benefited both the mounted and the foot soldier in the area of weapon lethality. In the region of non-lethal energy availability, which is the major focus of this article, this process has only benefited the mounted soldier whose ISE generation has increased from 0.66 hp to 375.0 hp while the foot soldier's ISE output has remained since the dawn of classical civilization at 0.1 hp.

With the advent of the future soldier system, we are at the threshold of a new era; an era which will see for the first time in history a non-lethal energy increase for the foot soldier since initial model projections call for an increase in foot soldier ISE by 0.074 hp in the 1994 scenario and by 0.322 hp in the 1998 scenario. It is no coincidence that this event will be taking place soon. The increasing amount of references made by military and academic scholars to post-modern warfare and urban terrorist warfare point toward a shift in not only the foundations of individual soldier energy but also, in turn, in the energy foundations of Western civilization.

This is a shift whose significance cannot be overlooked because it provides the energy basis for SIPE follow-on programs. These programs will contribute to the transformation of war in the 21st century and will set the stage for an eventual increase in individual soldier lethality based on beam weaponry.

DR. ROBERT J. BUNKER is an adjunct associate professor with American Military University. His graduate-level course on the Energy Foundations of War encompasses 2,500 years of weapon system development from the Greek hoplite to the future soldier system. He holds a B.A. in history, B.A. in behavioral science, B.S. in social science and B.S. in anthropology/geography from California State polytechnic University, Pomona and an M.A. in government and a Ph.D. in political science from the Center for Politics and Economics at the Claremont Graduate School.

The Intelligent Fault Locator has been developed "by the soldier, for the soldier" for trouble-shooting all of the Apache's systems.

INTELLIGENT FAULT LOCATOR

By SFC T. Chad Morgan

Introduction

The mission of the Army in these ever-changing times remains relatively clear: "Be ready for anything, anywhere, anytime." While this is a very unclear statement when addressing such a complex issue, there are a number of constants that can be drawn from it. Training, logistics, and maintenance are but a few of the absolute essentials in order to have a combat-ready unit. Should one consider the advanced technologies with which modern weapon systems are made, the challenges in maintaining them become self-evident. Many programs are currently underway, in as many organizations, to address these challenges. This article describes one tool that is certain to change the face of aviation maintenance—the Intelligent Fault Locator (IFL).

The AH-64A Apache is a very sophisticated, deadly, combat proven weapons platform. Maintenance of the complex systems aboard this aircraft requires a great deal of experience, knowledge, and technical data. During Operations Desert Shield and Desert Storm, the density of civilian contractor support needed to keep the Apache fleet mission ready clearly attests to the validity of this statement.

A Powerful Tool

The Intelligent Fault Locator, under development by the Aviation Applied Technology Directorate (AATD), U.S. Army Aviation and Troop Command at Fort Eustis, VA, is a powerful tool for use in diagnosing malfunctions in the subsystems of the Apache. Diagnosing a particular fault frequently requires substantial amounts of time, a fact that any aviation maintenance officer will attest to. The diagnostic process requires an appreciable amount of search time using numerous technical manuals consisting of thousands of pages, knowledge of sub-component locations on the aircraft, and very often previous experience with a similar malfunction.

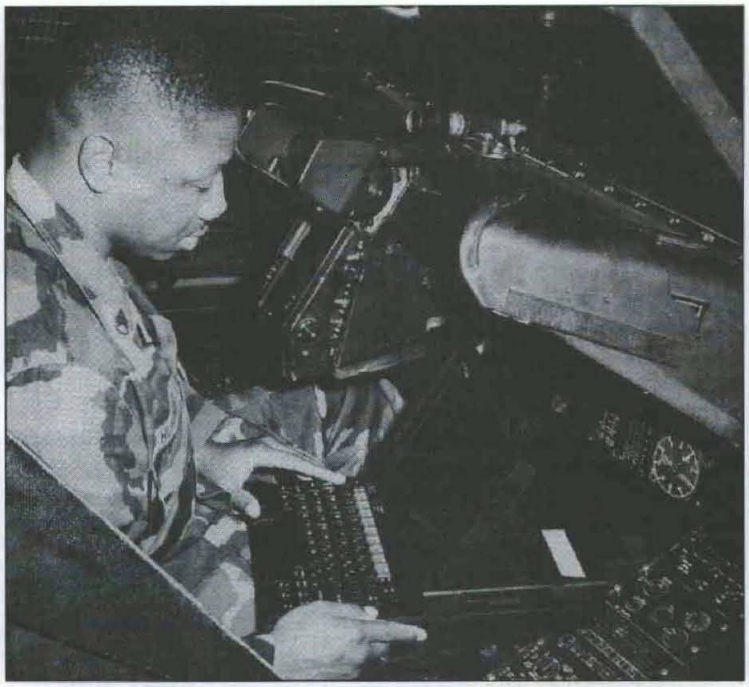
A couple of trips back into the hangar to retrieve a different manual or ask for advice will eat away at precious man hours, which literally translates into money down the drain.

Another way funds are unnecessarily expended on the flight-line is in No Evidence of Failure (NEOF) component replacements. This is usually caused by a lack of experience in reading wiring diagrams but, when an aircraft is desperately needed, component swapping does occur and will devastate a budget by burning up perfectly good components because a faulty wire has not been isolated and repaired.

A Diagnostic Expert

The IFL is a diagnostic expert system housed in a laptop computer and, within its program, are the knowledge, experience, and technical data to solve troubleshooting problems. Six of these computers are in use by soldiers maintaining Apache helicopters at Fort Hood, TX; Fort Campbell, KY; and Fort Bragg, NC; as well as the North Carolina and South Carolina National Guards. (Two IFL units are at Fort Campbell.) These units have been using the IFL since January 1993, which implemented the first subsystems within the knowledge base.

The development concept has, from the program's inception, hinged on use of the expertise of soldier/subject matter experts (SME) and their collective experience with, and knowledge of, the Apache. This method of system development ensures that not only does AATD know what soldiers want and need for flight line diagnostics, but that they



The Intelligent Fault Locator is compact enough to go where it is needed, even into the front cockpit of the Apache.

will understand and, therefore, use the system upon fielding.

Knowledge Base

Building the knowledge base has involved use of soldiers and civilian technicians who have experience with the Apache and its subsystems. Currently available diagnostics, wiring diagrams, and Army maintenance procedures are reviewed by the SME. The SME updates the diagnostics as required and passes on to the Knowledge Engineers (KE) completed flowcharts, which are logically oriented paths for identifying possible subsystem malfunctions. The Knowledge Engineers then insert the procedures into the knowledge base in a computer "shell" program. Periodically, all of the Intelligent Fault Locator computers are updated so that they include the most updated version available. The soldier/user performs the update procedure by following simple instructions using floppy disks they receive from AATD.

Troubleshooting

Once the computer is updated, troubleshooting a subsystem failure on the Apache is as simple as turning on the computer and pressing a few keys. The system was developed with the user in mind from every possible angle. The soldier does not need to be computer literate to use the IFL. Straight-forward menus guide the soldier through a troubleshooting session, offering easy-to-read menus, and asking basic "yes/no" questions when an answer is required by the computer. This is where the IFL is most useful.

Because many of the subsystems on the Apache are interconnected, locating a failure can be very taxing, and time consuming. When a soldier selects a subsystem to troubleshoot, for example the Multiplex Subsystem, the computer provides all data pertinent to that system including all connections with other systems. Should the session lead to a point of interconnection between subsystems, the IFL automatically shifts into the needed diagnostics and continues without diverting the soldier's attention.

If a soldier does not know exactly where a component is located on the aircraft, the IFL is equipped with a "Picture" option. By pressing one key, the soldier is offered component identification and location diagrams. Also included in the Picture option is access to wiring diagrams for every subsystem in the computer. This allows the soldier to visualize the procedure should he or she desire to do so, and provides leaders with an excellent training aid, such as Boresight Alignment Procedure training.

Safety

Safety is imbedded in the IFL. During the troubleshooting session, the IFL provides all applicable cautions and warnings. In every case possible, the screen presentation resembles the format that soldiers are accustomed to seeing in their technical manuals, not only concerning safety, but throughout the IFL.

Extensive review of existing maintenance practices has led to trouble-shooting logic that reduces the need for so-called "shotgun maintenance," the arbitrary replacement of components to "see if this fixes it." Reduction of No Evidence of Failure replacements will not only save money, but also will increase repair parts availability. Should the soldier desire to make a suggestion for improving the IFL, a menu option, "Notepad," allows him or her to type in comments, which will be reviewed and, if accepted, implemented in future updates.

Additionally, the IFL records each keystroke made while in use. The information gained by review of this file can be used to verify notepad suggestions, generate report data such as trouble-shooting time and trend analysis. The soldier is not required to take any action for the "Logfile" operation to function. Periodic downloads provide AATD personnel with "Notepad" and "Logfile" data.

The menu options appear at all times that they are available. Whenever an option is not available for use, it does not appear on the computer screen, thus reducing user confusion. Other options available include: "How," "Why," "Help" and "Restart." This system operates curretly in an MS-DOS environment, allowing for possible interaction with other systems at some point in the future, such as electronic technical manuals. The IFL is capable of operating in UNIX as well.

Conclusion

Once fielded, the Intelligent Fault Locator will provide the soldier on the flight line with an invaluable diagnostic aid. With the experience of senior maintainers embedded in the procedures, junior maintenance personnel will certainly benefit, as will the unit. By capturing the expertise of all of the professional, very capable, maintainers in this era of force size reductions, the Army will benefit through reductions in maintenance costs and increased aircraft availability.

SFC T. CHAD MORGAN is an aircraft advanced technologies NCO, an IFL subject matter expert at AATD, and a member of the Army Aviation Association of America.

CAMOUFLAGING THE INDIVIDUAL SOLDIER

Don't Be Seen.
If Seen, Don't Be Hit.
If Hit, Don't Be Incapacitated.
If Incapacitated, Get Well Fast.

—A Soldier's Credo

By Dr. Richard G. Quynn

Introduction

The first line of this credo, "Don't Be Seen" is supported by camouflaging the individual soldier. If soldiers cannot be seen, they cannot be targets. Camouflaging the soldier is the responsibility of the U.S. Army Natick Research, Development and Engineering Center (Natick). Camouflage comprises one portion, a major portion, of Natick's mission to provide the best possible protection for each U.S. serviceman and woman, thereby assuring his or her survival in combat.

At one time, the only enemy sensor combat soldiers had to fear was the human eye. Nowadays, they can also be "seen" by image intensifiers, thermal imagers, and ground-based radar, as well as "heard" by acoustic sensors, and therefore, must be protected from detection by these and other high-tech sensors.

Electromagnetic Spectrum

The day is long since past when camouflage was purely a matter of blending with the background in the visible spectrum. At present, other parts of the electromagnetic spectrum besides the visible are being used in detection devices, as indicated in Figure 1. This figure shows the relevant portions of the electromagnetic spectrum and indicates the wavelengths at which the various sensors operate. For example, thermal image detectors operate over the mid-infrared band of 3 to 5 microns (micrometers) and far-infrared band of 8 to 12 microns in wavelength. These are the two "windows" of the infrared spectrum in which there is no atmospheric interference from such things as water vapor or carbon dioxide. Some research instruments utilize both bands, but most current imagers which concern the individual soldier utilize the 8 to 12 micron band with new lightweight, uncooled individual weapon sights being developed based on mid-infrared band focal-plane scanning arrays.

Radar devices typically operate at wavelengths of approximately 1 to 3 millimeters and longer. Modern camouflage activity involves a multi-disciplinary science consisting of color science, textile technology, vision physiology, cognition psychology, physics and chemistry.

The human eye is still the most common detector of the soldier found on the battlefield. The Woodland Battledress

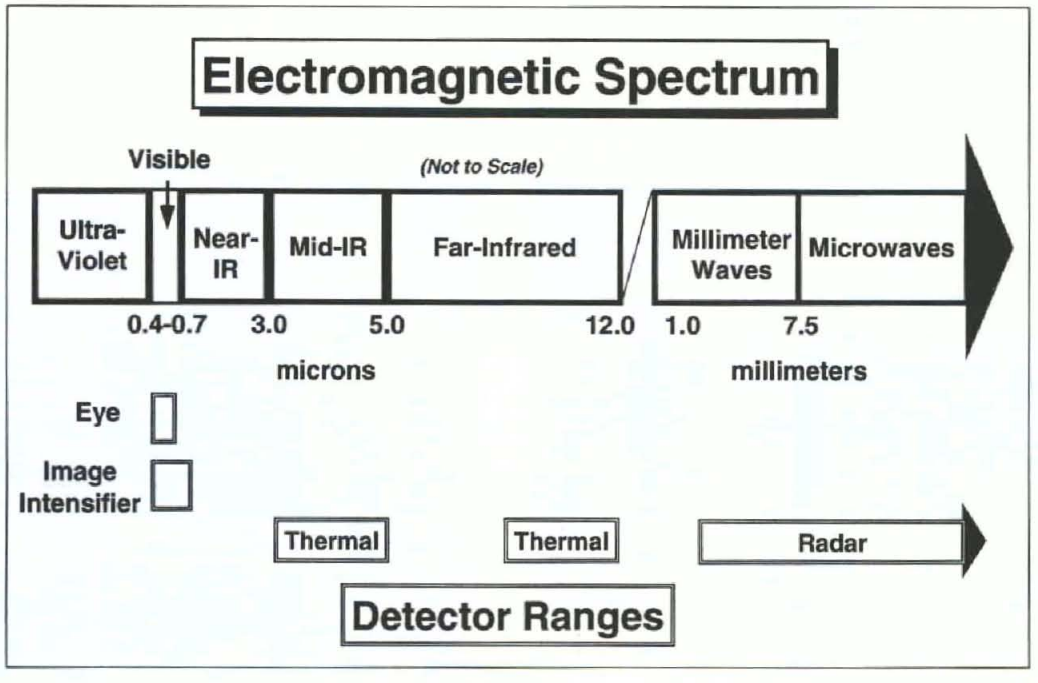


Figure 1.

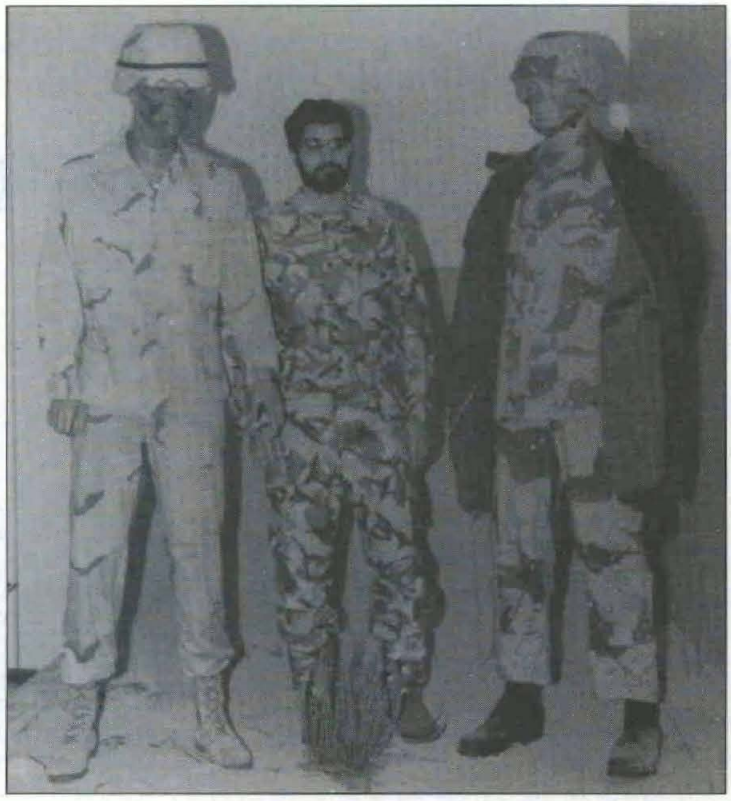


Figure 2.

Uniform and Desert Battledress Uniform are designed to break up the soldier's outline and make him or her less visible to the human eye, as well as to near-infrared night vision devices. These Battledress Uniforms are "disruptive" patterned garments that have replaced the older solid color or monotone uniforms.

Woodland Pattern

The color mix in the Woodland pattern was designed so that as the observation distance increases, all the colors blend into one solid green (Camouflage Green 483). In the Woodland Battledress Uniform, the dark green simulates grass and bushes, light green the undersides of leaves and glossy leaves, brown tree trunks, and black shadows.

The current Woodland Battledress Uniform shows less contrast with the background than some older uniforms, making the wearer more difficult to detect. This reduced contrast is achieved by requiring that the optical reflectance of the Woodland colors at several near- infrared wavelengths fall within certain specified ranges, thus matching the background elements. In order to meet these requirements, the dyestuffs or pastes used to print the uniform must be chosen carefully. Textile color specifications are updated whenever a significantly changed image-intensifier is fielded.

Other Patterns

Figure 2 depicts two mannequins and one volunteer in Natick's camouflage evaluation facility against a typical desert background. This facility allows rapid screening of candidate uniforms and lessens the dependence of researchers on the outside conditions as well as reducing logistical barriers. The mannequin on the right is wearing the older (six-color) Desert Battledress Uniform and a night grid parka, originally designed to provide nighttime protection from observation by the earliest image-intensifier devices (called Sniperscopes—seldom encountered now with the proliferation of modern thermal based sensors). The mannequin on the left is wearing the newer, Natick designed, three-color desert uniform. The bearded volunteer is wearing an Iraqi uniform purchased from the United Kingdom.

Figure 3 shows another pattern under development at Natick. The four soldiers in Figure 3 are wearing different snow camouflage uniforms. During limited testing in Alaska, all four were judged effective in one or more of the backgrounds investigated.

The principle objective of all camouflage is to make the target (in this case the individual soldier) blend into the background. The camoufleur must attempt to reduce the contrast between the target and its background, regardless of the type of sensor. Anyone who has ever hunted knows that one must remain motionless and perhaps wear a "ghillie" suit (a camouflage covering which has attached various natural and/or man-made garnishes to simulate the surrounding vegetation in

Figure 3.

Figure 4.

order to resemble the background).

Thermal Imagers

Thermal imagers are rapidly becoming a serious detection threat to the dismounted soldier and have become the recent focus of camouflage research efforts at Natick. Thermal imagers have long been used in aircraft (so-called Forward Looking Infrared or FLIR devices). Research instruments and vehicle or aircraft mounted versions are usually cooled to very low temperatures, but new uncooled lightweight devices for attachment to rifles are being produced.

Previously used only on tanks and aircraft, thermal imagers have also declined in price, making it practical to provide one to every infantry squad, if not to every soldier. A typical detector material for a thermal sensor is mercury cadmium telluride, but other materials and more advanced systems based on focal-plane arrays are being developed. Figures 4 and 5 (taken during daylight) show a comparison between what is seen by the human eye and what is "seen" by a thermal imager, this newer and more sophisticated surveillance device. The thermal imager differs from the older image-intensifier in that it operates on emitted light in the form of heat energy.

The thermal imager works just as well during daytime as at night, is capable of defeating daytime (visible) camouflage, and can "see" targets obscured by smoke, fog, etc. better than other devices. In Figure 4, three visually camouflaged soldiers are hiding behind bushes and are almost undetectable by the unaided eye. They are easily picked out by the thermal imager in Figure 5. Other heat sources like tanks, trucks not fully cooled down, tents with heaters inside, etc., can also be detected day or night. The major principle of thermal camouflage is to have the target behave in the same way as the background.

There are three ways that have been considered to provide thermal camouflage:

• **Actually cooling the target.** This approach is very often not possible or practical given weight and bulk constraints, especially for a uniform. Cooling has been tried on an experimental basis for uniforms and tents, so far without much success. It requires some kind of power source and circulation device that does not itself exhibit a thermal signature.

• **Changing the emissivity of the target.** This well known method works quite well. It is most suitable for metallic surfaces and therefore, has been used on tanks, trucks, etc. A face paint containing metallic particles is under development at Natick to reduce the emissivity or apparent temperature of the face and hands. With the particular metal tried so far, and its shape, the emissivity of the skin could not be lowered as far as desired. Other materials for face paints are being investigated because metallic particles create an objectionable "glint." Similar technology is being considered for the uniform as well.

Figure 5.

• **"Patchwork" emissivity schemes.** Thermal ghillie suits have been developed. They consist of a net-like covering to which are attached long strips of fabrics, the emissivity of which differs one from the next. The "scrambling" or distorting of the thermal image with this method works well. Although the target is not hidden, the enemy is deprived of knowledge of its identity and therefore, of the value of the target acquired.

Scientists at Natick are trying to extend soldier camouflage protection to the mid- and far-infrared in the same way that the Woodland and Desert uniforms protect from detection by sensors in the visible and near-infrared portions of the spectrum, without the requirement for a separate ghillie suit.

Radar devices operate in the radio frequency and higher frequency portion of the electromagnetic spectrum. Again, the intent is to ensure that the target reacts to the radar wave in the same way that the background does. Radar poses a threat to installations like Army command posts that employ tents and tactical shelters, and is a less likely battlefield threat to the ground soldier but can be important to individual soldiers during clandestine airdrop operations.

Since camouflage is desired to be an integral part of the individual soldier's normal uniform, the camouflage method should meet typical military textile requirements for color fastness, durability, breathability, stiffness, etc. These additional requirements make camouflaging of the soldier different from, and in some ways more difficult than, the camouflaging of inanimate objects such as vehicles, because of these added textile constraints.

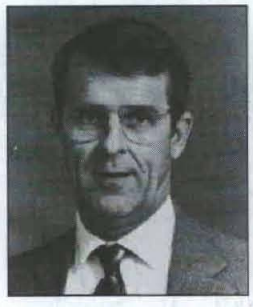
Other Research

Some other soldier camouflage research being investigated at Natick are "adaptive" camouflage (materials that can change color to match the background), infrared modifiers (materials which when added to traditional dyestuffs or pastes change the near-infrared reflectance properties of the printed fabric), dyestuffs and other materials which will fluoresce in the visible or near-infrared, and wavelength-selective absorbers.

It is clear that camouflage is a sophisticated activity since a very wide range of the electromagnetic spectrum is involved. The countermeasures are likewise becoming more sophisticated, and researchers must keep up-to-date on new sensor technology which could increase the threat to the individual soldier, imaging techniques, and a host of other related scientific advances.

DR. RICHARD G. QUYNN is a research physicist on the Integrated Camouflage Protection Team in the Survivability Directorate at the U.S. Army Natick Research, Development and Engineering Center in Natick, MA. He holds a B.S. degree in physics from the College of William and Mary, an M.S. in textile technology from Institute of Textile Technology, and A.M. and Ph.D. degrees in physics/physical chemistry from Princeton University.

"What Would You Like to Change Relative to the Army Acquisition Corps?"



Robert Morig
Director, U.S. Army Acquisition Executive Support Agency
Fort Belvoir, VA

There has been an enormous amount of effort put forth by the Office of the Director for Acquisition Career Management (DACM) and by PERSCOM in developing the AAC as we see it today. The military side seems to be working well. Accessions, education and training, retention, career progression, and promotion statistics indicate that management of the military AAC members is adequate.

On the civilian side, the management seems to be less orderly. With many of the Defense Acquisition Workforce Improvement Act (DAWIA) requirements kicking in October 1993, concern exists that we are not quite ready to implement what the law requires. The accession process is continuing albeit at a slower pace than the field would like to see. Education and training is taking place with numerous acquisition workforce members attending colleges and universities, as well as professional development seminars. Certifying our workforce members, central referral and central selection, successor positions, etc. are yet to be announced.

From my perspective, the most significant change required is better communication with the field. I try hard to stay informed with what is going on by searching out those in positions to know. And I understand that progress is slow when it comes to establishing acquisition workforce policy and procedures. But I would like to see an automated network that we could all query to find out the latest. PERSCOM has a bulletin board that is accessible but it provides information specifically related to a current issue. I would like to see a network or bulletin board be divided into a number of relevant subsections that are continuously updated by the appropriate DACM and PERSCOM offices as the information changes. Then the burden of staying informed would be on me, and I would stop looking to someone else to keep me informed.

With relevant information available to the acquisition workforce, members could chart their own course and be knowledgeable of the direction they are taking. Our bottom line is to become a more professional acquisition workforce that is better able to provide worldclass equipment to our great soldiers in the field in time to meet their needs.

Andrea Garcia
Professor, Systems Acquisition Management
Defense Systems Management College
Fort Belvoir, VA

If I could change one thing about the Army Acquisition Corps, I would like to see civilian members of the Army Acquisition Corps (AAC) become equal partners with their military counterparts.

More than two thirds of AAC members are civilians, but military AAC members have historically enjoyed much greater opportunities for education, training and advancement. For one thing, management of the AAC has always been under military control. The director for acquisition career management is a three-star general, and within the Total Army Personnel Command (PERSCOM), the Army Acquisition Corps Management Office falls under the *Officer* Personnel Management Directorate. While our military leadership is well versed in the management of soldiers, they have limited insight or experience in civilian personnel matters.

Opportunities for advancement are not equal. The preponderance of Army program managers are military: 162 out of 195 PMs wear a uniform. That is not surprising; the final decision as to whether a PM position is filled by an officer or a civilian is made by the *General Officer* Steering Committee, composed of six generals and one civilian. In addition, AAC officers are automatically assigned every few years to new positions with increasing challenge and responsibility throughout their careers. AAC civilians do not even have the benefit of a centralized job referral system, despite the fact that we filled out applications for such a system over three years ago.

Opportunities for training are not equal. It literally took an act of Congress to open acquisition training to Army civilians. Although officers routinely attend the eight-week Materiel Acquisition Management Course prior to an acquisition assignment, civilians typically got little or no classroom training in Defense systems acquisition. It was not until passage of the Defense Acquisition Workforce Improvement Act (DAWIA) that significant numbers of civilians have begun to gain access to Defense acquisition courses. In addition, officers at all levels receive leadership, management and specialty training at service schools that remain virtually closed to civilians.

Even the distribution of this magazine reflects a bias against civilians. I have been an AAC member since May 1991, but it was not until June 1994 that I received my first issue. Meanwhile, my colleagues in uniform have been receiving bimonthly *RDA Bulletins* for years. While this may seem trivial, I believe it symbolizes the relative importance of the two components to the Army

military leadership in charge of acquisition career management.

The Army needs both civilian and military professionals to acquire its warfighting systems. Officers provide an operational perspective, while civilians provide continuity and stability. Both deserve an equal chance to develop and apply their skills, knowledge, and abilities if the Army is to attract and retain the best and the brightest of *all* its people in the Acquisition Corps.

Bruno Wengrowski
Chief, Office of Acquisition
Fort Ritchie, MD

For the time in its existence, the AAC has made great strides. To keep the inertia in the program in a positive direction, I suggest two enhancements to the program. First, some of the career programs limit AAC civilian membership to the 14/15 level, since the functional career representative has determined critical positions to be at that level. To create new intake for these career programs, a 13 level candidate pool could be created for those to be postured for full membership. They accede to the AAC, non-competitively, when selected for a critical position. And, as an additional enhancement for females or minorities, establish selected positions at the 13 level, with a 14 target, to create new opportunities. Designate these positions as critical at the 14 level; and, promotion to this level would be without further competition. The employee would be fully qualified, and mobile.

The second suggestion is for the Army to have a Senior Executive Service candidate development pool as part of the AAC program. The Defense Information Systems Agency and National Aeronautical and Space Agency (NASA) have viable programs. The NASA program is well defined. Interested parties are competitively selected by an executive resources board (ERB). Once selected, the individual participates in three core activities: developmental assignments, interagency executive-level training and NASA seminars, which include competency assessments and exposure to new concepts and skills. Once the program is completed, with ERB endorsement, the candidate is certified for a three year period. During this period, the individual can be non-competitively placed in any SES position for which he/she meets technical qualifications.

With the current "rightsizing" of the Army, new career opportunities will continue to emerge. The AAC must continue to be an innovative force to ensure development of our workforce.

Esther Morse
Procurement Analyst
Office of the Assistant Secretary of the Army (Research, Development and Acquisition)
Falls Church, VA

First of all, I would like to highlight some of the positive aspects of the Army Acquisition Corps (AAC) that I have noticed in recent times. The increase in educational opportunities has truly been impressive and beneficial. Establishment of the Army Management Staff College, an intermediate service school, has been instrumental in providing AAC members management and leadership training. We recently received six designated slots at the Industrial College of the Armed Forces (ICAF), one of the senior service colleges which also enhances leadership and managerial skills.

Under the Defense Acquisition Workforce Improvement Act (DAWIA), military personnel are able to strengthen their knowledge and technical skills by taking advantage of educational and training opportunities. The Training With Industry (TWI) Program, for example, provides military personnel opportunities to actually work at a contractor's facility for one year, gaining that valuable industry perspective. This experience enriches their background and enables them to be more effective acquisition managers and leaders. As we continue to experience downsizing efforts and significant loss of military personnel, I would really like to see this program opened up to civilians. This would enable the Army to continue taking maximum advantage of the TWI Program as we experience a shortage of military personnel to fill the TWI slots. Civilian AAC members would then be equipped with the type experiences the military members have, which strengthens the overall effectiveness of the AAC and ensures consistency in the qualifications of the Army's future acquisition leadership.

I realize that changing mind sets is a major challenge. However, I would most like to see managers move away from the notion that "we can't afford to be without employees while they are away in training." This idea of not releasing civilian employees for training opportunities has a tendency to undermine the objectives of DAWIA. We must be willing to invest in our people in order to realize a positive return in terms of building a better qualified cadre of acquisition professionals. The other down side of failing to release civilian employees for training opportunities is that it negatively impacts their opportunities for advancement and could cause these employees to experience difficulties with certification procedures when they are fully implemented.

Accession into the AAC is another key issue. Military personnel are accessed once a year at a rate of approximately 40 members per year. Announcements for civilians are very sporadic and it has been at least three years since the last announcement. In the developmental phase of the AAC, the concept was that military and civilian members would be on parallel tracks as far as training, education, and professional development are concerned. The concept is indeed a noble one, but appears to be more difficult to implement than envisioned. Even though we have seen an increase in the number of 1102s attending the Program Management Course at the Defense Systems Management College (DSMC) in recent times, it is rare that an 1102 is selected for a PM or deputy PM position. In summary, I would like to see more career opportunity parity between military and civilian members of the Army Acquisition Corps.

From The AAC Career Manager...

Army Acquisition Corps Senior Service College Selections

Congratulations to the following Army Acquisition Corps civilians on their selection to attend Senior Service College:

Industrial College of the Armed Forces

Gary Anderson
Steven Coakley
Deborah Frank
Rosalee Jordan
Ramona Lush
Esterline Morse
Edward Thomas
Victoria Yourkavitch

University of Texas Fellowship Program

Roxanne C. Braun
Gordon D. Little
Garfield W. Boon
Donald C. Barker
William N. Washington

Selectees for Professional Development Programs

Congratulations to the following Army Acquisition Corps civilians on their selection to attend professional development programs.

Naval Post Graduate School

Perry Hicks
Sandra Crisp
James Caudle
Ricky Irvin

University of Alabama - Huntsville

Jacqueline Steele
Rodney Robertson
Steven Risner
Pamela J. Knight
Pamela Caruso

University of Texas - San Antonio

Jack Milone

Florida Institute of Technology

David A. Hayes

University of Central Florida

John Ells

Lehigh University

James Lilly

Farleigh Dickenson College

Robert Carnevale

Massachusetts Institute of Technology

Gregory Pruitt

Walsh College

David Jackson

University of Pennsylvania

Michael Hettman
Steven Pizzo

Educating the Corps

Three members of the Army Acquisition Corps (AAC) recently became the first graduating AAC officers of the Executive Masters of Business Administration at The University of Texas at Austin. This program is uniquely designed to meet the needs of mid-career executives. Classes meet on alternate weekends and special week-long workshops. This format allows AAC students to earn an M.B.A. degree while continuing to learn on the job by managing a variety of acquisition-related projects within the University's Center for Professional Development and Training (CPDT). Pictured (left to right) are: MAJ Steven E. Lopez, MAJ William M. Pontius, CPT Richard D. Hansen and Dr. Jerry G. Davis, director of CPDT. MAJ Lopez was selected as a recipient of the George Kozmetsky Award, which is presented to the top graduates of the program. This year's AAC group is made up of one DA civilian and three officers.

FY 94 LTC Selectees

Congratulations to the following Army Acquisition Corps (AAC) officers who were recently selected for promotion to lieutenant colonel. AAC total selection opportunity was 78.3 percent. The Army total selection opportunity was 70.4 percent.

NAME	FA
Allen, Gary William	51
Ammel, Michael D.	51
Anderson, Elizabeth	51
Beatty, William D.	51
Bell, David F.	53
Bentley, James S.	51
Berman, Sari Lynne	53
Bernhard, John Paul	51
Birmingham, Robert	51
Bokoch, Ronald John	51
Bone Johnnie Loyd	51
Bonner, Michael B.	51
Breitenbach, Barry	97
Brown, Frank P.	51
Brown, Mary K.	97
Buckingham, Mildred	53
Burke, William E.	51
Chandler, Robert L.	51
Cobb, Aaron L.	97
Cobb, Kenneth W.	97
Cole, Thomas M.	51
Covington, David A.	51
Cox, Steven John	51
Cripps, David Bruce	51
Danielson, Dean A.	51
Davis, Lauren Steve	51
Defatta, Richard P.	51
Dellarocco, Genaro	51
Ernst, Adolph H.	51
Fiscko, Kurt Alan	51
Froede, Alexander O.	51
Gardner, Carl G.	51
Gonzalez, Joe R.	51
Greek, Clement E.	51
Hankins, Knute E.	51
Harter, William E.	51
Hatch, Jay Allan Jr.	53
Hayes, Raymond Jr.	51
Haynes, Jacob N.	51
Hernandez, Robert A.	53
Hesler, Stephen R.	51
Hillenbrand, Edward	51
Holmes, Sharon Lee	53
Hrinishin, John W.	51
Illi, Orlando J.	51
Johnson, Michael E.	51
Johnson, Theodore E.	51
Johnson, William R.	51
Jones Kenneth L.	51
Jones Lauris T.	51
Jones Mark W.	51
Jorgenson Charles	97
Kiley, James P.	97
Kimmel, John P.	51
Kostek, Stephen R.	51
Kotchman, Donald P.	51
Lajoie, Richard L.	51
Lake, William G.	97
Leach, Kim Charles	97
Lee Charlotte H.	53
Liakos, Mitchell J.	97
Light, Thomas W.	51
Lloyd, James C.	97
Lofgren, Joseph D.	53
Macik, John Jr.	51
Macklin, Phillip D.	51
Mahony, John D.	51
Majo, Robert M.	51
Maloney, Billy M.	51
Martin, Dan Henry	51
Matthewson, James D.	51
Maxwell, Jody A.	51
McClellan Harry W.	51
McCoy, Curtis Lynn	51
McGraw, Terrence J.	97
McKee, Gary D.	51
McVeigh, Joseph J.	51
McWhorter, Thomas A.	51
Meeks, Carolyn V.	51
Miller, Gerald R.	53
Miller, Gregory S.	97
Mingilton, Mark D.	51
Moneyhun, Jon C.	51
Murphy, Brian F.	97
Ogg, Robert David J.	51
Ontiveros, Jean L.	51
Otlowski, Robert Jr.	51
Parker, Christopher	51
Perry, Steven R.	97
Petty, Frank S.	97
Pierce, Lawrence S.	51
Pippin, Patricia E.	53
Polk, Peter B.	53
Poore, Edward T.	53
Ransdell, Matthew P.	51
Ransom, Robert E.	51
Rasmussen Earl D.	53

CAREER DEVELOPMENT UPDATE

Raven, Gloria J.	97
Reed, Donald E.	51
Reyenga, Robert L.	53
Riedle, Walter Jr.	51
Robinson, Undra	97
Rogalla, Douglas W.	53
Samson, Bryan R.	97
Sans, Luis Diego	97
Schneller, George R.	51
Schnepf, Henry L.	97
Schoenrock, Mark A.	97
Shell, Robert M.	51
Stauffenberg, Henry	51
Stenberg, David P.	51
Swagler, Bruce M.	51
Tegen, Carl M.	97
Tolbert, Steve A.	97
Wands, William J.	97
Ward, Rodney G.	97
Webb, Larry D.	97
Weger, James E.	51
Wheatley, Alvis A.	51

LETTERS

Letter to the Editor...

Benefits of Government Credit Cards

For many years, the traditional small purchase procedures (Standard Form 44, Imprest Fund and DD 1155) used by the federal government have been criticized for being administratively burdensome and requiring more time than seemed warranted. Therefore, we have continuously pursued more effective ways of acquiring goods and services of low dollar value for government use.

A pilot study, conducted by the Department of Commerce in 1988, found that credit cards could replace purchase order forms and imprest fund purchases, thereby reducing paperwork and expanding the number of suppliers available to the government. The Army participated in the pilot test program with Fort Stewart, GA, serving as the Army's test site. Test results were positive and the Office of Management and Budget tasked the General Services Administration to establish a Federal Supply Schedule contract for VISA commercial credit card services.

Under the contract, awarded to Colorado National Bank of Denver (Rocky Mountain BankCard System), all federal agencies were provided opportunities to use credit cards to purchase supplies and services under $25,000. The initial contract was for one year with four unilateral option years to be exercised by the GSA Contracting Officer. Each option was exercised. In 1994, the contract was recompeted and again awarded to Rocky Mountain BankCard System.

Numerous agencies are now using credit cards to make small purchases and reaping the benefits that the Commercial Credit Card Program was intended to yield. GSA's most recent statistical report reveals that Department of the Army is currently the largest user of credit cards.

The following is a snapshot of the Army's volume of credit card business since the program was implemented:

Total Dollars	$260,620,863
Transactions	630,691
Cardholders	10,402

Among the benefits cited by Army commands are: elimination of small purchase backlogs; reduction of procurement administrative lead time; increased customer satisfaction; simplified and streamlined purchasing techniques; reduced paperwork; more timely deliveries (late delivery problem eliminated); and faster payments to vendors.

Within Army, the Credit Card Program is viewed a "success story" as it continues to gain momentum and yield significant benefits. It is instrumental in achieving some of Vice President Gore's National Performance Review objectives, such as: improving and simplifying contracting procedures; and increasing customer satisfaction.

It is important that we focus on these trends as the downsizing efforts and budget constraints continue.

Esther Morse
Procurement Analyst
Office of the Assistant Secretary of the Army (Research, Development and Acquisition)

Peacekeeping Vehicle To Keep Pace With Changing Army Missions

As we move toward the 21st century, our Army is faced with the challenge of conducting a very different spectrum of military contingency operations. Operations that were once considered special operations and "one of a kind" are fast becoming the norm for our U.S. forces. This new focus clearly creates a need to explore a vehicle or even a family of vehicles that can transition from disaster relief or humanitarian assistance missions to deliberate attack or defense missions.

In 1993, Operation Restore Hope in Somalia provided a classic opportunity for U.S. forces to conduct an array of operations quite different from anything done during the Cold-War era. Although the initial mission was to provide humanitarian assistance, U.N. forces were quickly summoned to perform peacekeeping operations and ultimately combat operations. This transition along the mission spectrum identified a severe vehicle deficiency.

Although peacekeeping doctrine exists, few units actually train for peacekeeping as a part of their mission-essential task list. Moreover, there is not a vehicle in the U.S. inventory that is designed to accommodate forces during training for Operations Other Than War (OOTW.)

In October 1993, Dr. Kenneth J. Oscar, the former director of the U.S. Army Tank-Automotive Research, Development and Engineering Center, developed a task force comprised of civilian and military personnel from TARDEC's Emerging Systems Division, the Advanced Systems Concepts Division, and the United Kingdom Liaison Office to investigate a materiel alternative for a "peacekeeper vehicle" concept. The working group's first objective was to ensure the user's needs were accurately represented.

Concurrently, the U.S. Army Training and Doctrine Command identified the Dismounted Warfighting Battlespace Lab at Fort Benning, GA, as the lead organization to initiate a similar effort to investigate peacekeeping operations from the user's perspective. The battlelab is responsible for developing concepts and performing analysis and evaluation. Its primary evaluation tool is the "DTLOMS" model, which provides detailed systematic evaluation in the following areas:

Doctrine,
Training,
Leadership,
Organization,
Materiel, and
Soldier.

As a materiel developer, TARDEC has the responsibility to assist the battlelab in the materiel portion of the DTLOMS evaluation. In doing so, TARDEC has developed a continuous line of communication with the user community.

In-depth research and discussion with senior leadership from the Joint Readiness Training Center at Fort Polk, LA, the Dismounted Warfighting Battlelab, and members from the 10th Mountain Division (Light) who recently redeployed from Somalia, have revealed some insights:

- There are currently 75-plus vehicles in the world inventory that are specifically designed to perform peacekeeping operations;
- Existing "urban-type" peacekeeping vehicles require a much less threatening profile than the U.S. Army's current combat vehicle fleet; and
- The High-Mobility Multipurpose Wheeled Vehicle is well suited for non-combat contingency operations.

The task force reached these additional conclusions:

- The M1 Abrams Main Battle Tank and the M2 Bradley Fighting Vehicle are both well suited for combat operations;
- A clear void exists in the Army's current vehicle inventory for a vehicle that can successfully operate at all mission levels throughout the spectrum;
- Probably users of the peacekeeping vehicle include light infantry, air-assault, and airborne divisions; and lastly,
- Based on quick-strike requirements and air-transport capability of the aforementioned units, C130 transport capability is necessary.

As our Army is increasingly called upon to protect U.S. interests in OOTW, we must expand our doctrine to accommodate that full range of operations. Our role as materiel developers must also expand our fighting force with leading edge technology and equipment. Interim protection packages and quick fixes only address near-term challenges. The peacekeeping vehicle will clearly provide the necessary capabilities for the 21st century soldier to succeed on the future battlefield.

The preceding article was written by MAJ Larry Hollingsworth, executive officer to the director of the Tank-Automotive RD&E Center. He previously was chief of the Dismounted Warfighting Battlelab Liaison Team and a weapon system manager for the High Mobility Artillery Rocket System. He holds an MBA in purchasing, contracts, and acquisition management and is a MAM course graduate and a member of the Army Acquisition Corps.

Fielding of Paladin M109A6

The 24th Infantry Division Artillery is the first direct support unit to be equipped with the Army's new 155mm self-propelled howitzer, the Paladin M109A6. The division's 1st Battalion, 41st Artillery took possession of 25 Paladins and 25 M992 Field Artillery Ammunition Supply Vehicles (FAASV) during a ceremony held earlier this year at Fort Stewart, GA. The 3rd and 4th battalions also recently received their systems.

The Paladins were turned over to COL William J. Lennox Jr., division artillery commander, by Army Program Executive Officer for Field Artillery Systems Dale G. Adams. Adam's organization, Project Manager, Paladin/FAASV, which developed and is fielding the Paladin and FAASV, is based at Picatinny Arsenal, NJ.

According to project manager LTC Charles A. Cartwright, the Paladin can "shoot and scoot" rapidly—a feature well-suited to the 24th Division's artillery battalions which must move quickly—thanks to its onboard navigational and automatic fire control systems.

Paladin fires 155mm shells to a distance of 30 kilometers, 25 percent farther than its predecessor, the M109A2. It can deliver rapid firepower—up to four rounds per minute—to a target day or night.

It also has a bullet-proof, Kevlar-lined chassis for crew protection and a special cooling system that safeguards the crew against nuclear, biological and chemical threat. The FAASV, which has been upgraded to match the new howitzer, resupplies the Paladin with 155mm ammunition.

The Army is buying a total of 824 Paladins from United Defense Limited Partnership and is converting 664 FAASVs at Letterkenny Army Depot in Chambersburg, PA. The system is nick-

AMC Publishes Specifications Guide

The U.S. Army Materiel Command (AMC) recently published the *Guide for the Preparation and Use of Performance Specifications,* AMC Pamphlet 715-17.

The purpose of the pamphlet is to assist DOD personnel, including specification developers, end-users, and procurement personnel, to focus on specific essential product requirements as a way to streamline the acquisition process. It will also cause them to question preconceived needs for the traditional detailed technical requirements, particularly those that add cost to the government with little or no value added. Information contained in this pamphlet is based on the successful use of performance specifications for acquisition of technologically superior products at reduced cost.

Copies of the publication are available at the publication office/stock room of each program executive office, major subordinate command, and the U.S. Army Training and Doctrine Command.

LOGPARS Software Available

A new version of the Logistics Planning and Requirements Simplification System (LOGPARS) has recently been released. LOGPARS is an expert system which offers assistance in writing Integrated Logistics Support (ILS) plans, ILS statements of work, provisioning plans, and warranty clauses.

New features in version 3.1 include:

- modules for generating materiel fielding plans and transportability reports;
- an automated DD Form 1949, Logistic Support Analysis Record Data Requirements;
- enhanced tailoring capability for non-development item acquisitions;
- an improved Contract Data Requirements List generator; and
- Schedule Advisor milestone updates.

A copy of the LOGPARS software may be obtained by calling the LOGPARS team members at DSN 645-9885 or commercial (205)955-9885.

Machine Translators: Voices of the Future

Editor's Note: The following article was written by Joe Sites, vice-president and director of Defense Systems, BRTRC, in Fairfax, VA.

During a recent discussion on the need for machine translators to support allied force operations, a very high level individual asked "Well, how many words do you need to translate?" I pondered the purpose of the question but, initially, had some difficulty because of my limited experience in foreign languages. Finally, it came through.

It seems that those who haven't worked in foreign languages see translation as merely replacing a word in one language with a word from another. Engineers, who tend to break down problems into basic elements, apparently see words as the basic elements of language. It then follows that if you only need 1,000 words to get your message across, the machine translator only needs to have a data base of 2,000 words; 1,000 in language X and 1,000 in language Y.

If words were the basic elements of language, developing a machine translator would be simple—you could just download a foreign language dictionary into a computer. Unfortunately, for the developers of a machine translator, words are not the basic elements of language. Words have different meanings—the meanings of individual words and meanings of combinations of words are the basic elements. When a translator performs, it takes the words used, attaches meanings to those words, and then finds words in the second language to express those meanings. If this sounds complicated, then you have heard right. Translation of meanings is difficult. Let's look at a simple example.

"Get over here at once!" The commander roughly stated this into his phone. Using words only, the machine translator looked up each word and replaced it. The following is an accurate summary of what could result. First the word "get"; one of the best synonyms for "get" is "obtain." Next "over"—"above," "here" equals "this location"; "at" equals "by" and finally "once" means "one time." The machine dutifully went through the word selection and the colonel's message came through loud and clear: "Obtain above this location by one time."

From this simple example, it is clear that translation involves a lot more than word substitution. The reader may not be too interested in parts of speech, declensions and cases, but should keep in mind the importannce of analyzing the colonel's sentence to get a feel for what the machine translator's computer brain has to consider. First, in determining the meaning of a sentence, it is necessary to decide what kind of sentence it is. When the sentence ends with an exclamation, the human eye sees it as a declaratory sentence of command. How can the translator determine that? It must look for a subject and verb. Scanning its list of words in the sentence, the computer recognizes that "get" is a verb. Unfortunately, finding a subject is not easy. To find a subject, the program would contain several routes, one would be a list of nouns and pronouns. To further complicate the problem, the noun must agree with the verb in number. For example, if the verb is singular then the noun must be singular. The computer scans the colonel's sentence looking for a suitable noun. There isn't any. Why? The colonel's sentence was elliptical. The subject of the sentence "you" was understood, not stated. For the computer to arrive at this conclusion, you can imagine the circuits it had to follow.

Without going into more details, "over here" is a colloquialism as well as "at once." The reader at this point is probably "sick and tired" of examining the English language. You can be sure, however, we have only scratched the surface in translating a five word sentence. To translate the sentence there will be data bases on every part of speech, colloquialisms, tenses, cases, etc., etc.

My purpose in relating the above is not to say that despite marvelous improvements in computer capability and artificial intelligence that we absolutely can't produce a machine translator. Rather, I am saying don't hold your breath for one.

This takes us back to the original problem. Allied forces working together need something more efficient than interpreter teams. They have volumes of work which must be done quickly and accurately. We can do something about it right now at a minimum cost.

We can produce a number of sentences which convey the majority of commands required in military operations. However, we can leave blank: times, coordinates, geographical directions etc. We can then translate these sentences into other language(s), leaving blank those elements which can be filled in as required. Each

sentence can be given a numerical designation (K1 for example for Korean, message 1).

Message K1 can then be sent with those blanks filled in as needed. Not only would the translation be made almost instantaneously, the transmission time would be greatly reduced to two characters plus limited data for the blanks. An additional advantage of this is the capability to prepare this information for languages of all potential allies.

The challenge of producing a real machine translator should not be neglected. For current and near term operational problems, we should consider language crib-sheets.

ARL Breaks Ground For New Materials Research Facility

The Army Research Laboratory (ARL) in Aberdeen Proving Ground, MD, broke ground recently for the $80 million building for its Materials Directorate. The building will house approximately 200 scientists, engineers, and support personnel.

Personnel now employed at ARL facilities in Watertown, MA, and Fort Belvoir, VA, will be offered the opportunity to relocate to the new facility. The Watertown facility is being closed under the 1988 Base Realignment and Closure Act.

The Materials Directorate is the Army's lead organization for materials research and development. These materials include polymers, specialty organic materials, composite materials, and high performance ceramics.

Distinguished guests at the ceremony included Sen. Paul S. Sarbanes (D-MD), Rep. Helen Delich Bentley (R-2nd District), and George T. Singley III, deputy assistant secretary for research and technology, Department of the Army.

The new building will contain approximately 290,700 square feet. Facilities will include research and technology laboratories, special purpose space, and office space. The building is due to be completed by May of 1997. The Army Corps of Engineers, Baltimore District, will oversee construction.

Architect's rendering of the new Army Research Laboratory Materials Directorate at Aberdeen Proving Ground, due to be completed in May 1997.

DOD Awards $18 Million For University Research

The Department of Defense has announced plans to award grants totaling almost $18 million to 62 competitively selected professors at 31 academic institutions in 17 states. The selections were made under the FY 1993 competition for the Defense Experimental Program to Stimulate Competitive Research (DEPSCoR).

Grant recipients will use the money to perform research in science and engineering fields important to national defense. The average award will be $290,000.

The Army Research Office, the Office of Naval Research, the Air Force Office of Scientific Research, and DOD's Advanced Research Projects Agency solicited DEPSCoR proposals from academic institutions in the eligible states listed below. In response, 675 proposals were submitted requesting nearly $245 million for research. This is the third year the DOD has solicited proposals under this congressionally mandated program.

The DEPSCoR Program is designed to expand research opportunities in states that traditionally receive the least federal funding for university research. Alabama, Arkansas, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Missouri, Montana, Nebraska, Nevada, North Dakota, Oklahoma, South Carolina, South Dakota, Vermont, West Virginia, Wyoming and the commonwealth of Puerto Rico were eligible to participate in the DEPSCoR program.

AWARDS

CPT(P) Altavilla Wins Besson Award

CPT(P) Peter A. Altavilla is this year's military recipient of the Frank S. Besson Memorial Award for Procurement Excellence (BMA). The BMA is sponsored by the American Defense Preparedness Association in order to recognize outstanding individual contributions improving the contracting and acquisition process. CPT(P) Altavilla, who is currently assigned to the U.S. Army Missile Command, was selected for outstanding contract placement/administration of the Terminal Guidance Warhead Program—International Cooperative Program, partnering the United States, France, Germany and Great Britain. He was awarded the BMA for formulating innovative funding strategy and the European Fee Agreements. CPT(P) Altavilla will next be attending the Executive M.B.A. Program at The University of Texas at Austin at the Center for Professional Development and Training. The degree program is sponsored by the Army Acquisition Corps.

BOOKS

The Fifth Discipline, The Art & Practice of the Learning Organization

By Peter M. Sence, Ph.D.,
MIT Sloan School of Management
Doubleday, NY, NY, 1990.

Reviewed by CPT Jim Nagel, infantry technology manager in the Human Research and Engineering Directorate at the Army Research Laboratory at Aberdeen Proving Ground, MD.

This is both a management and leadership text that explains how to develop and foster individual and group performance. The author states all organizations must become "learning centers" that continually adapt to changing competitive conditions. The book addresses how to build this type of continuous "learning organization." The descriptions in the text easily apply to government or military organizations, as well as private business; and the author provides numerous examples from these areas.

Dr. Sence describes five "component technologies" or "leadership disciplines," that managers must build in themselves and their organizations. The five disciplines are: systems thinking, personal mastery, mental models, building shared vision, and team learning. Systems thinking, the "Fifth Discipline," is the most important and involves the integration of the others into strategy and practice. All actions can be described in a systems-loop fashion and the key to influencing events is applying leverage at the proper point. The proper points are the other four disciplines. Personal mastery involves identifying clear priorities, vision, commitment, honesty, and intuition. It encourages subordinates to challenge status quo methods of accomplishing goals, in the current philosophy of "reengineering" and to build competency from within, rather than from outside consultants. Mental models involve nurturing creativity and breaking down false stereotypes or bureaucratic roadblocks. Building a shared vision binds people in an organization around common identities and sense of purpose, which reaps significant rewards in unity of effort. Interacting and learning through teamwork produces greater results and the text advises on how to align individual talents and roles. The ideas that the author advocates apply to any organization, be it an engineering group in research and development or an Army staff group.

The author presents a methodology and philosophy to shift through the normal distractions of daily operations and find the areas to apply focused, effective effort for improvement. A learning organization that can adapt quickly may use time as a competitive advantage. This applies to organizations within the acquisition life cycle, where reduction of cycle, process, testing, or development times can save millions of dollars without hurting the final product. Dr. Sence also touches on the subject referred to in the military as "power down" empowerment, which he calls "localness."

Overall, the book is quite interesting on its points of view and somewhat different perspectives toward organizational leadership and development. I recommend it for virtually anyone currently in or aspiring for management positions in government or private industry. The text flows well and offers many examples and small case studies. Some of the subjects can be a bit abstract and "soft" for the hardcore management science reader. Overall, *The Fifth Discipline* provides additional insight in the ever-challenging task and privilege of managing, motivating, and leading people.

Army Publishes *Contingency Contracting Manual*

The Army's initiative to publish a "how-to" handbook for deploying contracting officers in support of global contingencies has been accomplished. The distribution of more than 300 copies of Army Federal Acquisition Regulation Supplement, Manual No. 2, titled Contingency Contracting was made in January 1994.

Each MACOM principal assistant responsible for contracting (PARC) received copies of the manual for further distribution throughout their subordinate commands. To assure the widest dissemination, distribution was also made laterally throughout the Army staff and to the Services and Joint Staff.

The contingency contracting manual is the initial vehicle for the Army's evolving doctrine for contingency contracting officers to use in support of worldwide contingencies. The manual is also a consolidation of lessons learned from past contingencies which will enhance a deploying contracting officers's ability to better perform his or her primary mission...to provide contracting support to deployed and contingency forces.

This manual's distribution to the field parallels another Army initiative to identify, authorize, and fill authorizations and positions down to DISCOM level for contingency contracting officers. The Military Acquisition Position List (MAPL) identifies those contracting officer positions throughout the Army. Both of these ongoing actions are mutually supportive and promise to provide the means and qualified personnel necessary to successfully meet requirements for future contingencies. To ensure proper training and experience in preparing contracting officers for deployment, it is imperative that they work on a daily basis in their installation's Directorate of Contracting (DOC).

The Army is committed to developing a professional and qualified source of contracting officers ready to meet the operational demands of future contingencies. Dedicated use and continued improvement of the Army's Contingency Contracting Manual will ensure the challenges directed at the contracting community are successfully accomplished.

Copies of the Contingency Contracting Manual should come to each authorized contracting officer through their chain of command. The manual may be reproduced locally. An alternate source for copies of the manual is the Office of the Assistant Secretary of the Army (Research, Development, and Acquisition), U.S. Army Contracting Support Agency, ATTN: SFRD-KI, Skyline Six, Suite 916, 5109 Leesburg Pike, Falls Church, VA, 22041-3201, commercial (703) 756-7572, DSN 289-7572.

Reengineering the Corporation

By Michael Hammer and James Champy
Harper Business

Reviewed by CPT Thomas D. Coffman, an Army Acquisition Corps officer assigned to the PEO Tactical Wheeled Vehicles in Warren, MI.

Reengineering the Corporation is co-written by Dr. Michael Hammer, former professor at MIT and current president of the management education and consulting firm Hammer and Company, Inc. and by James Champy, chairman of CSC Index, Inc., a management consulting firm and leading authority on implementation of business reengineering initiatives. Their business doings have been featured in leading publications such as the *New York Times,* the *Boston Globe,* the *Wall Street Journal, Fortune,* as well as others.

This *New York Times* bestseller is easy reading and targets the entire workforce of today's businesses. It's the same target audience—100 percent of the workforce—that Hammer and Champy cite as necessary to make reengineering a company a successful endeavor.

Reengineering the Corporation introduces ways to successfully operate an organization today and into the 21st century that are as radical as the division of labor concept was, and written about by Adam Smith in his *The Wealth of Nations* in 1776. Hammer and Champy bluntly tell the reader that Adam Smith's ideas for fragmentation of work have served their time and are ideas no longer relevant for business success in today's "era of a global economy, powerful information technologies, and relentless change." Reengineering is defined in the book as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service and speed." Emphasis in this reengineering definition is focused on the four key words fundamental, radical, dramatic and processes. These words lend focus to the book's more pinpointed definition for reengineering—"starting over."

Reengineering is a concept that is still new to our business world. It is, however, a concept that has been undertaken by several companies that found themselves losing competitive ground in their respective markets. This book cites several of these companies, with entire chapters devoted to four such companies—Hallmark, Taco Bell, Capital Holding, and Bell Atlantic. The book describes common characteristics seen in reengineering successes, points out reengineering opportunities within organizations and lists those common errors to avoid that have doomed other companies.

As the defense base restructures dramatically over the next few years, those of us in the acquisition business, at all levels, are chartered with meeting successful objectives with far fewer assets. *Reengineering the Corporation* is a book whose concepts can successfully guide our acquisition community toward achieving those goals.

CONFERENCES

Upcoming Conferences

• The International Test and Evaluation Association will hold its annual symposium, "Testing in the Global Village," Oct. 3-6, 1994, in Baltimore, MD. Topics such as current trends in test and evaluation, cooperative testing arrangements, and testing methodologies from various nations and industries will be addressed. For additional information, call (703) 631-6220.

• The Sixth International Seminar on Battery Waste Management will be held Oct. 31 - Nov. 2, 1994, in Deerfield Beach, FL. This seminar is being organized by Dr. Sumner P. Wolsky, Ansum Enterprises Inc. and Dr. N. Marincic, Battery Engineering Inc. The discussion will cover manufacturing and user wastes of the important primary and secondary battery systems with a focus on lead acid, nickel cadmium, metal hydride, alkaline manganese, lithium and lithium ion.

For the seminar brochure contact Florida Educational Seminars Inc., 1900 Glades Road, Suite 358, Boca Raton, FL 33431; (407) 338-8727; fax (407) 338-6887. For technical and program details, contact Dr. Sumner P. Wolsky, 1900 Cocoanut Road, Boca Raton, FL 33432; (407) 391-3544; fax (407) 750-1367.

• A conference on manufacturing process development in photonics will be held Nov. 1-2, 1994, at the Redstone Arsenal Rocket Auditorium, Huntsville, AL. Sponsors are the U.S. Army Missile Command Research, Development and Engineering Center, the Advanced Research Projects Agency, the U.S. Army Test, Measurement and Diagnostic Equipment Activity, the U.S. Army Strategic Defense Command, and the U.S. Army Research Office. The objective of the conference is to identify gaps and research opportunities in photonics and optoelectronics manufacturing process development to allow both the public and private sectors to achieve a better allocation of resources. For additional information contact Susan T. Caldwell at (205) 895-6343, extension 277, or fax (205) 895-6581.

• A Horizontal Technology Integration (HTI) Workshop will be held Nov. 15-16, 1994, at the Redstone Arsenal Rocket Auditorium in Huntsville, AL. The workshop will be sponsored by the Night Vision and Electronic Sensors Directorate, U.S. Army Communications-Electronics Command; the Program Executive Office, Tactical Missiles; the U.S. Army Space and Strategic Defense Command; and the U.S. Army Missile Command.

This forum will focus on defining a common understanding of what HTI is, establishing guidelines for achieving Army HTI goals, and identifying technologies other than second generation Forward Looking Infrared, Battlefield Digitization, and Battlefield Combat Identification, for which the concept of HTI could be applied.

For additional information, contact Susan T. Caldwell at (205) 895-6343 extension 277, or fax (205) 895-6581.

• A call for papers proposed for presentation at the *"Technology Advances for Wetlands Science"* workshop, to be held April 3-7, 1995, in New Orleans, LA, has been issued by the Wetlands Research and Technology Center, U.S. Army Engineer Waterways Experiment Station. An abstract of 75 to 150 words must be submitted by Sept. 30, 1994, to: U.S. Army Engineer Waterways Experiment Station, Wetlands Research and Technology Center (CEWES-EP-W), 3909 Halls Ferry Road, Vicksburg, MS 39180-6199. For additional information on the workshop, write the same address or call (601) 634-2569/4217, fax (601) 634-3664.

PERSONNEL

Senate Confirms Gotbaum As Assistant Secretary for Economic Security

Joshua Gotbaum was confirmed earlier this year by the U.S. Senate as the first assistant secretary of Defense for economic security (ASD(ES)).

The ASD(ES) position was created to help the Department of Defense adjust to the economic realities of the post-Cold War world. Gotbaum is the primary advisor to the secretary, deputy secretary and the under secretary of Defense for acquisition and technology for policies and programs pertaining to the Defense industrial base, base closure and reuse, dual-use technology, international programs and economic adjustment.

Prior to his appointment, Gotbaum was general partner with the New York investment bank, Lazard Freres & Co. From 1990 to 1992, he was a managing director of Lazard Freres & Co. in London. In addition, in 1981 he was U.S. Senator Gary Hart's legislative assistant for economic matters and his representative on the Senate Budget Committee Staff for economic issues. Gotbaum also served as associate director of the White House Domestic Policy Staff for economic issues during the Carter Administration and as executive assistant to Alfred Kahn, President Carter's advisor on inflation.

Gotbaum is a graduate of the Kennedy School of Government and Harvard Law School.

Coburn Becomes AMC Deputy Commanding General

LTG John G. Coburn, former chief of ordnance and commanding general, U.S. Army Ordnance Center and School, recently assumed new duties as deputy commanding general, U.S. Army Materiel Command (AMC), Alexandria, VA.

Coburn has also served as deputy chief of staff for procurement, AMC; deputy commanding general, 22d Support Command, Dhahran, Saudi Arabia, and deputy chief of staff for logistics, U.S. Army Europe and Seventh Army.

Coburn holds a bachelor of science degree from Eastern Michigan University, a Master of Arts degree from the University of Kansas, and a Juris Doctor degree from the University of Missouri. He is licensed to practice law before the Michigan and Kentucky Supreme Courts, District of Columbia Court of Appeals, and the Supreme Court of the United States. His military education includes the U.S. Army Command and General Staff College and the Industrial College of the Armed Forces.

Coburn's honors include the Distinguished Service Medal, Legion of Merit with Oak Leaf Cluster (OLC) Bronze Star with OLC, Meritorious Service Medal with three OLC, Joint Service Commendation Medal, Army Commendation Medal, and the Southwest Asia Service Medal.

ARMY

Research
Development
Acquisition

RD&A BULLETIN

WRITER'S GUIDELINES

ABOUT THE BULLETIN: Army RD&A Bulletin is a bimonthly professional development bulletin published by the Office of the Assistant Secretary of the Army (Research, Development and Acquisition). The address for the bulletin's editorial office is: DEPARTMENT OF THE ARMY, ARMY RDA BULLETIN, 9900 BELVOIR RD SUITE 101, FT BELVOIR VA 22060-5567. Phone numbers are: Commercial (703)805-4215/4216/4046 or DSN 655-4215/4216/4046. Datafax (703)805-4218 or DSN 655-4218.

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 may not be necessarily limited to, policy guidance, program accomplishments, state-of-the-art technology/systems developments, career management information, and management philosophy/techniques. Acronyms should be kept to an absolute minimum and when used, must be written out and explained. Articles with footnotes will not be accepted.

LENGTH OF ARTICLES: Articles should be approximately 1,500 to 1,800 words in length. This equates to 8-9 double-spaced typed pages, using a 20-line page.

PHOTOS: Include any photographs or illustrations which complement the article. Black and white or color are acceptable. 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.

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 5 1/4-inch or 3 1/2-inch disk in ASCII format.

DEPARTMENT OF THE ARMY
ARMY RDA BULLETIN
9900 BELVOIR RD SUITE 101
FT BELVOIR VA 22060-5567

Commercial: (703)805-4215/4216/4046
DSN: 655-4215/4216/4046

DATAFAX: (703)805-4218
DSN: 655-4218

ARMY RD&A BULLETIN
ISSN 0892-8657

DEPARTMENT OF THE ARMY
ARMY RDA BULLETIN
9900 BELVOIR RD SUITE 101
FT BELVOIR VA 22060-5567

SECOND CLASS
POSTAGE PAID
AT FORT BELVOIR, VA
(and Additional Offices)