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## ABOUT THE COVER

The front cover relates to an article on the establishment of the U.S. Army Laboratory Command. Cover drawing prepared by Jay O'Leary, Harry Diamond Laboratories' Graphics Branch. The back cover, which shows a typical "soft" radio, is associated with an article on the nondevelopment items acquisition process at the U.S. Army Communications-Electronics Command. Our new logo was designed by Daniel Jeffrey Marks Jr. and Deborah Magga.

## FEATURES



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# The U.S. Army Laboratory Command

By Dr. Timothy M. Small

***Army Materiel Command (AMC) research and development organizations are being restructured to more effectively perform their functions in the management and program execution of systems acquisition. At the same time, the way AMC acquires equipment is undergoing significant change. This article, the first of two on AMC's organizational initiatives, focuses on the creation of the U.S. Army Laboratory Command. A second article which addresses the AMC Research, Development and Engineering (RDE) Centers and the role that they will have in the streamlined acquisition process will be published in a future issue of this magazine.***

## Background

The core of AMC's ability to accomplish its research, development, and engineering responsibilities resides in its corporate laboratories and commodity-aligned RDE centers. It's through these activities that AMC can:

- ensure the timely availability of essential technology,
- integrate it into conceptual systems,
- demonstrate that the concepts will work, and
- provide engineering support for the remainder of the system's life.

In essence, the laboratory/RDE center system produces proven concepts and then continues to provide support as the concept is converted into a fielded system.

The individual labs and RDE centers, and the way they do business, take on the flavor of the technologies or commodities on which they work—whether they're associated with missiles, aircraft, tanks, electronic systems, ammunition, or others. Likewise, their organizational structures have been tailored to conform with many practical considerations—such as local availability of facility, technical, and readiness support. As a result, the current labs and RDE centers do not look alike, whether viewed as to size, budget, support requirements, whom they support, in-house capabilities, or range of mission responsibilities.

There are many challenges in understanding and managing such diverse organizational elements, particularly since collectively they form an impressively large enterprise. The management challenge extends beyond organizational issues to the many and varied programs executed by the labs and RDE centers. The requirement to manage AMC's research and development organizations and programs well is the fundamental driver behind current initiatives.

## Formation of LABCOM

An entirely new major subordinate command (MSC) has been established to manage the corporate laboratories and provide intensive integrated management of the entire AMC technology base. It is called the U.S. Army Laboratory Command (LABCOM), and its headquarters was formed from the disestablished headquarters of the Electronics Research and Development Command (ERADCOM).

The functional elements of ERADCOM were distributed between LABCOM and the Communications-Electronics Command (CECOM). LABCOM was assigned Harry Diamond Laboratories, the Electronics Technology and Devices Laboratory, the Atmospheric Sciences Laboratory, and the Vulnerability Assessment Laboratory (formerly called the Office of Missile Electronic Warfare, the vulnerability element of the Electronic Warfare Laboratory).

CECOM was assigned (using their former names) the Combat Surveillance and Target Acquisition Laboratory and the Electronic Warfare Laboratory (less the Vulnerability Assessment Lab), which now combine to form the Electronic Warfare/Reconnaissance Surveillance and Target Acquisition Directorate; the Night Vision and Electro-Optics Laboratory (now Directorate); and the Signals Warfare Laboratory (Directorate). These directorates have been consolidated, along with elements of the the former CECOM R&D Center, to form the CECOM RDE Center. This centralizes all major electronic system R&D under a single commodity command and consolidates intelligence and surveillance capabilities within CECOM. This is even more appropriate when considered in the light of CECOM's continuing readiness responsibility for ERADCOM-developed systems.

Besides the elements from ERADCOM, LABCOM was assigned the existing corporate labs—Materials Technology Laboratory (formerly Army Materials and Mechanics Research Center), the Ballistic Research Laboratory, and the Human Engineering Laboratory. In addition, LABCOM became headquarters for the Army Research Office, giving LABCOM a comprehensive technology base coordination and planning capability, a key ingredient in LABCOM's ability to execute the integrating management function. The Army Research Office will retain linkages to AMC and DA headquarters to continue its unique direct support and basic research sponsorship activities.

## A Laboratory Is ...

Consolidation of the corporate laboratories under LABCOM clarifies organizational roles. In the past, both corporate labs and R&D centers were referred to by one word—laboratories. In fact, there is a clear distinction in their roles

and functions, so there now will be a clear distinction in their titles. AMC organizations called "laboratories" will be those assigned to LABCOM. They will conduct research and technology development of broad ultimate utility. Their programs will be in the technology base (primarily with 6.1 and 6.2, but, in exceptions, 6.3 type funding), unconstrained to a specific commodity, and nurturing unique high-utility, high-payoff technologies.

However, as in the past, the laboratories will do much more than develop critical technologies. One example is the consultant services they provide to the rest of AMC. Because the labs have experts who work on multiple-application technologies, they are able to advise and assist system planners, project engineers, PMs, or others in need of their extensive experience and knowledge.

## LABCOM Roles

LABCOM's sweeping role in the overall management of AMC's technology base, integrating across not only their own labs but all the RDE centers as well, is a responsibility previously associated only with AMC Headquarters. To give him the formal organizational authority required to execute this mission, the LABCOM commander wears a second hat—that of the AMC Headquarter's deputy chief of staff for technology planning and management. This gives LABCOM a key staff role in the formulation of strategic guidance and policy for the tech base.

LABCOM will assimilate program data from the RDE centers and its own labs, compile it in computerized data bases, analyze it in terms of total responsiveness and potential payoff, and establish a fully integrated tech base program. The principal product of this process will be a well planned tech base input for program review and analysis, in which LABCOM then participates as a headquarters staff element. Any associated issues identified by the RDE centers will be considered and conflicts will be resolved during the review process.

LABCOM also supports other command-wide functions, such as analyzing advanced system concepts and participating in battlefield system integration studies. These functions are performed by the LABCOM Advanced Systems Concept Office (ASCO)—the LABCOM equivalent of the RDE center ASCO, which will be discussed in the second organizational initiatives article in a future issue of this magazine.

LABCOM's ASCO is unique in that it has responsibility for horizontal integration across commodities and the function of pushing exploitable maturing technology from all sources into system development through a concept demonstration process.

AMC's activities in survivability assessment and enhancement are consolidated under LABCOM with capabilities to conduct vulnerability analyses; facilities and equipment for experimental measurement of materiel signatures/responses; and teams which assess equipment/designs, provide advice, and establish policy on signature reduction and hardening in system design. The Survivability Management Office has been established in LABCOM to centralize coordination of these activities.

The bottom line is that LABCOM provides corporate management of AMC's tech base programs; is a source of technical expertise during all phases of materiel acquisition; and develops critical technology which is not being done, or is inappropriate to do, elsewhere.

## Tech Base Execution Roles

Equally important participants in technology base programs are the RDE centers. They have a somewhat different role from the laboratories, since they are elements of commodity major subordinate commands. These centers will be discussed in greater detail in the second organizational initiatives article. The distinction between the commodity commands' RDE centers and LABCOM's laboratories is an important one in the area of technology base. Whereas the RDE center's tech base efforts will be in direct support of their commodity, the laboratories will explore cross-cutting technologies, totally new (possibly high risk) concepts, and options that don't fit into the present commodity command structure.

Whether performed by labs or RDE centers, technology development must be carefully managed. Without appropriate criteria for evaluating progress, such efforts can lose focus and languish undetected. Stakes must be driven into the ground to provide milestones and technical objectives—guidelines to challenge the project scientist and touchstones for the manager.

As a rule, laboratories do not develop systems. At some point, lab products (with specific exceptions) must be handed off to an RDE center or a PM for development and application. When and how depends upon the situation.

One type of technology developed within the labs has the dual characteristics of being directly applicable to specific system concepts identified within an RDE center and having the support of that RDE center. Technology of this type is handed off to the RDE center early in development. This is in conformance with the normal role of RDE centers, in which they nurture technology from all available sources (the labs being one source), integrate it into prototypes to demonstrate concept feasibility, and assume total responsibility for concept exploration activities.

A second type of technology developed by the labs, though promising, may not find application in the programs of any of the RDE centers or may be in competition with that promoted by the

## U.S. ARMY LABORATORY COMMAND (LABCOM)

**NEW MAJOR SUBORDINATE COMMAND WHICH CONSOLIDATES THE "CORPORATE LABS" AND THE ARMY RESEARCH OFFICE**

**The Original Corporate Labs:**

**Ballistic Research Lab**

**Human Engineering Lab**

**Materials Technology Lab**
***(formerly the Army Materials & Mechanics Research Center)***

**Are Joined By:**

**Electronic Technology & Devices Lab**

**Harry Diamond Labs**

**Atmospheric Sciences Lab**

**Vulnerability Assessment Lab**
***(formerly the Office of Missile Electronic Warfare)***

**Army Research Office**

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MATERIEL COMMAND
5001 EISENHOWER AVENUE, ALEXANDRIA, VA 22333-0001

EXTRACTS FROM PERMANENT ORDERS 51-1

Headquarters, U.S. Army Laboratory Command (LABCOM), Adelphi, MD 20783

Following organization/unit action directed.

Action: Unit organized.
Assigned to: Headquarters, U.S. Army Materiel Command.
Mission: Develop and execute a technology base management plan for investment strategy development, technology base program packaging and data bases, horizontal technology forecasting and identification/evaluation of future technologies. Ensure that contract research programs are properly integrated with the proponent AMC laboratories. Focus resources in areas reflecting greatest opportunities to satisfy Army needs. Manage corporate laboratories and the Army Research Office.
Effective Date: 1 October 1985

associated RDE center. To exploit these technologies it may be necessary for the lab to temporarily assume the role of an RDE center. They must be prepared to formulate a system concept, initiate concept exploration, and demonstrate feasibility—possibly in head-to-head competition with an RDE center concept. These exceptional programs will receive special management attention at AMC Headquarters. Once extraordinary concepts are shown feasible and desirable, an appropriate RDE center will assume program responsibility and complete concept exploration planning and documentation.

A third category of lab developed technology transfer is that which doesn t require a formal concept feasibility demonstration. This usually involves technology that is developed in multi-year, continuing efforts, often to stay ahead of the threat's ability to defeat it. It may be used in product improvements, block improvements, subsequent generations of equipment, or associated with a type of acquisition which already has proven feasibility or is insensitive to feasibility issues.

Success of the hand-off process in all three cases depends upon careful up-front planning and coordination. Both partners must be committed to expeditiously maturing the technology and incorporating it into demonstrable system concepts.

## Summary

AMC's laboratory system is in the implementation phase of an exceptionally dynamic organizational process. Corporate tech base entities and management functions have been consolidated within a new major subordinate command—LABCOM, with seven laboratories, management offices for Army research and for survivability, and responsibility for overall technology planning and management. The roles of the labs have been clarified and initiatives to enhance their effectiveness have been (and continue to be) implemented. The second organizational initiatives article will discuss the RDE centers in greater detail. Their form and function will be developed in context of AMC's acquisition goals and the streamlined acquisition process. This will illustrate the critical acquisition roles they and the laboratories have and how this is reflected in their organizational structure.

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## AMMRC Becomes Materials Technology Laboratory

The U.S. Army Materials Technology Laboratory (MTL), located in Watertown, MA, is the new name of the former U.S. Army Materials and Mechanics Research Center. MTL's new name reflects its evolving emphasis on materials technology research and development.

The name change, effective Oct. 1, 1985, is concurrent with the inception of the newly formed U.S. Army Laboratory Command (LABCOM) located in Adelphi, MD. Chartered by the U.S. Army Materiel Command (AMC), in Alexandria, VA, MTL is one of seven Army laboratories which now come under the immediate direction of LABCOM. LABCOM was formed to improve the quality, productivity, and effectiveness of the Army laboratory system in order to improve support for the Army's readiness and force modernization program.

"Our inclusion in a new Major Subordinate Command, and our name change, are opportunities for us to enhance our standing in the AMC community and our already high reputation for excellence in research and development efforts," says MTL Director Dr. Edward S. Wright.

MTL manages and conducts the Army's materials research and development program as designated by AMC. In addressing the Army's materiel needs, MTL is the lead laboratory in the area of materials, solid mechanics, lightweight armor, and materials testing technology. Also, as the Army's Center of Excellence for corrosion prevention and control, MTL leads the development of corrosion-resistant and corrosion-proof materials.

# The Acquisition Method of First Choice

By MG Robert D. Morgan and Dr. Ted J. Klein

## Background

The need for nondevelopment items (NDI) can be simply stated. The traditional development cycle, typically eight to 11 years, is too long and too costly. Add to this the fact that the technology half-life is getting shorter and shorter, and the result is that the traditional approach leads to fielding equipment that is nearing technological obsolescence.

Use of NDI has received increased emphasis in recent years, and should significantly impact both time to fielding and development costs. NDI refers to products that can be purchased off-the-shelf without development time or development costs. This applies to products built to commercial standards as well as to military standards. To help assure maximum use of NDI at the Army Communications-Electronics Command (CECOM), an NDI Advocate Office was created in February 1985.

GEN Richard H. Thompson, commander, Army Materiel Command (AMC), in an address in January 1985 to a joint audience including representatives from the Association of the U.S. Army, Armed Forces Communication Electronics Association, and the Institute of Electrical and Electronic Engineers, emphasized the need to shorten the acquisition cycle. One of the strategies to achieve this is increased use of NDI. Thompson stated, "We can no longer afford to design equipment to meet the entire realm of environmental possibilities, especially if the equipment will encounter those conditions only 10-15 percent of the time. We must start designing for the expected rather than routinely for the worst case. We must question and tailor specifications that don't make good sense in meeting product requirements."

Another area emphasized by Thompson is test data. He pointed out that failure to use test results simply because they didn't originate from one of our proving grounds is unacceptable.

Hopefully, the increased emphasis on NDI will lead to fielding equipment in a markedly shorter period after identification of user requirements. The equipment will reflect current state-of-the-art design, and will be fielded in more affordable quantities.

## Approach to NDI Acquisition

NDI has become the acquisition method of first choice. This means that NDI will be considered for all new procurements and reprocurements. NDI permeates all phases of the acquisition cycle beginning with the Concept Exploration Phase, and impacts project management, procurement, logistics, training, maintenance, and documentation. However, the success of NDI acquisition depends greatly on making the correct NDI decision at the conclusion of the Concept Exploration Phase, and that is the focus of this paper. To do this requires the ability to determine the availability and capability of needed equipment in the marketplace, i.e., to conduct a timely and comprehensive market investigation.

A requirement for a new communications-electronics (CE) item or system starts with the development by the Army Training and Doctrine Command (TRADOC) of a draft Operational and Organizational (O&O) Plan. The draft O&O Plan is reviewed by CECOM, and by both the developmental and operational independent evaluators. At this point preliminary market investigation information is needed so that the plan can be analyzed against available information on potentially applicable products.

The next step is the development of an Independent Evaluation Plan. The combat developer, the materiel developer, and independent evaluators from both TRADOC and AMC are all players at this stage. During this step a market investigation is required, and all essential and critical requirements and features are identified. If an NDI solution is believed viable, it is then necessary to determine whether additional test data are needed, or whether modification of equipment may be needed. This information is included in the Independent Evaluation Report, which forms the basis for the NDI decision.

The NDI decision involves, among other things, designating the category of NDI. Categories A and B both refer to products available off-the-shelf. Category A refers to equipment that will be used in the same environment as that for which it was designed. Category B refers to equipment that will be used in a different environment and in these cases additional testing is probably needed. These tests could lead to modification such as ruggedizing, or replacing a particular temperature-sensitive component. Category C refers to systems that, in general, require some hardware and software development and integration. Therefore, use of NDI may be possible at all levels of system integration. In some cases R&D may be needed to develop new components.

Of course, the NDI decision could be that NDI is not a viable solution. This is very likely for example, when the requirement calls for anti-jamming or electromagnetic pulse hardening.

The first step in a market investigation is to determine what CE products are available and then to determine which of these products can satisfy requirements. The current approach to a market investigation is illustrated by a recent survey that was done for the reprocurement of the PRC-68, a hand held radio transceiver. An announcement in the *Commerce Business Daily* (CBD), stating the

***The AN/PRC-68.***

original military specification, yielded 16 models by eight contractors, with prices around $1,500. This led to a second CBD announcement with environmental constraints deleted, and frequency bands broadened. This time 31 additional models were offered by nine additional contractors, with prices mostly in the $200 to $600 range. This market investigation led to the question: What if all frequency constraints were eliminated? Telephonic contact was made with all the previous respondents. Although additional models were found, their price range was about the same as the second survey. The overall results of this market investigation led to the development by TRADOC of a draft O&O Plan for a so-called "soft" radio that will satisfy a large percentage of the need for small unit radios. This survey, which took about four months to complete, illustrates the iterative nature of the market investigation process.

The preceding example also illustrates what can happen when a distinction is made between expected use and worst case use. A limited number of military specification radios will be purchased for those cases where compromising environmental characteristics would adversely impact combat effectiveness. For the large majority of cases the soft radio will satisfy all requirements.

**Communications-Electronics Product Categories**

**RADIO**
- Receivers
- Transmitters
- Transceivers
- Antennas
- Multiplexers

**SWITCHING**
- Circuit Switches
- Message Switches
- Packet Switches

**NETWORK EQUIPMENT**
- Local Area Networks
- Gateways
- Modems

**TERMINALS**
- Communications-Printing
- Communications-Display
- Optical Character Readers

**GUIDED TRANSMISSION**
- Wire Cable/Connectors
- Fiber Optic Cable/Connectors

**COMPUTER PERIPHERALS**
- Hard Disk Drives
- Diskette Drives
- Magnetic Tape Drives
- Monitors
- Printers
- Displays

**ANCILLARY EQUIPMENT**
- Shelters
- Generators
- Transit Cases

**COMPUTERS**
- Mainframes
- Mini-computers
- Micro-computers
- Portables

## NDI Advocate Office Role

The ongoing augmentation of the CECOM RD&E mission introduces an even greater need for a structured approach to the identification and assessment of all relevant technology. To fill this need, the NDI Advocate Office was established by the commanding general, CECOM, in February 1985. The NDI Advocate Office will accomplish its mission with the development and maintenance of a comprehensive data base of CE off-the-shelf items supplemented by knowledge off current R&D programs including those at CECOM, industry independent R&D, other services, and foreign industry.

A major objective of the NDI Advocate Office is to establish a procedure, an engineering tool, that will enable market investigations to be conducted in a timely manner, and with industry-wide scope. The adopted approach is an automated, on-line, CE product data base. This approach will provide information on product availability that will enable the engineering staff to interact with TRADOC during review of draft O&O Plans and requirements documents. This approach will also help shorten the acquisition cycle by minimizing the time to find products that satisfy minimum essential requirements. Because of its industry-wide view, this approach can also minimize the additional testing that may be needed.

## Relationship With Industry

The establishment of such a CE product data base requires a close relationship with industry to provide a continuing network of information sources. In return, having a product listed in the data base will assure that it is considered for all new requirements and reprocurements for which it is potentially applicable.

Army Regulation 70-1 describes the market investigation, and what type of information must be considered. The information included in the data base is based on this regulation and clearly goes far beyond information that can be obtained from product brochures.

The accompanying list shows the initial set of products to be included. This list will certainly grow, but it is a good starting point since it represents some of the most commonly purchased items by CECOM. The related data base will list, for each product, the manufacturer's name, the nomenclature or model number, principle product specifications, a narrative description of the product, types of tests performed, and the source of the test data.

A procurement data section will include the year the product was announced; production capacity; data on reliability, availability and maintainability; average time between model changes; training, operational and maintenance manuals; extent of government and non-government use; time from order to delivery; transportability; quality assurance; configuration management controls; and product price.

An environmental data section will list applicable standards; nuclear, biological and chemical considerations; TEMPEST or electromagnetic interference and electromagnetic compatibility standards; operating temperature range; product safety considerations; physical dimensions; weight; type of mounting; and input voltage, frequency, and power.

A section on customer service will include information on support capability, commercial guarantees and warranties, commercial distribution channels, maintenance, parts inventory policy, and policy regarding phased out models.

The data base will not be used to select products for sole source procurement. Each requirement has its own unique features, and no data base could

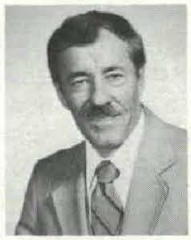
capture the information needed for each different application of a particular product. The data base will be used throughout the Concept Exploration Phase to indicate the existence of a potential NDI solution, and to challenge requirements and motivate tradeoffs. It will promote competitive procurement. And most importantly, it will help provide a sound basis for the NDI acquisition decision.

## Summary

This article has summarized the role of the NDI Advocate Office, and how the market investigation fits into new equipment and reprocurement acquisitions. A CE product data base is a challenging task, and needs industry's full support. We expect to have an initial operational capability by the end of the second quarter of FY86. After that will come the daily task of maintaining the data base, and each company's information will periodically be returned for updating, and for addition of new products.

Once a product is listed in the NDI data base, it will be considered for every procurement for which it is potentially applicable. With industry's full support, we believe the NDI data base will have a real and positive impact on materiel acquisition at CECOM.

*MG ROBERT D. MORGAN has served since June 26, 1984 as commander of the Army Communications-Electronics Command and Fort Monmouth, NJ. He is a graduate of Canisius College and has a master's degree in foundations of education from Troy State University.*



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# ARDC Saves Money Through NDI Efforts

The U.S. Army Armament Research and Development Center (ARDC), Dover, NJ, is supplying the American soldier with the world's most technologically advanced weapons and munitions at the lowest possible cost through an effort known as the Nondevelopment Item Program—or NDI.

The NDI Program is not unique to ARDC. However, this program is an integral part of the research and development efforts at ARDC. The idea behind NDI is simple: scientists and engineers examine the possibility of incorporating foreign and domestic technology and equipment, already in production and fielded, into the American arsenal.

This means that the U.S. is looking to adopt, with minimal alterations, state-of-the-art equipment developed by foreign countries and domestic commercial firms. The Army, therefore, can eliminate duplication of basic R&D. This results in military hardware at the lowest cost possible that meets the needs of the Army and is interoperable with equipment of America's allies.

One example of an item that is being evaluated by the Army for adoption through the NDI Program is the L119 British Light Gun—a 105mm howitzer. The need for such a weapon can be traced to the current military concept of a Light Infantry Division. This unit, created by the chief of staff of the Army, would become the key element of the rapid deployment force.

The Light Division has special requirements, one of which is the need for lightweight, durable military equipment. When the Light Division was created, the Army was using the M102, 105mm howitzer, a 20-year-old weapon with a relatively short range and limited growth potential. This was hardly an appropriate howitzer for the Light Division.

In assessing its needs, the Army decided a new weapon was in order. This new weapon had to be small and light enough so that several of these howitzers, with ammunition and support items, could be transported by the aircraft assigned to the Light Division artillery. The weapon also had to be light enough so it could be towed by the High Mobility Multi-purpose Wheeled Vehicles, air-lifted by the UH-60 Black Hawk helicopter, and strategically deployed in C141B U.S. Air Force aircraft.

Also, the weapon had to fire the current U.S. stockpile of 105mm ammunition, maneuver adequately, and be reliable enough for the limited maintenance capability of the Light Division. Finally, the weapon had to be deployed quickly. This meant that the weapon had to be available for production immediately.

ARDC researchers began a market investigation as the first step of the NDI process. They evaluated potential howitzers, narrowed the field to four, and after careful scrutiny, picked the L119 British Light Gun. This weapon met all the needs of the Light Division.

MAJ Rick Bailer in ARDC's Fire Support Armaments Center is the program manager for the British Light Gun. According to Bailer, this gun is not a new development item. In fact, its sister—the L118 British Light Gun—has been field tested by the British, most recently in the Faulkland Islands. Therefore, the L119 will not be subject to design changes and will require minimal testing by the United States.

According to Bailer, one of the characteristics of the NDI Program is "intense management," to cut the typical research and development cycle of a military item.

"The intense management of the NDI Program allows us to field an item much faster than we normally would using the standard research and development cycle," said Bailer. "Even though these NDI items have already been researched and developed by foreign countries and domestic companies, the U.S. Army must ensure that the items meet the requirements of the user, or the soldier in the field. This, too, requires time. But in the case of the L119, the time from concept to type classification will be 18 months if testing is successful.

# Proactive Career Management for Operations Research Analysts

**By Marie B. Acton**

## Background

Since World War II, when they broke codes and predicted enemy combat maneuvers, operations research analysts have helped our military leaders make crucial decisions. Today, Army operations research and systems analysts play increasingly vital roles in our fast paced, high pressure environment.

These 1,900 officers and 1,600 civilians use such tools as statistical inference, probabilistic modeling, mathematical programming, network analysis, computer science, and common sense (not necessarily in that order) to provide quantitative and qualitative analyses across a broad array of issues. Their work gives the Army's senior leadership systemic insight and helps them to make the hard decisions and solve the complex problems presented by the challenges of national security. The Army looks to its operations research professionals to provide an informed, multidisciplined view of concepts and doctrine, operations, training, the force structure, program management, and materiel development, testing, acquisition, and support.

Career management of the military operations research/systems analysts (OR/SA) officer functional area 49 program is assigned to the Army Training and Doctrine Command (TRADOC). The Army Materiel Command (AMC) manages the 20,000 men and women in the non-construction engineer and scientist career program, including those in the civilian operations research analyst (ORA) GS-1515 subprogram.

Functional area 49 OR/SAs are represented by one of the Army's most active and responsive proponency committees, chaired by the commander, Combined Arms Center, Fort Leavenworth, KS. The spadework for the functional area 49 committee is accomplished by a group of hard working people led by BG David Maddox, commander, Combined Arms Operations Research Activity, also at Fort Leavenworth. The results are telling—a strong hand in influencing officer accession, advanced education, training, career development—and program initiatives such as the warrant officer OR/SA.

AMC Commander GEN Richard H. Thompson has launched a similarly responsive management program for civilian operations research analysts. The goals include proactive recruitment, retention of top talent, and a revitalization of the Series 1515 career field. In short, we intend to bring management of civilian operations research analysts up to the standards of the military program.

In May of last year GEN Thompson appointed me as his representative to manage the ORA career subprogram. His mandate was to strengthen this vital analytical arm through improved hiring, training, development assignments, and career planning. Our aim is to create an active and influential program for Series 1515 careerists, to include design of model career paths with guidelines and milestones for developing individual potential.

## ORA Action Plan

The ORA Career Program Action Plan, now in its formative stages, will be the road map for improved management. The emphasis is on action. Under the plan, we'll work to:

- align the civilian ORA program more closely with the military OR/SA program, including entry standards, training, and developmental assignments;
- establish training profiles covering interns through executive level careerists;
- develop alternative career paths for ORAs;
- improve communication with careerists by establishing a network of advisors and distributing a careerist newsletter; and
- analyze careerists' turnover, mobility, skills profiles, and skills requirements throughout the Army.

### ORA Advisory Committee

- Deputy Under Secretary of the Army for Operations Research
- Comptroller of the Army
- Chief of the Army Civilian Personnel Center
- Director of the Concepts Analysis Agency
- Chairman of the System Cost and Automation Department, Army Logistics Management Center
- AMC Deputy for Managment and Analysis
- Director of the Army Materiel Systems Analysis Activity
- Professor and Head, Department of Engineering, U.S. Military Academy
- Commander of the Army Military Personnel Center
- Technical Advisor to the Deputy Chief of Staff for Operations and Plans
- Army Director of Program Analysis and Evaluation
- Commander of the TRADOC Combined Arms Center
- Commander of the TRADOC Combined Arms Operations Research Activity
- Deputy Chief of Staff for Combat Developments, TRADOC
- Director of TRADOC Operations Research Activity
- Scientific Advisor, HQ TRADOC

The plan is people oriented. It will address the needs of individual ORAs, their professional and career development, and the management program and tools required to strengthen and improve the ORA field.

## ORA Advisory Committee

We're off to a good start. In August 1985, we established a joint civilian/military ORA Advisory Committee (see accompanying list).

This Army-wide joint proponency will ensure a close link between the military and civilian programs. The advisory

committee will focus its efforts on getting all of the talent in the civilian and military analytical communities working in optimum concert on behalf of the Army.

In the past, charting one's career path in "ops research" was catch-as-catch-can. Many people in the business found their own way—often successfully, I might add. But such an unstructured approach is confusing to those people just entering the program. To reduce the confusion, we intend to lay out clear, but flexible, career options that will permit ORAs to chart their own direction based on personal interests, capabilities, needs of the Army, and sound program guidelines.

Because of the multidisciplinary nature of the ORA field, we feel strongly that our people must broaden their scope of knowledge and experience. This has to be a partnership, blending individual efforts in self-development with formal opportunities provided under the program. An ORA is often qualified in more than one career series. For example, one might be a qualified Series 1515 ORA and also be qualified as a mathematician or engineer. So, we are going to develop a series of model alternative career paths that an individual can follow through jobs in other disciplines with crossovers to the identified ORA field. Educational qualifications, mandatory and elective training, and developmental job opportunities will be spelled out.

## LOGAMP

The Army's Logistics and Acquisition Management Program (LOGAMP) is a good example of an ongoing program that offers career development opportunities to a mix of careerists, including ORAs. LOGAMP provides both formal training and job assignments through which high potential civilian employees can move to compete for positions at the Senior Executive Service level. At the heart of LOGAMP are multifunctional, interdisciplinary training and developmental assignments in materiel acquisition and logistics.

We envision a program for ORAs that is unashamedly patterned after LOGAMP. The formal education, military schooling, and developmental assignments that will be beneficial in rounding out and honing professional skills will be incorporated into the career program regulation (AR 690-950 Series). The first step is a reality. Our Master Intern Training Plan, developed by the staff of the Department of Intern Training, Army Logistics Management Center, Fort Lee, VA, is now being reviewed by the advisory committee.

## Good Communications

We know that the key to the success of the ORA program will be good communications with careerists. To date, we have had no way to reach the individual because there is no institutionalized way to obtain the mailing addresses of ORA personnel. We want to overcome this problem by encouraging all Series 1515s and other qualified and interested professionals to register in the AMC Announcement Distribution System (AMCADS). This is an Army-wide distribution system for the engineer and scientist career program. Addresses from AMCADS will be used for direct mailing of career program information to ORA personnel, including newsletters and job announcements. To register in AMCADS, individuals should fill out AMC Form 1910, available through their local civilian personnel office. For details, phone HQ, AMC on AUTOVON 284-8509, or commercial (202) 274-8509.

Initially, a semiannual newsletter is planned. We're also exploring the potential for computer network electronic mail service. Other plans include an ORA career opportunities pamphlet and an ORA skill profile, based on Series 1515 population data that we now receive from the Army Civilian Personnel Center.

In addition, the Army Logistics Management Center (ALMC) has developed a pamphlet entitled "How To Approach An Analysis" which defines the role of the analyst in supporting the decision making process and provides an overview of basic analytical techniques. Lessons learned from previous studies are also presented. Information about this pamphlet can be obtained from the ALMC, ATTN: AMXMC-LS-S, Fort Lee, VA 23801-6040, or AUTOVON 687-2442.

As the Army's premier analytical training institution, ALMC offers many excellent courses, including:

- Operations Research/Systems Analysis Continuing Education Program (ALMC-53). This program includes short courses of three to five days on varied subjects of interest to all operations research and systems analyst personnel. The courses are an excellent way to keep current.
- Decision Risk Analysis (ALMC-DA) is a two-week course designed to provide an introduction to quantitative and qualitative methodologies that can be applied to conducting decision risk analysis. This course is recommended for operations research and systems analysts as well as engineers and scientists dealing with cost and weapon system analysis.

FY86 offerings of the System Analysis Cost and Automation Department of ALMC are described in a brochure available from: Commandant, U.S. Army Logistics Management Center, ATTN AMXMC-LS-S (Mrs. Thompson), Fort Lee, VA 23801-6040. Enrollment information and assistance can be provided by your supporting training coordinator or Mrs. Williams at the U.S. Army Logistics Management Center, or by calling AUTOVON 687-2177/3593.

## Conclusion

Civilian operations research analysts must understand the Army—the environment in which he or she works. I firmly believe that an individual can be the world's finest technician, but if that individual fails to comprehend the nature of the business, the Army cannot be effectively served. The ORA program will seek ways to "green" our civilians—individuals are encouraged to make this understanding a self-development goal as well.

Virtually all Army organizations, up to the highest echelons, use quantitative techniques in support of decision making. Today's Army must have an ORA career management program that is responsive to the needs of the service and its people—one that is an investment in the future. I'm pleased to report that GEN Thompson has recognized this need and has made a commitment that it be met!

*MARIE B. ACTON is deputy for management and analysis, HQ, U.S. Army Materiel Command. In 1975, she was awarded a civil service fellowship for graduate study at Indiana University's school of Public and Environmental Affairs.*

## T800 Engine Program

# A Commitment to Excellence

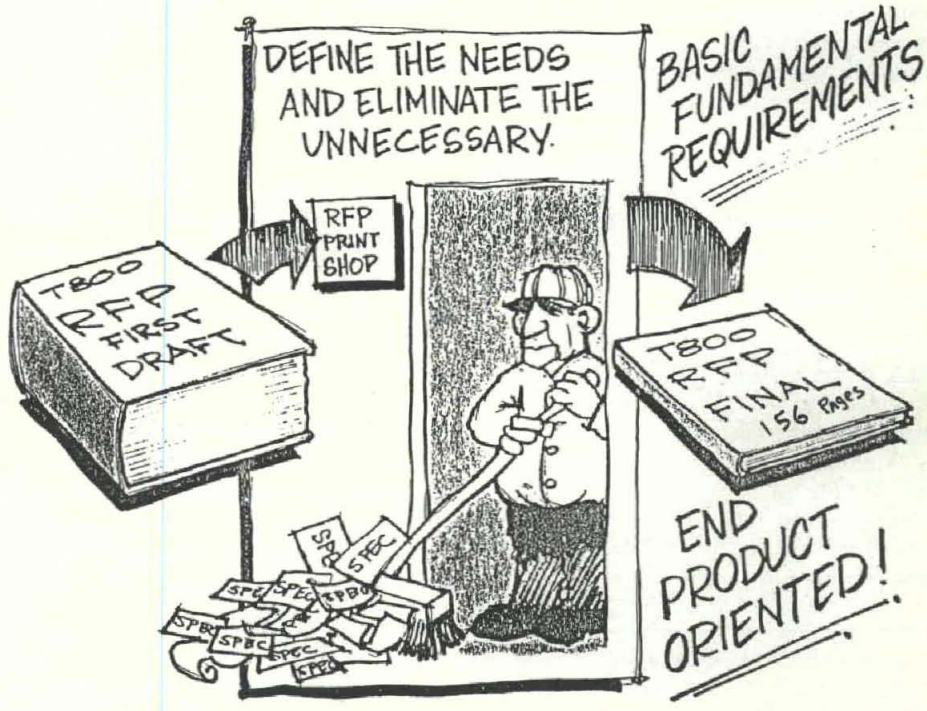
By LTC Willie A. Lawson and Robert M. Deppe

### Background

In the July-August 1985 issue of *Army RD&A Magazine*, the innovative acquisition approach pursued in the Light Helicopter Family (LHX) T800 Engine full-scale development Request for Proposal (RFP) was described. That RFP was a much more simplified document than generally issued by the government and espoused a "performance-oriented" approach in which the government identified its requirements and provided the contractor the opportunity to perform trade-offs and propose the approach and program which best meets those requirements. We eliminated the how-to-do-it from the RFP.

It is important to understand some of the evolutionary process that took place in the early stages of the T800 program. Many briefings and agonizing sessions were conducted with the AMC Commander and the under secretary of the Army in order to implement their guidance concerning the acquisition streamlining principles and initiatives. Many weekends, especially Saturdays, were spent in Washington explaining to the under secretary our progress in streamlining the RFP.

Our very first draft was 750 pages. This was reduced to 571 pages as the result of a number of comprehensive meetings and data calls. We thought this was a very impressive and acceptable piece of work. However, the under secretary thought differently. Seven drafts later (four coordinated with industry for comments), we finally provided the contractors with an RFP that was end product oriented and identified only the basic fundamental requirements. The total number of pages, including system specification and data requirements, was 156. This performance-oriented approach addressed three major program drivers or initiatives: competition, cost, and performance with the objective to transfer as much risk as possible to the contractor.




Our objective for the cost area was firm fixed-price contracts for development and production. Accomplishment of this objective would shift both financial and technical risks to the contractors. To ensure that this shift of risk really meant something, we required the contractors to commit to guarantees for production cost, with those commitments to carry over into the production. We also identified support goals and asked the contractors to commit to an operational and support guarantee with liabilities, and asked the contractors to provide programs that were manageable and evaluated those programs against the corporate commitment.

The RFP required competition in order for us to even begin evaluation. Our objective was to achieve production competition throughout the life cycle of the engine. It was extremely important to have end-item competition with each contractor throughout the life of the production buys. We wanted an increase in the number of vendors as well as small business involvement early on. And finally, we wanted up-front commitment to expand small business participation so that the contractors from the outset would identify those companies capable of producing and competing for parts breakout.

Further, we asked for reliability, availability and maintainability (RAM), and manpower personnel integration commitments in order to develop guarantees in performing those requirements in full-scale development and to carry over that performance into production. If the government was not satisfied with each test or the contractors failed any test during development (in accordance with negotiated pass/fail criteria), they would redesign, retest and requalify, and retrofit at their own expense.

Three proposals in response to the RFP were received March 5, 1985, and a comprehensive Source Selection Evaluation Board was conducted culminating in award of two contracts for full-scale development of the T800 Engine on July 19, 1985. The awards were made to two teams with each team comprised of two major engine manufacturers. One award was made to AVCO/United, a joint

venture comprised of AVCO Lycoming of Stratford, CT, and Pratt and Whitney of West Palm Beach, FL, a Division of United Technology Corp.

The other award was made to the Light Helicopter Turbine Engine Co. which is a partnership between the Garrett Turbine Engine Co. of Phoenix, AZ, and Allison Gas Turbine Division of General Motors Corp, located in Indianapolis, IN. These teams will perform for approximately three years, at which time another Source Selection Evaluation Board will be conducted to select one team that will complete development and enter production. The contractors, at that time, will be evaluated to measure progress toward fulfilling the requirements in the contract and to measure overall progress toward meeting T800 program requirements.

## Competition

The contractors and the Army have made commitments at the outset of development to maximize competition at all levels for the life of the T800 program. As explained above, two contracts were awarded for full-scale development and a competition will be ongoing for a period of approximately three years. This competition will force contractors to pursue design and develop vigorously and activate the required organizations to implement the RAM/ILS and production competition requirements at the outset of the program.

A major requirement of the T800 engine program is establishment and maintenance of two sources for manufacture of an engine to the same design. The two sources will then compete for production beginning not later than the third production lot. Contractors have contractually agreed to exchange the necessary technology and "know how" between the team members during development and production to ensure maintenance of a single design. This includes Class I design changes, Class II design changes, tooling data bases and Materiel Review Board actions.

To accomplish the government requirement for end item competition, the three offerors established a different teaming arrangement. These three arrangements, a joint venture, a partnership and a leader-follower, were viable teaming arrangements.

The government evaluation of the teaming agreements concentrated on two areas. First, did the agreement "fit" the contractors and their individual organizations so the management of the program would not be adversely impacted? Second, did the terms of the agreement conflict with or limit the contract requirements and program goals? Several key clauses were established and incorporated into the contract to assure the teaming arrangements complemented or enhanced the program goals. These provisions include a "Joint and Several Liability" clause, and a "Technology Transfer/Licensing Fee" clause.

Parts competition and breakout were the key areas of competition that received major emphasis during the evaluation and subsequent contract. The contract teams have committed to qualify a minimum of two sources for each part of the engine down to a certain level and have established procedures whereby they will maintain two sources throughout the program. In addition, should any form of breakout and parts management be required (because of high cost parts), the contracts contain priced options to buy technical data packages and/or to qualify alternate vendors.

An important fact is that production competition, to include end item and parts, was a major area of the evaluation criteria for the first time in Army aviation. This emphasis on and commitment to competition should enable the government to control program costs through maximum use of competition and will provide a production base down to the vendor/subvendor level to support surge and mobilization.

The T800-XX-800 RFP, the evaluation plan, and the subsequent Source Selection Evaluation Board actions have enabled the Army to obtain, for the first time, contracts with industry that contain a binding plan for establishment and maintenance of vendors and also supplies competition for engine parts in an expanded industrial support base. The competition plan was negotiated in great detail to provide firm commitments and milestones, as well as challenging goals.

**T800 DRIVERS**

| Initiatives | Objectives |
|---|---|
| Competition | • Two End Item Sources<br>• Alternates for Spares<br>• Small Business Participation |
| Cost | • Firm Fixed Price Development<br>• Production Guarantee<br>• Support Guarantee |
| Product Performance | • Government Requirement/ Contractor Specification and Statement of Work<br>• Development Guarantee<br>Redesign Requalify<br>Retest Retrofit |

## Cost

The government, in formulating the acquisition strategy and requirements of the contracts, attempted to establish the basis for the life cycle costs early in the program.

The R&D portion of the contract, except for support of flight testing, was established on a firm fixed-price basis which poses a substantial risk to the contractors. In addition, the contractors have assigned extensive Design-to-Cost


(DTC) and Operational and Support guarantees. These guarantees are contractually binding provisions negotiated into the full-scale development contact which will carry over into production. On previous programs, DTC and O&S "goals" were established in full-scale development and the contractors were required to exert their best effort to accomplish these goals.

During development then, trade-offs were made and many times the cost goals would take a back seat to the technical requirements. As a result, projected life cycle costs would often increase dramatically. Contractors have now signed up to a not-to-exceed price for production and are committed to not allowing operating costs to exceed a specified dollar amount and to payment of damages if operating costs exceed that guaranteed amount. Cost becomes a major factor in trade-off determinations.

In addition to representing actual numbers, in lieu of goals, the DTC and O&S provisions are flexible enough to account for potential program changes. For instance, the DTC prices are based on a planned production schedule. However, the clause contains a method for determining the price if a quantity less than the planned quantity is procured. Also, the provision establishes that each of the members of the team will have the capacity and will agree to bid on other than a 50/50 split for each production year. This was necessary because if an approximate 50/50 split is required to maintain DTC agreement, a competitive environment does not exist.

Finally, the T800 contracts establish challenging RAM requirements which must be demonstrated during full-scale development. This forces the contractor to integrate RAM into the design, beginning early in full-scale development, so as to have an engine that is less costly to operate and one that will meet the contractor O&S guarantee. Requiring the contractor to meet RAM requirements during full-scale development decreases the expensive additional testing and production changes encountered during a post development maturity phase that has occurred on previous programs.

## Performance

The contract, by being firm fixed-priced and establishing requirements that must be met instead of goals to which the contractor will exert his best effort, will ensure the engine will satisfy the established requirement at the completion of full-scale development. The contractors were provided minimum and maximum requirements, with the minimum being fully acceptable in meeting the government's requirements, i.e., we established the weight to be between 270 pounds as a minimum and 300 pounds as a maximum. We had fuel consumption requirements at 320 pounds per hour desired with 335 pounds per hour maximum.

By identifying basic pass/fail criteria for each of the technical performance tests, contractors have agreed to accomplish any redesign, retest, requalification, and retrofit during full-scale development that is necessary to demonstrate the requirements of the system specification.

The competition that is occurring during full-scale development will provide the government with an opportunity to procure the best performing product. The competition will force the contractor teams to develop the best performing design, including maximization of output power, fuel consumption, and other technical and physical characteristics. Contractors will strive to conduct early substantiating tests of critical items that provide time for corrective measures during development and allow the government to select on the basis of demonstrated success.

## Summary

The contracts signed for the T800 engine full-scale development contain many commitments and guarantees by the contractors to ensure program success. The contractors have assumed a great deal of risk for contract performance. Some of these have been briefly discussed in this article. Many other innovations, guarantees, and special contract requirements have not been described. An after action report detailing the entire process, including RFP preparation, Source Selection Board preparation, evaluation and lessons learned has been written and is available upon request. Copies may be obtained by calling AUTOVON 693-2124/1890 or commercial (314) 263-2124/1890.

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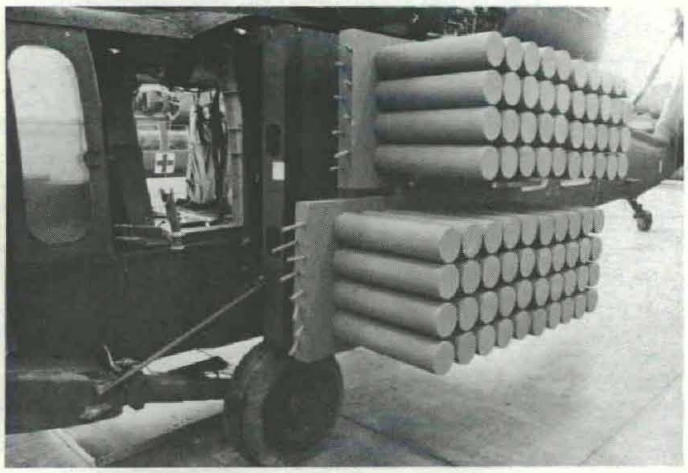
*ROBERT M. DEPPE is a contracting officer at the U.S. Army Aviation Systems Command (AVSCOM). He has been employed at AVSCOM for 11 years and holds a B.A. degree in administration of justice from the University of Missouri.*

# Volcano: A Flexible Force Multiplier



*Volcano mounted on a UH60A helicopter.*

*Volcano mounted on a 5-ton dump truck.*

A new multiple delivery mine system that emplaces anti-armor and anti-personnel land mines from a variety of delivery platforms is currently under development by the project manager for mines, countermines and demolitions in conjunction with the Army Armament R&D Center at Dover, NJ.

A variety of delivery vehicles gives the field commander mine emplacement options in a changing battle situation, while the added versatility and commonality of mines measurably eases the logistics burden on field troops.

The Volcano system, with its rapid mining capability by air or ground vehicles, provides a highly effective and lethal combat multiplier. Volcano can destroy, delay, and disrupt enemy units. As they attempt to pass through or around densely mined areas, enemy units are exposed to prolonged, direct and indirect fire. The enemy's premise for victory is based on mobility, speed, and echeloning to fully employ firepower against allied units. Volcano can quickly deny mobility and speed, and multiplies combat effectiveness.

Volcano's quick deployment can deny the enemy's use of terrain, restrict maneuver options, and prolong lethal exposure of his combat and support units. The mines dispensed are the highly effective anti-tank and anti-personnel Gator mines, which are now in production. The proven lethality and a choice of three self-destruct options allows the maneuver commander to ensure that Volcano's use does not restrict friendly mobility or maneuver.

Volcano utilizes the modular theory in its system design. Under this concept, the major functional units are broken out and represent stand alone subcomponents. The benefits are numerous, including ease of manufacture, maintenance, repair, and a maximization of utility among the numerous delivery vehicles. By varying the mounting hardware the same components can be utilized by the UH60A, the 5-ton dump truck, and the 5-ton cargo. Also, plans have been developed to utilize the system's components on other vehicles such as the Marine Corps Light Armored Vehicle and the Landing Vehicle Tracked.

The Volcano system is operated through the dispenser control unit (DCU) which provides the system with test features that assure proper assembly, circuit continuity, active mine canisters, and, if required, trouble shooting fault isolation. The DCU also contains the mine dispensing switches, emergency power cut offs, the rate of dispensing switch, and a memory of numbers of loaded, undispensed canisters. For the air system, the DCU includes an emergency jettison switch. Finally, if a canister fails to dispense, the DCU informs the operator and tells him the location of the failed canister.

The Volcano rack contains the mounting location for the canister, the locking mechanism, the mechanical arming mechanism, and the electrical circuitry between each canister and the DCU. It can hold 40 canisters with 240 mines. Two major delivery vehicles are the UH60A and the 5-ton dump truck. Each one of these will be able to carry four racks for a total mine payload of 960 mines.

The Volcano mines are housed in the mine canister which contains one anti-personnel and five anti-tank mines. The canister also includes the propulsion cartridge for expulsion of the mines and the electrical interface for mine battery power initiators and for self-destruct time setting.

The racks are attached to a variety of delivery vehicles by a set of mounting hardware. Mounting hardware designs can vary depending on the particular vehicle. This is the only component that does not have commonality throughout all the applications.

A final but perhaps very important aspect of the Volcano program is the rapid development schedule currently being followed and the system's success against the schedule. Volcano complies with the current Army Materiel Command objectives of a four year development. A ground system application will be type classified first and then a limited production will be initiated in parallel with the air system development. This represents a significant shortening of the acquisition cycle.

# Contaminated Environment Operations Studied

Armor crewmen from Fort Knox, KY, and Aberdeen Proving Ground (APG), spent long hours buttoned up inside M1 tanks wearing full Mission Oriented Protected Posture (MOPP) gear as part of a recent Army evaluation of extended operations in a contaminated environment. The study was a joint effort among the U.S. Army Human Engineering Laboratory (HEL), the Army Armor and Engineer Board, and the Army Medical R&D Command.

The investigation, which was called Ironman, was conducted in the Moving Target Simulator test facility at APG and supported by the U.S. Army Combat System Test Activity at APG.

The Army Research Institute of Environmental Medicine, the Army Aeromedical Research Laboratory, and the Walter Reed Army Institute of Research (WRAIR) also participated in the evaluation. The U.S. Army Materiel Systems Analysis Activity, the Army Ordnance Center and School, and 523rd Military Police Company at APG provided soldiers who assisted as master controllers and radio telephone operators. These soldiers, together with trained civilians, followed a 72-hour tactical scenario script written by HEL and Fort Knox.

Monica Glumm, an engineering psychologist at HEL and the Ironman test director, said the study is designed to measure the degradation in crew performance during continuous combat vehicle operations. Potential solutions to problems associated with long-term confinement in a contaminated environment are being examined to determine the effect they might have on effective crew performance. If performance degradation was determined, potential solutions included changes in training and doctrine procedures and hardware improvements.

***The seat sling used in the test enabled the M1 driver to assume a reclined position, allowing for improved blood circulation.***

Seats for the commander, gunner and loader were modified so they could be pivoted easily to allow the crew members to take a semi-reclining position. A seat sling developed for the M1 driver's position was evaluated during the test. The sling allowed the driver to take a supine posture during rest periods to improve blood circulation and to minimize blood pooling in the lower abdomen that occurs from long hours in a partially reclined position.

Another piece of equipment developed for assessment was a sleep hammock. The hammock, which was designed for easy installation and rapid removal, enabled one turret crewman to fully recline during sleep periods.

The test also included an evaluation of food in a tube resembling a toothpaste container. The food was consumed through a tube inserted in the protective mask. Ration warmers were provided to heat the tube food. Also, a drinking system, incorporating a squeeze bulb that delivered fluids from the canteen through a drinking tube to the mouth, was used instead of the gravity feed method.

Some of the crews who participated in the baseline tests were not provided any of the training, doctrine or hardware solutions. Some crews were provided only the hardware improvements; others only the training and doctrine solutions. Some crews were given the opportunity to use all the potential fixes.

Crews remained in their vehicles for extended periods of time. The primary factor influencing crew endurance was heat.

"It was awfully hot and sweaty," said LT Tim R. Smith, tank commander of one Fort Knox crew. After the stint inside the tank wearing the bulky MOPP gear, Smith said he wanted to take a long soaking bath. PVT Kevin Shea, the driver in the same crew, had a different craving. He had had pizza on his mind for the time he was in the vehicle, during which the crews had fluids and tube food but no solid food.

Crew members had their core temperature monitored constantly, along with their heart rate, to assure their safety. Physicians and medics from WRAIR were present throughout the evaluation.

A Semi-Automated Scoring System, a computerized polygraph, measured the quality and quantity of the sleep of the crew members during the investigation

***The soldier is wearing the full MOPP protective gear with the XM43 aviator's mask.***

to compare it with their sleep once out of the tanks and MOPP gear.

During their confinement in the tanks, the crews performed tasks like target tracking and engagement, loading and encoding and decoding. Slides projected on the test facility wall provided the terrain scenery. These slides would periodically change to present vehicle targets on the terrain backdrop. The test facility's laser systems provided a moving target for the target tracking task. Crew members left the tanks every seven hours to perform such tasks as refueling, ammunition resupply, weapon disassembly/assembly, and vehicle/aircraft identification.

Since the tanks were stationary during the evaluation, the driver had the fewest tasks to perform. A video game that simulated driving was installed, and the driver played it once an hour. Shea said his performance in the game got worse over time, and he noticed his patience wearing thin with it and the other crew members. When he "crashed" in the course of the game and received the standard razzing from the other crew members, he said he resented it more than if the same situation had occurred in a video arcade.

Questionnaires and interviews provided information on the crewman's background, job satisfaction and the cohesiveness of his crew. During their confinement in the vehicle, crewmen provided information on mood changes and physical discomforts. Comments on the test environment and opinions on the potential solutions were included in post-test questionnaires and interviews.

# Catalysis: The Future for Decontamination

By Dr. Reginald P. Seiders

## Current Decontaminants

An improved decontamination system has long been one of the primary objectives of the Army's research and development program in chemical defense. Both of the standard decontaminants currently fielded are very corrosive or aggressive toward materiel and personnel, and both present severe logistic burdens. The first of these, Decontaminating Solution Number Two (DS-2), is an excellent, highly reactive decontaminant, but it readily removes paint from most surfaces and dissolves or softens many polymeric materials on contact. DS-2 also contains organic chemicals which make it flammable and therefore hazardous to use near hot surfaces such as engine compartments or exhaust areas.

The second fielded decontaminant is Super Tropical Bleach which contains calcium hypochlorite, a highly alkaline bleach or oxidizing substance that is extremely corrosive to most metal surfaces. Because it is such a strong oxidizer, it presents special logistical problems in packaging and storage.

Neither of these decontaminants can be left on the equipment indefinitely, and in fact must be rinsed off with copious volumes of water to minimize equipment degradation. So much water is required that typical decontamination operations quickly become mud holes or quagmires. It is difficult to envision an AirLand Battle 2000 fighting unit bogged down in such a time-consuming and burdensome operation.

## New Decontaminants

A new generation of decontaminants is on the way however, thanks to exciting new discoveries in the university laboratories of two chemists receiving Army Research Office (ARO) support. Both of these new decontamination reagents are true turnover catalysts. That is they are rapidly regenerated after reactions with, for example, a nerve agent. Thus, they can consume hundreds of times their own weight in nerve agent! This would of course present a tremendous logistical advantage if the soldier only needed to apply a small quantity of catalyst to destroy a large amount of toxic chemical agent.

**COMPOUND 1**

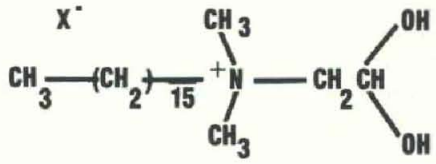



*Figure 1.*

The first and less well studied system is the aldehyde hydrate (Figure 1) that was developed at Emory University by Professor Fred Menger. Menger correctly reasoned that the proximity of the positively charged nitrogen would make the oxygen protons easier to remove. The resultant oxygen anion was found to react readily with nerve-agent type compounds, and in the slightly basic solution, the proton on the other oxygen came off to decompose the intermediate and subsequently produce the aldehyde precursor to compound 1. Finally, in the aqueous environment, water adds to the aldehyde precursor to regenerate compound 1 and complete the cycle.

Menger is actively pursuing better synthetic routes to compound 1 and is also searching for derivatives that could be even more potent catalysts. He has generously donated a sample of compound 1 to the Chemical Research & Development Center (CRDC) for evaluation with actual nerve agents.

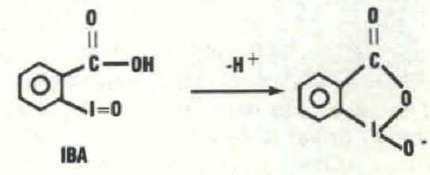
The second and more exciting catalytic system was discovered by Professor Robert Moss at Rutgers University. He found that the commercially available compound, ortho-iodosobenzoic acid (IBA) (Figure 2), when dissolved in a mildly buffered, simple micellar (detergent) solution, would catalytically hydrolyze nerve-agent type compounds at rates that were as good as or better than anything yet developed. Since the initial discovery, Moss has synthesized several other, even more potent derivatives of IBA. He has also generously supplied samples to CRDC for actual nerve agent testing.

Researchers believe that the active form of IBA in the mildly basic (pH 7.5) micellar solution is the cyclized anion 3. This oxygen anion is a potent nucleophile that attacks the phosphorus center of nerve agents. The resultant intermediate is then attacked by nearby hydroxide to produce hydrolyzed nerve agent and regenerated IBA (or its anion 3).

IBA has other attributes that distinguish it as the prime candidate for a new multipurpose catalytic decontaminant. Animal studies have shown that it has very low toxicity. This finding, together with the exceedingly rapid nerve agent destruction, has attracted the attention of the skin decontamination group at the Medical Research Institute of Chemical Defense (MRICD). This group has been working closely with personnel from the Applied Chemistry Branch of CRDC to fully evaluate IBA as a potential skin and wound decontaminant. The skin decontamination group has found that IBA is one of the best candidates for formulation as a lotion or cream to be used for personal decontamination.

Another favorable attribute of IBA is its mild oxidative properties which give it antibacterial characteristics. As an oxidant, it also has the potential to destroy H and V agents. Indeed, recent results re-

**COMPOUND 2** **ANION 3**




IBA

*Figure 2.*

veal that IBA does react with close nerve-agent type compounds of H and V, and with V itself although the reactions appear not to be catalytic. Finally, this oxidative power is responsible for IBA's well documented ability to detoxify certain proteins and enzymes that could be found in snake venom or other biologically derived poisons. Thus, IBA has additional potential as a toxin decontaminant.

A final positive point to discuss regarding IBA is the solution in which it is used. The detergents that are required to make IBA act as a catalyst will also help remove oil, grease, dirt, and other toxic compounds that don't dissolve well in water. Also, because the solution is mild and non-corrosive, it does not require rinsing. The soldier could simply spray the IBA solution on a vehicle for example, and then drive it off a few minutes later.

The development of a catalytic multipurpose decontaminant would further help the soldier in many other ways. He could decontaminate himself and/or equipment more quickly and easily because less IBA would be needed. This would translate directly into a logistics improvement because less decontaminant would be needed in the field. Since rinsing would not be required, water would be conserved and, in addition, the equipment could return to service more quickly. Thus, the whole decontamination operation could be streamlined to produce a more mobile and effective fighting unit. Finally, the faster decontamination operation following a chemical attack would allow the soldier to remove some of his cumbersome chemical protective gear, and thereby enhance his fighting efficiency earlier.

## Summary

In summary then, the development of new catalytic decontaminants is proceeding briskly. The best candidate at the present time is IBA, a very versatile compound that may be a true multipurpose decontaminant. Since its discovery by university investigators, IBA has progressed rapidly into the Army laboratories at CRDC and MRICD. This is another excellent example of the strong government-industry interface that is producing new technology to aid tomorrow's Army.

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## Army Simulates Everest Ascent

The U.S. Army Medical Research and Development Command is currently sponsoring a study of the health effects of high terrestrial altitude by simulating a Mount Everest climb in an altitude chamber.

Operation Everest II (OE II) will demonstrate how healthy men adjust to long-term reductions in oxygen, the major environmental change encountered with increasing terrestrial altitude. A similar project, OE I, was conducted in 1946, and resulted in a definitive study of altitude physiology. The sophistication of 1980s medical technology is expected to help investigators develop new data, and make OE II a valuable source of information about illnesses that diminish respiratory capacity, such as emphysema, asthma, and heart failure.

Eight volunteers, selected from 50 applicants, have been living in the confined quarters of an altitude chamber since last October. They represent a mix of interests and accomplishments, are from 20 to 30 years in age, and range from college seniors to resident physicians, and from Olympic class cyclists to a martial arts teacher. All consider themselves athletes and most are mountaineers.

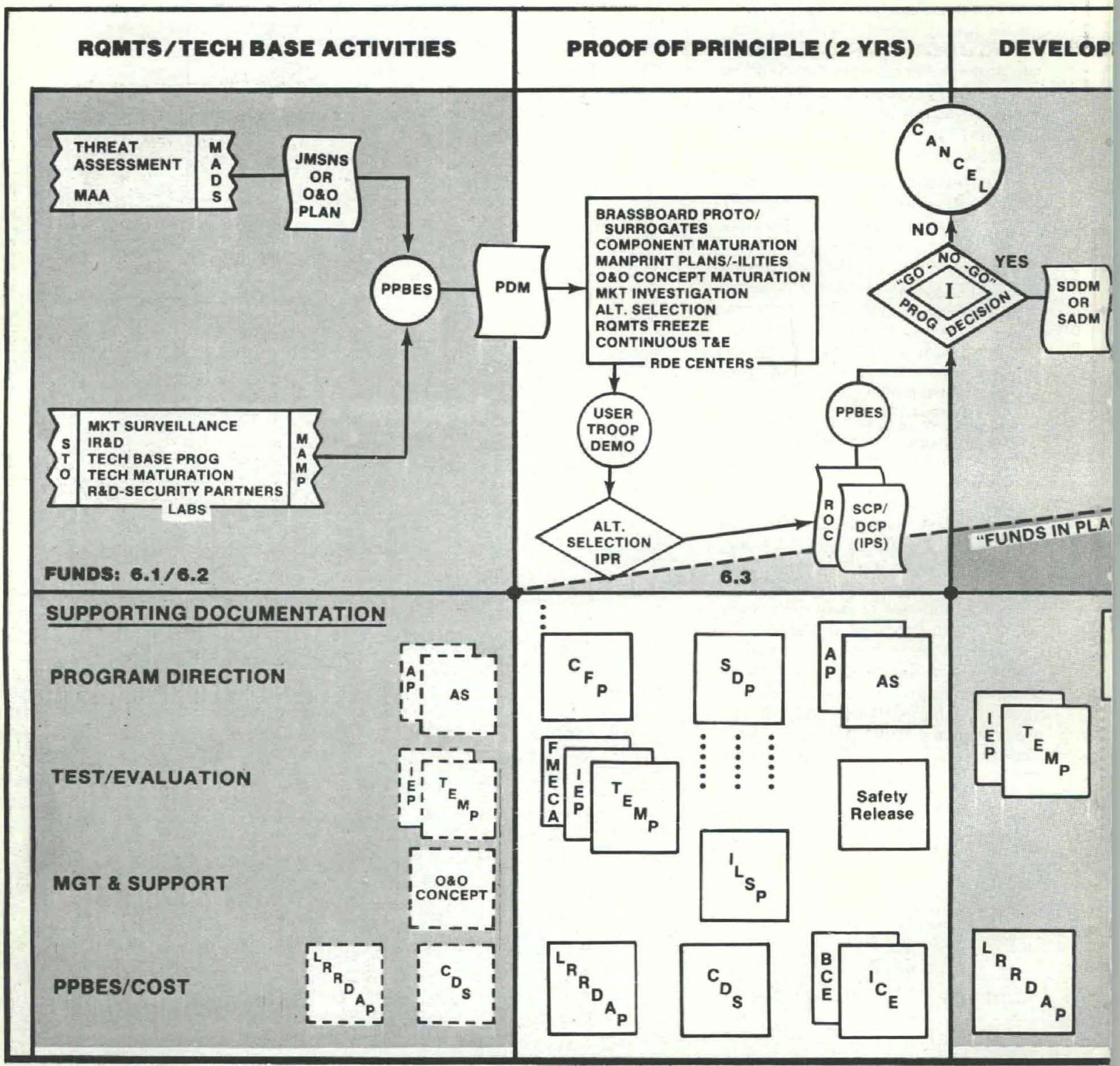
Physiologic adjustments in man begin around 8,000 feet above sea level and are important to soldiers deploying in mountainous terrain because incapacitation can occur if allowances are not made for performance decrements that these physiologic adjustments initially cause. Although the more dramatic parts of this study occur above 18,000 to 20,000 feet, the changes observed above 8,000 to 10,000 feet will be of significance to military operations.

Medical studies include maximal exercise treadmill tolerance tests with central arterial and venous catheters in place and collection of expired air. Blood oxygen, electroencephalogram, respiratory exchange rate, and composition of exhaled air of sleeping subjects are recorded. Speed and accuracy of eye-hand coordination are also measured. Other studies include leukocyte activity, muscle histochmeistry, retinal changes, and electrocardiogram and echocardiogram alterations.

OE II is funded by the U.S. Army Medical R&D Command and is being conducted at the U.S. Army Research Institute of Environmental Medicine (USARIEM) in Natick, MA. The 20 participating scientists are international leaders in altitude physiology in the U.S. and Canada. Three of the principal investigators are Charles S. Houston, M.D. (Arctic Institute of North America); John T. Sutton, M.D. (McMaster University); and Allen Cymerman, Ph.D (USARIEM).

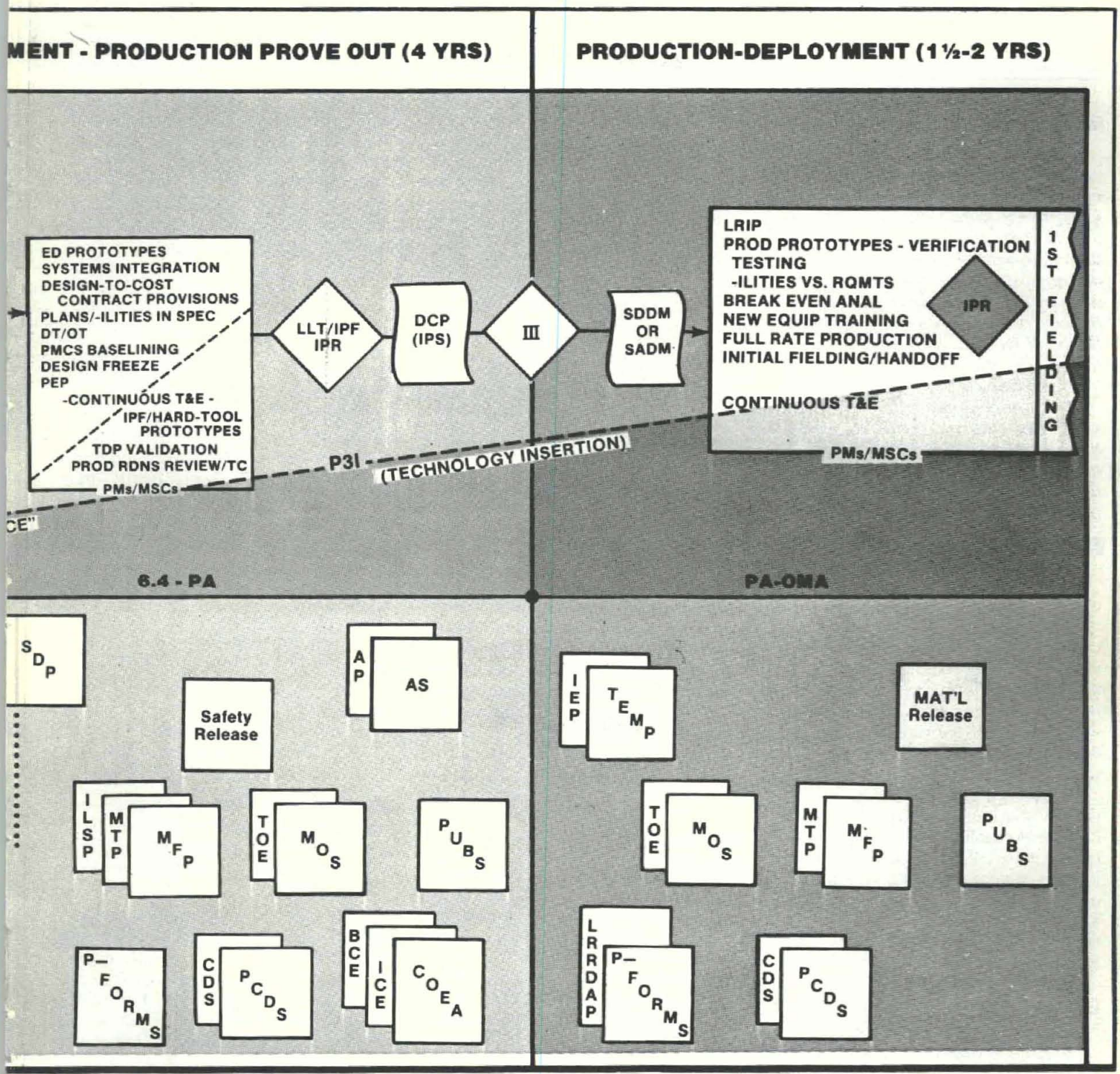
For further information contact Chuck Dasey, public affairs officer, U.S. Army Medical R&D Command, AUTOVON 343-2732, or commercial (301) 663-2732.

# AMC'S STREAMLINED A




**AS** ..... Acquisition Strategy
**A-Team** .... Acquisition Team
**BCE** ..... Baseline Cost Estimate
**BOIP** ..... Basis of Issue Plan
**BTA** ..... Best Technical Approach
**CDS** ..... Congressional Descriptive Summary
**CFP** ..... Concept Formulation Package
**CMP** ..... Configuration Management Plan
**COEA** ..... Cost and Operational Effectiveness Analysis
**CRMP** ..... Computer Resource Management Plan
**DCP** ..... Decision Coordinating Paper
**DT/OT** ..... Development Test/Operational Test
**EA/EIS** ..... Environmental Assessment/Environmental Impact Statement
**ESAR** ..... Electromagnetic Spectrum Allocation Request
**FMECA** .....Failure Mode Effects and Criticality Analysis
**HFEA** ..... Human Factors Engineering Analysis
**HHA** ..... Health Hazard Assessment
**ICE** ..... Independent Cost Estimate
**IEP** ..... Independent Evaluation Plan
**ILSP** ..... Integrated Logistics Support Plan
**IM-RSI** ..... International Military RSI
**IPR** ..... In-Process R
**IPS** ..... Integrated Pr
**JMSNS** .... Justification
**LOA** ..... Letter of Agr
**LR** ..... Letter Requir
**LRRDAP** ... Long Range I Acquisition P
**MAA** ..... Mission Area
**MADS** ..... Mission Area
**MFP/MTP**... Materiel Field Transfer Plan

# ACQUISITION PROCESS

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**O&O** ..... Operational and Organizational Plan
**PCDS** ..... Procurement CDS
**PDM** ..... Program Decision Memorandum
**PPBES** ..... Planning, Programming, Budgeting and Execution System
**QQPRI** ..... Qualitative and Quantitative Personnel Requirements Information
**ROC** ..... Required Operational Capability
**RSI** ..... Rationalization, Standardization and Interoperability
**SADM** ..... Secretary of the Army Decision Memorandum
**SCP** ..... System Concept Paper
**SDDM** ..... Secretary of Defense Decision Memorandum
**SDP** ..... System Development Package
**SSPP** ..... System Safety Program Plan
**STO** ..... Science and Technology Objectives
**TEMP** ..... Test and Evaluation Master Plan
**TOA** ..... Trade-Off Analysis
**TOD** ..... Trade-Off Determination

**ACRONYMS**

# Warranties — They Are Here to Stay!

**By COL Johnny L. Lambert**

***"The idea of obtaining a warranty on a weapon system is ridiculous! In commercial business, the manufacturer offers his warranty to the customer, but now, the customer is going to dictate to the manufacturer the terms of the warranty. Warranties will drive up the cost of our weapons! The potential risk in guaranteeing the performance of a weapon system is so high it will drive small companies out of the defense business! This will ruin the breakout program because only a few companies will be able to bid. We'll be forced to buy all our spare parts from the original manufacturer."***

These comments were typical reactions to the enactment of the new warranty law in 1984. Despite these concerns, the dust is finally starting to settle and we are now routinely going about the business of obtaining warranties on our weapons systems. The events of the past two years have caused a dramatic turnaround in both the philosophy and use of warranties within the Army.

The following discussion will address the law, the temporary revision to the Defense Federal Acquisition Regulation Supplement (DFARS) implementing this law, and current status of Army efforts to obtain warranties on weapon systems. Throughout this article the terms warranty and guarantee are used interchangeably.

## Background

Prior to 1984 the use of warranties was not mandatory. Department of the Army policy, as set forth in AR 702-13, was to obtain a warranty only when it was demonstrably in the best interest of the government or when it was impossible to procure equipment without a warranty. The enactment of Section 794 of the Department of Defense Appropriation Act, 1984, ended this policy. This law, with few exceptions, required written warranties to be obtained in the procurement of weapons systems.

Despite considerable testimony by DOD officials and industry representatives urging the repeal of Section 794, the Congress did not do so. The FY85 DOD budget submission also proposed repeal of Section 794 and that no such provision be included in the FY85 act. The Senate Armed Services Committee (SASC) held hearings on Feb. 28, 1985 to consider the issues. Sen. Mark Andrews of North Dakota (the author of Section 794), DOD officials, and eight outside witnesses testified.

Following these hearings, the SASC agreed they were in accord with Andrews that properly crafted warranties have an appropriate place in our efforts to purchase effective weapons. The SASC prepared a proposed new law and, in conference with the House Armed Services Committee, agreed to provide new legislation on warranties.

The FY85 DOD Authorization Act repealed Section 794, effective Jan. 1, 1985, and enacted new language in Section 2403 of Title 10 United States Code. The Defense Acquisition Regulatory (DAR) Council issued an interim change to the DFARS, bringing the DOD into compliance with the provisions of the law. This change was published in the Federal Register for public comment and will be discussed later in this article.

## The Law

Section 2403 consists of eight subsections. Subsection (a) defines the terms used in this section. "Weapons systems" are defined as items that can be used directly by the armed forces to carry out combat missions. Only systems with a unit cost of more than $100,000 or for which the eventual total procurement is more than $10,000,000 are covered.

A "prime contractor" is a party that has entered into an agreement directly with the United States to furnish part or all of a weapon system. "Design and manufacturing requirements" refers to the structural and engineering plans and manufacturing particulars and finished product tests for the weapon system. "Essential performance requirements" are the operating capabilities or maintenance and reliability characteristics of the system that are necessary for the system to fulfill the military requirement for which the system was designed.

"Components" are defined as any constituent element of a weapon system. "Mature full-scale production" refers to the manufacture of all units of a weapon system after the manufacture of the first one-tenth of the eventual total production or the initial production quantity of a system, whichever is less. The "initial production quantity" is the number of units of a weapon system contracted for in the first year of full-scale production.

Subsection (b) provides the general requirement to obtain warranties and establishes the minimum remedies in the event the system fails to meet the warranty requirements. Specifically, this subsection states the agency may not enter into a contract for the production of a weapon system unless each prime contractor for the system provides the United States with written guarantees that the item provided under the contract will:

(1) conform to the design and manufacturing requirements specifically delineated in the production contract;

(2) at the time it is delivered to the United States, will be free from all defects in materials and workmanship and;

(3) will conform to the essential performance requirements as specifically delineated in the production contract.

If the item provided under the contract fails to meet the guarantees specified above, the contractor will, at the election of the secretary of defense or as otherwise provided in the contract, promptly take such corrective action as may be necessary to correct the failure at no additional cost to the United States, or pay costs reasonably incurred by the United States in taking such corrective action.

Subsection (c) is a general exemption for government furnished equipment. This provision states that we may not require the guarantees in Subsection (b) from a prime contractor for a weapon system, or for a component of a weapon system, that is furnished by the United States to the contractor.

Subsection (d) concerns the authority granted to the secretary of defense to waive some or all of the requirements of this section. It states he may waive part or all of the warranties required by Subsection (b) if he determines that the waiver is necessary in the interest of national defense, or that a guarantee under that subsection would not be cost effective.

This authority may not be delegated below the level of assistant secretary of defense or assistant secretary of a military department. For the Army, this authority has been delegated to the assistant secretary of the Army for research, development and acquisition.

Subsection (e) provides requirements to notify the Congress when the secretary of defense intends to waive the warranty requirements. In the case of a weapon system that is a major defense system, the secretary is required to notify the Committees on Armed Services and Appropriations of the Senate and the House of Representatives in writing of his intention to waive the requirements of this section and to include an explanation of the reasons for the waiver. Although it is not specified in the law, the committees have indicated that they expect to be notified 30 days in advance.

For non-major systems, the secretary is required to submit an annual report by Feb. 1 of each year to these same committees identifying each waiver and including an explanation of the reasons for the waivers.

Subsection (f) states the requirement for a performance guarantee (Subsection (b)(3)) applies only to contracts for weapon systems in mature full-scale production. However, it does not preclude obtaining such a guarantee for a weapon system that is not yet in mature full-scale production. Notwithstanding this exception, the secretary is required to notify the Congress, as stated in Subsection (e), when a contract for a weapon system not yet in full-scale production is not to include the guarantee described in Subsection (b)(3).

Subsection (g) clarifies issues relating to implementing this section. It states that: specific details of a guarantee, including reasonable exclusions, limitations and time duration may be negotiated so long as the guarantee is consistent with the general requirements of this section; components of a weapon system furnished by the government to a contractor must be properly installed so as not to invalidate any warranty provided by the manufacturer of the component to the government; the price of any contract for a weapon system or other defense equipment may be reduced to take into account any payment due from the contractor pursuant to the remedies clauses; in the case of a dual source procurement, the second source contractor may be exempted from the requirements of Subsection (b)(3) for an amount of production equivalent to the first one-tenth of his eventual total production; and written guarantees may be used to a greater extent than required and that the remedies may be more comprehensive than those specified by this section.

Finally, Subsection (h) directs the secretary of defense to prescribe such regulations as may be necessary to carry out this section.

## The Regulation

Defense Acquisition Circular (DAC) 84-9 revises Subpart 46.7 of the DFARS to incorporate the changes required by Section 2403. Because the DAR Council only had about two months to prepare and publish implementing guidance, there was insufficient time to publish a draft for public comment as required by Subsection 2303a Title 10 of the United States Code. Therefore, DAC 84-9 was published in the Federal Register Jan. 2, 1985, as a temporary regulation and provided a 60 day period for public comment.

Both industry and government activities have responded; but to date, the DAR Council has not issued a permanent change to Subpart 46.7. Therefore, the comments that follow address the changes implemented in DAC 84-9. Since most of Subpart 46.7 is simply a straightforward implementation of Section 2403, I will discuss only those sections that provide additional guidance or are particularly controversial.

In Subpart 46.770-1, the wording of the Section 2403 definition of "essential performance requirements" was changed from "operating capabilities or maintenance and reliability characteristics of a weapon system" to "operating capabilities and maintenance." I believe this change from "or" to "and" may cause confusion as to what types of performance requirements may be considered essential. The wording in the law provided the appropriate flexibility needed in dealing with the wide variety of weapons systems purchased by all the services. The DFARS language should be changed to conform with the law, or perhaps to read "and/or."

The definition of a "weapon system" was taken verbatim from Section 2403. However, it was then considerably expanded:

> By way of illustration the term "weapon system" includes, but is not limited to the following, if intended for use in carrying out combat missions: tracked and wheeled combat vehicles; self-propelled, towed and fixed guns, howitzers and mortars; helicopters; naval vessels; bomber, fighter, reconnaissance and electronic warfare aircraft; strategic and tactical missiles including launching systems; guided munitions; military surveillance, command, control, and communication systems; military cargo vehicles and aircraft; mines; torpedoes; fire control systems; propulsion systems; electronic warfare systems; and safety and survival systems. This term does not include related support equipment, such as ground handling equipment, training devices and accessories thereto; or ammunition, unless an effective warranty for the weapon system would require inclusion of such items. This term does not include commercial items sold in substantial quantities to the general public as described at FAR 15-804.3(c).

In my opinion, this "laundry-list" definition goes too far, particularly all the systems listed from "military surveillance" to the end of the sentence. These terms may have different meanings to each service and should be eliminated. For example, the Army has many items that are considered to be command, control and communications systems or safety and survival systems but are clearly not weapons systems.

A better definition would be the one originally proposed by the DFARS Warranty Subcommittee: "In executing assigned combat missions, this equipment is used to discover/identify a hostile threat or to place/apply a force that neutralizes a hostile threat." This expansion of the definition provided in Section 2403 is sufficient. Each of the services can then provide whatever additional guidance may be necessary in their own supplements to the DFARS.

Another area requiring clarification is the requirement for warranties on components. It is not clear when a component becomes a major subsystem, if items used in production contracts should be handled differently than those used for spares, or if the $100,000 or

$10,000,000 criteria should be applied here as well. The DFARS does not address this issue.

In Subpart 46.770-3, the concept of tailoring warranty terms and conditions from Section 2403(g) is discussed. In part, this discussion states "Contracting Officers shall appropriately tailor the required warranties on a case-by-case basis, including remedies, exclusions, limitations and duration; provided such are consistent with the specific requirements of this section." Some contracting officers have attempted to use this as a basis for accepting warranties that only partially comply with the law. This is wrong. *Every warranty must comply with the law in every respect, or a waiver or partial waiver must be approved.*

In subpart 46.770-7, the applicability of warranty requirements to Foreign Military Sales (FMS) is addressed: "It is the policy of the Department of Defense to obtain for FMS purchasers the same warranties against defects in workmanship and material and conformance to design and manufacturing requirements as is obtained by the United States for similar purposes. DOD will not normally obtain essential performance warranties for FMS purchasers." Section 2403 did not mention FMS, therefore this subpart provides that necessary guidance.

Subpart 46.770-8 discusses the need for a cost-benefit analysis. DOD policy is to obtain only cost-effective warranties. In determining this cost-effectiveness, Subpart 46.770-8 states that the "analysis should examine a weapon's system life cycle cost, both with and without a warranty. . . . The analysis should be documented in the contract file." Obviously, to conduct this analysis, all costs of the warranty must be known. This is not always an easy task.

In Subpart 46.770-9, waiver and notification procedures are established. The requirements are the same as those in Section 2403. For the Army, procedures for processing waivers, notifications and reports are described in the Army FAR Supplement, 46-770-9(d). Requests for waivers must be submitted to the assistant secretary of the Army for research, development and acquisition at least 45 days prior to the anticipated award date and will include the following information according to the FAR Supplement, 46-770-9 (d):

- identification of all warranty costs and procedures used to evaluate cost effectiveness;
- what efforts were made to negotiate a modified warranty;
- if entire system is not warranted; any warranties obtained on individual components;
- commercial or other guarantees to be included in lieu of required warranty provisions;
- actions taken to preclude waivers on future procurements

Although the DFARS does not contain a warranty clause, the Army did publish a sample warranty provision in Acquisition Letter 85-2, dated Jan. 4, 1985 in order to assist contracting officers. This clause was not provided as policy; it was for information only.

## Current Status

Within the Army, the Office of the Assistant Secretary of the Army for Research, Development and Acquisition has been working closely with the Office of the Deputy Chief of Staff for Logistics and the Army Materiel Command (AMC) to develop sound policies and procedures to comply with the intent of the Congress. This effort has not been without growing pains.

There are two current initiatives that are particularly worthy of discussion. They are the shift away from "total coverage" warranties and the development of a cost-effectiveness model. In our initial efforts to comply with Section 794, there was a tendency to try to cover all failures under the warranty provisions. Despite guidance that warranties should cost no more than one to three percent of the contract cost, this approach was expensive, and it did not capture the essence of previously established performance requirements.

We do not expect our weapons systems to operate perfectly 100 percent of the time. For example, most specifications provide a mean time between failures or provide for a maximum number of failures during a prescribed period of operation. Yet, in developing warranties, we asked the contractors to cover all failures that occurred during the warranty period. These contractors did not have failure data, and we had not collected these data in such a way as to accurately track the causes of failures. Therefore, neither the government nor the contractor was able to determine the risk associated with the warranty.

We are now using an approach that allows for the "expected" number of failures. Using this technique, the government accepts those failures that occur within the parameters of those essential performance requirements in the contract. If failures occur beyond those parameters, the contractor is then responsible for taking corrective action within the terms of the warranty. Simply stated, if the contractor provides a weapons system that performs as expected, in accordance with essential performance requirements in the contract, and has no more failures than expected, there should be no warranty claims. In contracts where this methodology has been used to date, we have been able to negotiate effective, low-cost warranties. In one instance, the only cost was the administrative expenses of developing and monitoring the program.

Another important initiative has been the development of a cost-effectiveness model. This warranty cost-effectiveness model was developed by the U.S. Army Aviation Systems Command and is now being used throughout AMC. The model provides a cost-effectiveness analysis with and without a warranty, risk and sensitivity analysis showing fluctuations in the number of warranted failures and most importantly provides the contracting officer a "should cost" for the warranty. If the contracting officer can negotiate a warranty at a cost equal to or less than this cost, the warranty should be cost effective. If an agreement cannot be reached at this level, then a waiver should be considered.

## Warranties Are Here to Stay

Now that the dust is settling, and with both the government and industry accepting the fact that warranties are here to stay, I believe we are finally ready to quit fighting the problem and to get on with a common sense approach to making warranties work. The right attitude on the part of industry and the government should result in more reliable weapons. Our mutual goal should be to never have to use a warranty.

*COL JOHNNY L. LAMBERT is the deputy for program requirements in the Office of the Assistant Secretary of the Army for Research, Development and Acquisition. He received a B.S. degree from Oregon State University and an M.B.A. from the University of Oregon.*

# Realignment of ASA (RDA) Office

Realignment of the structure and several functions of the Office of the Assistant Secretary of the Army (Research, Development and Acquisition) has been approved by the secretary of the Army. The change will permit the assistant secretary of the Army (ASA) for research, development and acquisition to place greater emphasis on the establishment of materiel requirements, human factors considerations in materiel development, acquisition planning, weapons systems integration, productivity and quality assurance in materiel acquisition, and on the Army's role in space endeavors.

The ASA (RDA) retains responsibility as the Army's procurement executive and has full responsibility for the Federal Acquisition Regulation, the DOD Federal Acquisition Regulation supplement, and for the Army Federal Acquisition Regulation supplement.

The realignment groups functions of the Office of the ASA (RDA) into the following principle areas:

- the front end of the acquisition process with emphasis on technology development, the requirements process, human factors engineering, integrated logistics support, training, and major Army systems;
- the overall acquisition function with particular emphasis on procurement/contract policy and the early development and acquisition strategies for major Army systems; and
- the evaluation of program performance against plans and initiatives to increase productivity and quality and to encourage capital investment.

Grouping of the acquisition process into these three areas gives the office a more disciplined and focused approach to developing and acquiring materiel. Specific responsibilities are assigned for all phases of the acquisition process, from the development of various technologies, to the formulation of requirements, to the strategy for acquiring an item, and to the evaluation of program execution against established plans.

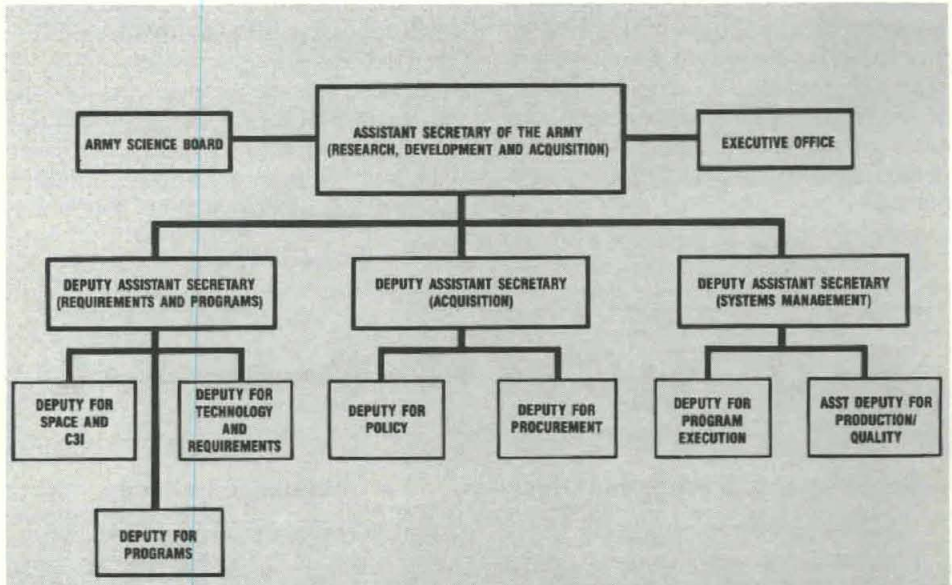


*Figure 1 shows the realigned ASA (RDA) Office.*

## Requirements and Programs

The new Office of the Deputy Assistant Secretary of the Army (Requirements and Programs) is divided into three areas, as shown in Figure 1. In the first area, a "Space" function has been added to the current command, control, communications and intelligence position to provide a focal point in this area. The second area, formerly a science and technology position, now includes the analysis of requirements, human factors, integrated logistics support and training. The grouping of these functions into a single cell provides the office a more organized approach to the requirements process. This cell consists of members of requirements task forces and interfaces with Training and Doctrine Command Headquarters, the schools, and the Combined Arms Center. This cell is also involved in the long range RDA planning process.

The third area, which is a programs office, is responsible for a more "across-the-Army" view, and provides the focal point in the Office of the ASA (RDA) for the Program Objective Memorandum and budget process.

The combination of these functions provides a comprehensive evaluation of a process flowing from technologies through requirements to the programming and budgeting of resources. Some of the specific functional areas that are covered by the requirements and programs office are shown in Figure 2.

## Acquisition

The Office of the Deputy Assistant Secretary of the Army (Acquisition) is the focal point for acquisition, procurement, and contract management in the Army. The policy function has not changed and continues to provide procurement policy and procedures for all Army activities.

The procurement element within the acquisition office will devote additional attention to the early development of acquisition strategies for major programs. This procurement office addresses issues such as competition, types of contracts, source selection and Request for Proposal approvals. This places the office in a position of leading the overall development of an acquisition approach early in the program planning process. The increased emphasis on planning provides a focal point from the beginning of an acquisition through actual contracting. (see Figure 2 for some of the functional areas of the acquisition office).

## Systems Management

The Office of the Deputy Assistant Secretary of the Army (Systems Management) takes the existing functions of the management and programs office and adds the responsibilities for productivity and quality. Many program problems are traced to problems in the quality area. The combination of these functions allows for corrective actions to be developed and implemented.

In addition, the productivity area includes many programs that should encourage contractor capital investment which will ultimately improve quality and program performance. The combination of these functions into one office provides a single point in the Office of the ASA (RDA) that is responsible for the outward looking evaluation of actual performance against established plans. Some of the functional areas covered by the systems management office are shown in Figure 2.

## Conclusion

The new organization streamlines the previous organization and provides the ASA (RDA) with a more logical structure to address the overall acquisition process. Clear lines of responsibility have been established by grouping functions into logical and workable areas.

# F•U•N•C•T•I•O•N•A•L A•R•E•A•S

### Requirements & Programs Office

- Army Analysis Program
- Advanced Concepts and Technology Committee
- Artificial Intelligence
- Army Systems Acquisition Review Council
- Behavioral/Social Sciences
- Combined Arms Center
- Congressional Testimony
- Defense Advanced Technology Demonstration
- Decision Coordinating Paper
- Defense Satellite Communications
- Engineer and Scientist Career Program
- Federal Contract Research Centers
- Future Development
- High Technology Light Division
- Human Factors
- In-House Laboratory Independent Research
- Independent Research and Development
- Jet Propulsion Laboratory
- Laboratory Management
- Long Range RDA Plan
- NASA Programs
- National Research Council
- Office of Research and Technology Application
- Program Budget Committee
- Priorities and Allocations
- Planning, Programming and Budgeting System
- Reprogrammings
- Scientist and Engineer Exchange Program
- Single Manager for Conventional Munitions
- Space Assets
- Science and Technology Information Program
- Summer Faculty Research Program
- Very High Speed Integrated Circuits

### Acquisition Office

- Acquisition Strategy Development and Approval
- Acquisition Audits, including Army Audit Agency, Government Accounting Office, DOD Inspector General
- Contract Administration
- Contracting Policy
- Competition
- Dual Sourcing
- Federal Acquisition Regulation with Defense and Army Supplements
- Industrial Preparedness Planning
- Justification and Authorizations
- Major System Acquisition Policy
- Procurement Career Program
- Request for Proposals
- Technology Export Control
- Warranties
- Source Selection
- Security Assistance/International Programs

### Systems Management Office

- Acquisition Improvement Reviews
- Civilian Executive Resources Board Operating Committee
- Configuration Management
- Cost Performance Reports
- Cost Schedule Control System Criteria
- Defense Acquisition Executive Summary
- Efficient Use of Resources
- Environmental Stress Screening
- Freedom of Information
- Industrial Modernization Improvement Program
- Industrial Mobilization
- Management Information Systems
- Manufacturing Technology
- Monthly Program Reviews
- Nunn-McCurdy
- Production Base Support
- Program Management Control System
- Quality
- Quality Career Program
- Selected Acquisition Report
- Value Engineering
- Weapon Systems Handbook

***Figure 2 shows some of the specific functional areas of each new Deputy Assistant.***

# Warrant Officers in Systems Acquisition?

**By CWO Frank L. Prabel**

## Background

Over the years the Department of the Army has experienced and been criticized for many problems in the acquisition of its weapon systems. The majority of these problems center in the areas of high weapon system support costs, lack of total system performance, poorly developed system specifications and the lack of user participation in the design process. These problems have dictated a need for the Army to take steps to insure personnel experienced and knowledgeable of the issues associated with fielded weapon systems are involved in all aspects of materiel acquisition management.

One approach to the systems acquisition management dilemma that has been overlooked is the use of the senior warrant officer in the acquisition process. This critical asset, which is currently available in the materiel acquisition arena, can provide the system program manager with a link between the defense contractor and the program office that is unequaled by a commissioned officer. The warrant officer possesses the "street know how" of the weapon system and can understand the peripheral impact that a decision in one particular area may have on another far removed area.

The broad-based, hands-on technical experience possessed by the senior warrant officer provides a link between the untested theory of the engineers' design terminal, and the practicality of real world operational supportability and mission readiness. Warrant officer involvement in systems acquisition normally takes place around the 11th year of warrant officer service. It's during this later career period that the Army can gain the most from the technical expertise the warrant officer has amassed.

Because of his hands-on experience he can function in all areas of the materiel acquisition life cycle and should be able to temper decisions made on acquisition strategies, Manpower & Personnel Integration (MANPRINT), human engineering, contracting, weapon system development, test and evaluation, and integrated logistics support with the understanding of "down the road" problems with which he has had personal experience. This is especially true in areas of supportability, cost control, human engineering, performance, and design.

Senior warrant officers should be brought on board early in the developmental process while the idea or concept is still fresh. By actively using the senior warrant officer in the acquisition process, a realistic, low cost attempt is made to influence the design; assure that the weapon system is supportable; and insure the weapon system can defeat the threat at an affordable cost in terms of fiscal and human resources.

Warrant officer integration into the systems acquisition arena should occur after military education in the systems acquisition process through attendance at a service acquisition management school or through attendance at the Defense Systems Management College. After training and integration into the systems acquisition field, the warrant officer should be awarded an additional skill identifier of 6T, for materiel acquisition management, and then be managed as a viable systems acquisition asset by the U.S. Army. Unlike commissioned officers, warrant officers are not normally awarded an additional skill identifier for materiel acquisition management, nor are many warrant officer positions in the Army identified as being involved in the materiel acquisition process.

## PM Offices

Most program management offices operate in a matrix organizational structure, each segment striving to accomplish the goals outlined in the acquisition strategy. To assign a warrant officer to one particular functional area in that matrix organization would be a disservice to the program manager, the organization and the warrant officer. A warrant officer in a PM office should be assigned to the organization as a whole.

The program manager, after analyzing the situation of his programs, his needs, and the desired goals of the organization, can move the warrant officer throughout the matrix where problems occur, capitalizing on the warrant officer's experience, education, and ability. Each assignment should be of sufficient length to assure the projects or products under the supervision of the warrant officer can transition from one phase to another in the acquisition life cycle.

The lead time required to effect a program change is considerable; the acquisition experience necessary to recognize a decision is needed is great; and the authority necessary to carry out those decisions after having made them is tremendous. All require a substantial amount of time in the program office to gain "real world" program experience.

Lack of "real world" experience often fosters a reluctance to provide military personnel with meaningful, responsible tasks. This reluctance can be attributed to the perception that military personnel are transient and that the military lacks program continuity.

The assignment of more responsible tasks would occur at a more rapid rate if both the availability of systems acquisition education and the length of the assignments in PM offices were increased. Because of the high dollar cost growth associated with many system acquisition programs, insuring personnel continuity and workforce stability could reduce that growth associated with personnel changes.

Retainability and accountability will ultimately keep the "not on my watch" syndrome at a distance. Since personnel do move on, rotation from the PM office assignments should occur when convenient for the program and program manager. At a minimum, a replacement for a warrant officer assigned to a PM office should be in position at least four months prior to the reassignment of the

incumbent. This overlap allows for gradual transition of products of projects under the warrant officer's supervision.

Normally, after the weapon system transitions from one life cycle phase to another (for example, from development to production), both personnel and weapon are ready for the change. If the weapon system, system modification, or product improvement program is ready for fielding, the replaced warrant officer should be part of the new equipment fielding team, or assigned as an advisor to the receiving battalion or brigade. In this capacity he can assist in the operational shake down of the equipment and provide feedback information to the PM office regarding the operational suitability of the system, and the acceptability of its components or its modified equipment.

After all the training, education and acquisition experience, the warrant officer, upon reassignment, should be brought back into the program management arena. He can prepare future modifications to existing equipment, assist in development of new systems, and provide the PM with field experience needed to satisfy user requirements.

During the last few years we have heard how large a role the acquisition of reliable and supportable equipment plays in the readiness equation. One part of the equation which has been overlooked in the acquisition arena is the contribution of the technical officer: that middle manager who has an intimate relationship with, and in-depth knowledge of, the equipment which will significantly enhance the combat effectiveness of the fighting force.

Warrant officer involvement in systems acquisition can contribute significantly in both the equipment and training aspects of the equation. By influencing the design of one piece of mission-critical equipment, the warrant officer has increased the chance of success during conflict. By tempering maintenance publications and training doctrine with personal experience, the warrant officer can increase the ability of the unit to respond.

## Knowledge Levels

Warrant officer involvement in the systems acquisition process is a function of experience, military schooling, and civilian education. The degree of involvement can be stratified into three different levels of acquisition knowledge. Level one, which is the greatest depth of involvement, requires detailed acquisition knowledge and training, many years of field experience, and total personal commitment to a program. Positions at this level include product managers, test and evaluation managers, integrated logistics support (ILS) managers, and work group leaders.

Level two does not require as much detailed acquisition knowledge but still requires extensive field experience and personal commitment. Positions include participation as a work group member in a specific acquisition area such as ILS.

Level three, the lowest but not the least important, requires still less acquisition knowledge than the other two levels but just as much field experience and personal commitment as levels one and two. Typical positions for this level include working as an assistant or as an advisor to members on work groups or engineers in government laboratories. Level three capitalizes on the field experience portion of the warrant officer's background. This level is where "how its done in the field" or "problems I've had" plays an important role in the selection of workable alternatives for the basic design of the weapon system. Some of the more obvious areas in which warrant officers can contribute are outlined below, with the typical corresponding level of involvement.

| Acquisition Area | Involvement Level |
|---|---|
| Research (Concept Exploration) | 3 |
| Development | 1 |
| Test & Evaluation | 1 |
| Integrated Logistics Support | 1 |
| Rationalization, Standardization and Interoperability | 1 |
| Contracting | 1 |
| Fielding | 2 |
| Cost & Economic Analysis | 2 |
| Procurement | 1 |
| Product Management | 1 |

## Summary

The systems acquisition field is not for every warrant officer. Only highly motivated, well trained individuals should be selected for these assignments. The acquisition recruiting poster should read, "only self starters need apply."

A warrant officer involved in the dynamic systems acquisition process can provide the "in touch with reality" quality of field experience, a commodity often in short supply in acquisition circles. Bringing field experience into the program office provides answers to acquisition problems which can't be corrected by contracting out or by hiring another engineer.

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# Software Quality Assurance and the Program Manager

**By Norris C. Middleton**

## Introduction

During the past few years, in an attempt to improve the acquisition of major weapons systems, several initiatives have been proposed and directed from senior management within DOD. These initiatives have been somewhat successful in many areas. Unfortunately, the software development and maintenance area in DOD has not made any appreciable improvements. This is directly attributable to an apparent lack of aggressive use of software quality assurance and the necessary quality control programs. It is not necessary to promulgate new DOD directives on policies when, in many cases in the area of software, program managers have simply failed to do the tasks required to insure quality products are produced.

The quest for quality is currently one of the dominant forces in our society. We are crying for products that work properly, that meet specifications, that are dependable, and are economically priced. For the DOD, it is a question of survivability. We cannot afford software failures in a weapons system or a critical command, control, communications and intelligence system. The risk is unacceptable, the results disastrous.

Even in industries, such as the American automobile industry, we have seen American dominance erode because other countries are fostering quality concepts. Most notably, the Japanese industry, with its emphasis on quality, is responsible for America's sudden interest in quality. Program managers who choose to disregard this fact and not become more actively involved in software quality assurance will find their projects exceeding thresholds in cost and schedule. There will also be an associated decrease in performance with increased requirements to fix "bugs" that were not discovered in the development phase.

For many years, software development was considered to be more of an art than a science. When viewed as an art, quality becomes related to the author as much as the product. This viewpoint tends to lead one to believe that quality software can be developed by those brilliant and talented artists without any technical assistance. Fortunately, we in the DOD are moving away from this myth and beginning to develop standards, formalized documentation processes and detailed development methodologies. The problem is that we, many times, are our own worst enemy. We neglect to apply the quality concepts in a structured environment.

Without a stable structured environment, it becomes difficult to determine the effect of changing the environment. Since quality can only occur when the cause/effect relationship of change can be determined, the concepts of individual creativity and quality are counterproductive and may even be mutually exclusive in software development.

## Standards of Performance

Software quality means conformance to a standard. If the standards of performance are established, and those standards are met, then performance is considered "quality" performance. Failure to meet the standards means less than acceptable quality. Quality can be defined as an absolute value or as a level of tolerance. The key concept is that quality must be predefined and measurable. The quality expected must be defined or it can't be achieved and measured.

The failure to define quality is one of the major deficiencies found in software development within DOD. It becomes the direct responsibility of the program manager to insure that his project software, regardless of whether the software is embedded, is developed in a quality manner.

## Quality Control and Assurance

Although the government contractor is responsible for software quality assurance, the program manager must understand that both quality assurance and quality control are needed in software development. The two functions are closely related, and in some instances, performed by the same personnel. However, it is possible to have quality control without quality assurance but not vice versa. Quality assurance deals with the process used to create the software product. The objective of quality assurance is to evaluate and improve the process. Quality control is concerned with the software product produced by the process. When quality control personnel look at a product, they must be concerned that the best possible product is created.

The proper use of quality assurance and quality control will have a direct influence on the costs associated with software development. Ensuring that software is developed correctly the first time with reviews, inspections and testing will reduce the costs of reruns, recoding and redesign. Therefore, the "bottom line" return on investment from software quality assurance/control is the reduction in the cost of failures.

## Software Attributes

The following represents a list of software attributes or factors that program managers should be aware of and understand. Application of specific and measurable criteria to these attributes will allow the determination of whether or not the attribute has been achieved.

- Correctness is the extent to which a program satisfies its specifications and fulfills the user's mission objectives. Correctness is a factor which represents the

ability of the system to process perfect input correctly, and produce the defined output correctly. This quality factor is used to measure the ability of the program developers to implement the defined specifications.

• Reliability is the extent to which a program can be expected to perform its intended function with required precision. This factor measures the consistency with which the program can produce correct results. For example, if an input transaction is entered perfectly, and the desired result is produced correctly by the program, then the correctness factor would be rated perfect. However, if that same program fails to produce correct results when given imperfect input, then reliability may score low.

• Efficiency is the amount of computing resources and codes required by a program to perform a function. This factor measures the cost of developing application programs. The cost can be translated into the entire effort needed to develop computer programs to perform specific user tasks. However, the factor is more meaningful when used in relationship to other factors, e.g., resources to provide correct results or reliable results.

• Integrity is the extent to which access to software or data by unauthorized persons can be controlled. This is the amount of protection that must be afforded the system resources. This protection is required because of the need to protect important information, preserve the privacy of the information, and prevent unauthorized data manipulation.

• Usability is the effort required to learn, operate, prepare input and interpret output of a program. This factor refers to the ease with which the system can be used by people. Included is the effort required by users to learn how to use the system, to complete input forms or screens to initiate transactions and processing, to operate the application and properly utilize the information produced.

• Maintainability is the effort required to locate and fix an error in an operational program. This factor relates to the ease with which problems in the program/system can be corrected and routine changes can be installed. These changes are defined as being nonstructural.

• Testability is the effort required to test a program to ensure that it performs its intended function. This factor includes the resources needed to ensure specified quality has been achieved. The amount of resources required is based on the degree of reliability demanded by users from the program.

• Flexibility is the effort required to modify an operational program. Enhancements are changes made to the application program that affects the structure of the program. When the structure is affected, requirements must change, the design must change and the implemented version of program(s) must change. The ease with which enhancements can be incorporated into the application program(s) is flexibility.

• Portability is the effort required to transfer a program from one hardware configuration and/or software system environment to another. This factor addresses the ease with which an application program can be transported from one piece of computer hardware to another or from one piece of operating software to another. The design characteristics of a computer, the language used to implement that system, as well as the instructions within that language, will vary with the need to move programs to another operating environment.

• Reusability is the extent to which a program can be used in other applications—related to the packaging and scope of the functions performed by the programs in that application. The reuse of programs or parts of programs previously developed is desirable if reduction in costs is achieved, consistency between applications is ensured, and reliability can be improved.

• Interoperability is the effort required to couple one system to another. This includes the resources necessary to intercouple computer systems or to pass other information.

## Conclusion

The above factors can be used by the program manager to ascertain whether or not his software quality assurance program is in fact operating properly. The PM needs only to pick out those factors that will have the greatest impact on his program. The contractor should be required to demonstrate to the PM those criteria being used to measure those important factors. Then and only then will the PM really become the driving force for software quality assurance.

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**NOTICE**

A **REMINDER** to active officers in branches 51, 52 and 97, or with a 6T skill: Since we have switched to using your address as listed in your Officer Record Brief, it is important that you keep your records updated. A number of requests for change of address have been mailed to us, but we do not have the ability to make those changes. Your address comes to us in a computer printout from MILPERCEN, which is taken directly from your ORB. If you have changed your address recently, please change your ORB so the magazine can reach you at the proper address.

## The End of the Apprentice Soldier

# A Concept-Based Training Development System

**By LTC Robert S. Hardy Jr.**

One of the secrets to success is to have a vision. We can be certain that change will occur. If we do not manage it, it will manage us. If we have a clear concept of what we want the future to be, we can make day-to-day decisions with a consistent purpose. Without such a concept, we can only react to the current situation. Conceptualization must be a continuous process, and its goals must be repeatedly achieved.

Because of my strong belief in a concept-based system, I have developed a concept for training developers. This concept has been implemented at the U.S. Army Air Defense Artillery School, Fort Bliss, TX, and is gaining support at higher levels. I believe the results will be better-trained soldiers and better-trained units emerging from improved air defense artillery individual and collective training programs.

## The Concept

A generally recognized fact is that armies fight as they train. Therefore, it is imperative that training strategies be complete and realistic.

U.S. Army training doctrine is based upon the principle of performance orientation. Training resources are to be applied only to effect training of skills, knowledge, abilities and attitudes which are valid tasks embedded in required performance. At the same time, training strategies must be sufficient to produce units trained in all critical performance tasks.

Training related to any materiel system is an integral part of the total system. The development of the training system must parallel the development of the materiel system. The two development efforts should be merged throughout the acquisition process so that both the materiel system and the training system reach the soldier in a timely manner.

If training development begins too late, it will be driven by the characteristics of the materiel. Most certainly, the man-machine interfaces will be difficult. This is the situation that Army training developers, caught far behind the development curve, have struggled with throughout the history of warfare. Putting the training developer in front of the developmental curve is an essential part of the concept-based training strategy.

Our training mission is to train units to fight the battle. The ultimate goal is to have an effective force on the ground, hardened by near combat conditions, the day before the war starts. Training occurs at two locations, the service school and the job site. The school's mission is to provide trained soldiers, training programs, training materials and training products which commanders in the field must have to attain and maintain the highest standards of combat readiness for their units. The focus of all training efforts is centered on the unit, both active and reserve. Training must be supportive of the units now and in the future, and must be realistically based on the amount of resources available. Policies and programs must also provide for training before and after mobilization.

## Individual Training

The task of the service schools is to produce soldiers prepared to go to war the day after they arrive in their units. We haven't produced that type of soldier in the past. Instead, we've produced an apprentice soldier. Today, we are committed to producing a much more competent soldier, a soldier ready to pull his weight the day he arrives at his unit. Conceptually, this means that all survival skills and knowledge must be taught and sustained in the institution during initial-entry training. In addition to all of the survival skills, a minimum of approximately 80 percent of the soldier's job tasks must also be taught in the institution. This means that, when a soldier reports to his unit, he will have mastered 80 percent of his job skills and will be 100 percent proficient in the survival skills.

In addition, the concept-based training system calls for the creation of a complete individual training system site at the unit. The operational chain of command will apply the individual training system to train and sustain soldiers at mastery level in all individual skills not taught in the institution. Our long-range goal is to teach all individual tasks in the institution. Once individual tasks are taught to mastery at the institution, sustainment of those tasks becomes a unit responsibility.

## Training Strategy Development

Achieving and maintaining readiness to fight the air and land battle is a complex enterprise involving increasingly sophisticated systems and rapidly escalating costs. In particular, the cost of buying and maintaining weapon systems has risen so steeply that using them as the training means to achieve and sustain readiness has become prohibitively expensive. There are, however, potential solutions to this problem. The very technology that underlies sophisticated systems is also capable of producing, within economic constraints, a supporting architecture for cost-effective training. High-technology training approaches such as simulation systems, feedback systems and training devices can provide the means for both improving training and reducing costs. Conceptually, the Army should move from weapons-based training strategies to training-device based strategies.

Under the concept-based training system, the training challenge for each materiel system is viewed as a continuum stretching from initial entry through total collective training. A training strategy is developed for each materiel system which overlays the entire continuum. There are to be no gaps and little overlap. No single method, media or device will effectively and efficiently cover the entire continuum. Therefore, what should emerge is a mix, or family of

trainers, with one element beginning where the preceding element ends and with each element contributing significantly to training to fight the battle.

There are numerous alternative training strategies to overlay on each training continuum. Therefore, a studied approach must be taken to determine the optimum strategy for each materiel system. The purpose of such studies is, first, to define, system by system, the training continuum in terms of tasks to be trained; second, to examine the technology base to discover and compare training alternatives; and third, to emerge with a recommended plan for training the force. Each study must be a living document. Change in materiel, organization, doctrine or training technologies require the study to be reviewed.

Training development should begin concurrently with the combat development process, that is, during concept exploration. It must also be continuous throughout the entire materiel acquisition process. The goal is to field the materiel system and the complete supporting training subsystem simultaneously. While field input is absolutely essential, the primary responsibility for training strategy development rests with the service schools.

The selection of strategies will be governed by cost and training effectiveness factors. Solutions requiring large capital outlays which are not offset by savings or materiel cost avoidance in the near term are not viewed as viable.

There should be a phased product improvement program approach to training systems. Solutions, where possible, should be evolutionary in nature rather than revolutionary.

An expansion of the training base should be avoided. Solutions should work within current space constraints and course lengths in the institution must remain within current direction. Lengthening courses is not a viable solution.

## Conclusion

Is this concept a pipe dream or is it achievable? We don't have to guess; we know the answer. The training developer, combat developer and materiel developer have pooled their collective talents and are developing an institutional training system for HAWK Phase III that totally answers the mail. A related article in the November-December 1985 issue of this magazine shows in detail how we are making a dream into a reality.

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# RDA Decision Support Systems Initiatives

***(Continued from inside back cover.)***

## Action Officer System

In our effort to establish an ODCSRDA-wide Decision Support System, we are conscious not only of the potential impact of that system on the decision process, but especially of any demands it might, in time, create for the staff to "feed" it. With that concern in mind, we have recently added an officer with a graduate degree in human factors engineering to the information management team.

We are developing our action officer management information system as a way to relieve the burden of routine document preparation and information gathering. It will provide a work station that is a data terminal as well, automating the document preparation task which now consumes the majority of an action officer's time. We expect a 50 percent time savings that will enable the action officer to spend more time on analytical and information aspects of his or her job. The challenge is to develop a multifunctional work station with a software emulation capability that provides access to needed information sources wherever they may reside.

## Support Terminal Network

To improve our interaction and coordination with the other Army Staff elements in the development of the FY88-92 RDA Program Objective Memorandum, we are extending secure access via our fiber-optic Support Terminal Network to the Office, Deputy Chief of Staff for Logistics (primarily for spares and repair parts portion of the program); the Office, Deputy Chief of Staff for Operations and Plans (for program prioritization and operations and sustainment information on force modernization systems); the Office, Assistant Chief of Staff for Information Management (telecommunications and automation systems); Office, Comptroller of the Army (financial execution information); and to the Program Analysis and Evaluation Directorate (overall program integration). This is a near-term fix to what must eventually be replaced by a secure HQDA Local Area Network and extended via the Defense Data Network when it becomes available for full exchange of classified information.

## Conclusion

We have a long way to go before we can keep up with the many demands for more detailed information, especially with the projection of less, not more, resources. I am reminded of the words of LTG Robert L. Moore, AMC deputy commander for RD&A, in this forum in a recent issue of this magazine. He was specifically referring to the competing goals of high quality materiel and rapid fielding and the special commitment that the RDA community must make to achieve them. He said, "There will be no more 'business as usual' in materiel acquisition." I heartily endorse that thought and would extend it to include our efforts to develop an Army RDA Decision Support System with which to better provide for the soldier in the field in the future.

# From The Field. . .

## Army Works on New Artillery Quieting System

A new artillery quieting system being developed by the U.S. Army Corps of Engineers and the Combat Systems Test Activity (CSTA) will be built at Aberdeen Proving Ground, MD.

Researchers at the Corps' Construction Engineering Research Laboratory (CERL) in Champaign, IL, are working with CSTA to investigate the use of water-based foams to diminish noise from demolition and artillery fire. "We are working with the Corps on the last phase of the design stage," said David Philips of CSTA's Development and Analysis Directorate. "Once the design is agreed upon, we will be ready to begin construction of the device."

The use of foam allows for fabrication of smaller, lighter mufflers to reduce noise from artillery firing. According to CERL officials, they will be easier to move than the large mufflers currently in use. Broader use of the lighter mufflers should decrease the noise in neighboring civilian communities during testing.

"It is smaller and will be much quieter than the mufflers now in use," added Dr. Paul Schomer of CERL. "The new system will make a considerable difference in the amount of noise being produced. This prototype could also be used in other areas where artillery testing is conducted."

The design calls for the foam to surround the muzzle of an artillery piece in order to muffle the sound as it is being fired. It will be used for outdoor firing on mounted guns and howitzers.

## New System Impedes Enemy's Advance

An old concept and a new approach may add another tool to America's military arsenal. The concept, the Tactical Explosive System (TEXS), involves laying pipeline in a potentially strategic combat area and pumping a liquid explosive into the pipeline. The new approach will update the system from manual to automatic handling of materials. TEXS will impede an enemy's advance by detonating the explosive to create obstacles in the enemy's path.

TEXS is a high visibility program according to John Sikra, TEXS project officer, Office of the Project Manager, Mines, Countermines and Demolitions, U.S. Army Armament Munitions and Chemical Command, Army Armament Research and Development Center (ARDC), Dover, NJ.

The explosive system has been successfully tested in several locations in the United States, Korea and Germany. Combat engineers responsible for the field operation of the system also plan to use it in the main battle and rear combat areas by explosively creating craters in roads and runways, demolishing bridges and buildings, breaching mine fields and obstacles, and digging fighting positions.

A slurry explosive was developed in the 1970s but the user concept of handling materials was changed so the system was never fielded.

The present design still includes a liquid explosive that will be packaged in 55-gallon drums for either transporting or storage. But today, the system eliminates the manual handling of materials. Skid-mounted pumping units placed on 5-ton trucks pump the liquid into the prelaid pipe at the combat site.

A small emplacement excavator is presently being procured for use by combat engineer units. For the TEXS, the excavator will be outfitted with a trencher attachment and other accessories to perform various demolition operations. The TEXS-configured excavator will be used to dig trenches and lay and cover the pipe. One will be produced for each combat unit.

In a typical utilization, several thousand pounds of liquid explosive are put in 300 meters of plastic pipe laid in deep, backfilled trenches. When detonated, the explosive produces an inverted triangular-shaped ditch to effectively stop the movement of armored forces.

Commercially available equipment for pumping the explosive will be adapted for easy loading and unloading from the 5-ton trucks. An explosive that is commercially available will be used. "Easily available equipment and off-the-shelf material make this a cost-effective and useful protective system for our troops," said Sikra.

## New Ammo Storage Proposed

Two Army research labs have suggested ways to more safely store artillery rounds at U.S. Army camps in Korea, where the need for quick response requires that the troops be close to their ammunition.

A lot of ammunition stays loaded on trucks and trailers, ready for deployment. With the trucks parked next to each other, the detonation of one round could spread throughout the ammunition holding area. Explosions of that magnitude would send fragments flying into nearby troop areas, causing casualties and damage in the camp.

The U.S. Army Ballistic Research Laboratory (BRL) and the U.S. Army Human Engineering Laboratory (HEL) worked together on solutions during the past year and came up with several ideas.

John D. Waugh, a human factors engineer at HEL, said one goal was to devise practical solutions to the problem that would not affect the troops' ability to mobilize. Those solutions would use equipment that would be safe to handle. At the same time, Waugh said, this had to be accomplished without sacrificing space on the loaded trucks devoted to the ammunition.

One solution is the reconfiguration of artillery projectiles and propellant charges on each truck. The proposed configuration would cushion each section of projectiles with prop charges rather than grouping all projectiles together and filling in with prop charges. With the non-explosive prop charges absorbing some of the energy from the explosive projectiles if detonated, the explosion could be limited to a truckload or part of a truckload.

Another solution under study calls for a minimum of protective shielding on projectile pallets inside the truck. Research headed by Dr. Philip M. Howe at BRL has shown that when adjacent projectiles are detonated, a crude but effective shaped charge-type jet is formed that further increases the chance of propagation to other truckloads of ammunition. BRL has devised some simple shielding techniques to diffuse the jets that form and reduce the probability of further propagation.

Another proposal is protective shielding made of concrete slabs on a steel frame on castors for easy movement. Howe noted that the concrete slabs would be foamed concrete cinder block material and not aggregate-filled concrete, which would become dangerous itself in an explosion. Positioned between trucks of ammunition, the concrete slabs would prevent explosions from spreading from one truck to another.

"Planning and innovation can help confine an incident to one truckload or a fraction of a truckload as opposed to losing an entire storage area," Waugh said.

To date, HEL and BRL have concentrated on artillery ammunition in the program. Future plans call for bringing similar solutions to bear on TOW and Dragon missiles and for the Multiple Launch Rocket System.

## Bianchi M-12 Hip Holster Chosen by DOD

Bianchi International has been awarded a U.S. government contract to produce the new official U.S. armed forces M-12 standard holster for the military's newly adopted 9mm handgun.

The contract award, which initially provides for the production of 170,000 holsters over the next three years, culminates a four-year, privately funded development program for the holster at Bianchi. The adoption of the M-12 was made possible when the U.S. government announced plans to replace the M1911, 45-caliber automatic pistol with the Beretta 92SB-F 9mm pistol as the standard-issue military handgun. The M-12 is specially tailored to accommodate the Beretta 92SB-F.

The M-12 is an ambidextrous hip holster featuring a completely modular design, allowing the holster to be worn on a wide or narrow belt; with or without flap; cross- or side-draw; or on belt or shoulder. Unlike the leather M1916 holster it replaces, which was not satisfactory in extreme climates, the M-12 is made of ballistic nylon fabric outer facing over a non-absorbent, closed-cell polyfoam core.

These modern materiels provide padded protection for the weapon, are silent in use (they don't "creak" like leather), are abrasion resistant, and are up to 20 percent lighter than conventional materials.

## AATD Awards Contract for Rotor Hub Concept

McDonnell Douglas Helicopter Co. will complete the detail design, fabrication, and laboratory, ground and flight testing necessary to demonstrate an advanced composite rotor hub concept on the U.S. Army AH-64 Apache helicopter under a 36-month, $4,722,626 contract awarded by the U.S. Army Aviation Systems Command's Aviation Applied Technology Directorate (AATD), Fort Eustis, VA.

"This program will substantiate the military benefits that can be derived from this technology and provide the basis for composite hubs on future Army rotorcraft," explained AATD Project Engineer Fred Swats.

## Negotiations Result in No-Cost Warranty

The U.S. Army Missile Command, Redstone Arsenal, AL, was recently successful in negotiating a no-cost, unlimited 36-month warranty on the FY85 Stinger Post Missile production contract with General Dynamics Corp. that meets the full intent of the FY85 warranty law.

General Dynamics, in its proposal, separately identified $6,029,851 as the warranty cost, but through negotiation, agreed to a no-cost warranty. This is considered significant in that it forces the contractor to repair or replace failed components in excess of those allowed by the specifications at no cost to the government. The value to the government is 36 months of added protection not otherwise provided and incentive to the contractor to institute management initiatives to ensure quality and control cost.

# Capsules. . .

## AMC IG Reports on PM Smoke Monetary Savings

The Army Materiel Command inspector general recently reported that the Office of the Project Manager for Smoke/Obscurants, Aberdeen Proving Ground, MD, has achieved net savings of $107,000 as a result of an office automation project. These savings are credited to increased productivity, more accurate and up-to-date records, and increased distribution of information to senior managers on a real-time basis.

The PM Smoke Office automation project was initiated in the spring of 1983 with the purchase approval of four micro-computers and a local area network. A contract was awarded in July 1983, followed by the initial receipt of equipment in August. The network became operational with seven micro-computers in March 1984, and by October 1984 approximately $80,000 had been invested in equipment, training and supplies.

## Firm Chosen for SDI Testbed Interceptor

The Strategic Defense Initiative Organization and the U.S. Army Strategic Defense Command have announced the selection of a prime contractor for final negotiations leading to a five-year contract for a key Strategic Defense Initiative research project.

Lockheed Missiles and Space Co, Sunnyvale, CA, was selected through a competitive solicitation calling for the design, fabrication and testing of a testbed interceptor for the Exoatmospheric Re-entry-vehicle Interceptor Subsystem (ERIS) project. Exoatmospheric means a ground-launched vehicle would engage target re-entry vehicles outside the earth's atmosphere. Re-entry vehicles are the warheads carried by strategic nuclear missiles. The re-entry vehicles used in flight tests are dummy warheads.

The contract will not be awarded until satisfactory conclusion of in-depth negotiations between the government and Lockheed. The negotiations will also determine the value of the definitive five-year ERIS contract.

The ERIS effort is a major Army contribution to the Strategic Defense Initiative, the research effort begun by President Reagan in 1983 with the ultimate goal of eliminating the threat posed by nuclear ballistic missiles. The ERIS program will be conducted in compliance with the 1972 Anti-ballistic Missile Treaty and other U.S. treaty obligations. All interceptor missile test flights will be conducted from fixed ground-based launchers at agreed test ranges.

Several major subcontracts will be awarded by Lockheed. These subcontracts will be awarded for tasks including development of an optical seeker, flight-control hardware, booster technology and radius-expander technology (to increase the operability of direct-impact "kill" of re-entry vehicles).

ERIS was initiated by the Army following its success in the Homing Overlay Experiment (HOE), which demonstrated the potential for strategic defense offered by missiles which intercept and destroy re-entry vehicles upon impact above the

atmosphere. The HOE culminated in 1984 when the experimental HOE flight vehicle, using an on-board optical sensor and data processors, hit and destroyed a target re-entry vehicle at an altitude of more than 100 miles.

The ERIS project is pursuing research in this same area, investigating lightweight, low-cost technologies for non-nuclear defensive interceptors. These characteristics would be essential to the feasibility of any ultimate interceptor operating in the exoatmospheric, or mid-course portion, of a strategic defense system.

# Conferences & Symposia. . .

## 1986 Army Science Conference

The 15th biennial Army Science Conference will be held June 17-20, 1986 at the U.S. Military Academy, West Point, NY. The theme of the conference is "Technology for the Soldier."

One hundred papers have been selected for presentation from 366 submitted by Army researchers and scientists from the Army Materiel Command, the Corps of Engineers, the Medical R&D Command, the Army Research Institute for the Behavioral and Social Sciences and West Point.

The Paul A. Siple medallion will be awarded to the author(s) of the best paper as determined by the Army Science Board. More than 300 scientists and other personnel from the Army RDA community are expected to attend. For additional information call Ann Asbill at the Army Research Office on AUTOVON 935-3331 or commercial (919) 549-0641.

## PM Smoke Announces Symposium X

Smoke/Obscurants Symposium X, sponsored by the project manager for smoke/obscurants, Aberdeen Proving Ground MD, will be conducted April 22-24, 1986 at the Harry Diamond Laboratories, Adelphi, MD. In commemoration of its 10th anniversary, the Office of PM Smoke/Obscurants has selected a "Decade of Progress" as the theme of the symposium.

The objective of the meeting is to bring together materiel developers, combat developers, and users of smoke and electromagnetic (EM) systems to discuss new concepts, developments, and interactive assessments of system performance in realistic battlefield environments. Representatives of the Department of Defense, industry, academe, and allied nations are invited to attend.

Technical sessions will address the following areas:

- Testing Field and Laboratory. This session, which will include instrumentation and methodology, will focus on descriptions of the techniques and data from field and laboratory testing on the properties of new/developmental smokes/obscurants and effects on standard/developmental EM systems, and results or plans of force-on-force testing in obscured environments.
- Modeling. Topics include EM device or systems modeling of performance or interaction with the battlefield environment, phenomenology or physical models of aerosols, combat models or war games on realistic battlefields, modeling libraries and data bases, and smoke systems and atmospheric transport and diffusion.
- Smoke/Obscurants and Electromagnetic Systems: Technology and Hardware Development. Topics include descriptions of new developments in smoke/obscurants technology and those of electromagnetic technology; the effects of smoke/obscurants on the expected clear air performance of EM systems, including descriptions of design changes minimizing effects; and impact of smoke on the acquisition and logistic cycle.
- Doctrine and Training Systems and Concepts. Topics include new or emerging doctrine, tactics, or concepts with new systems for the obscured battlefield; and results or lessons learned from smoke or realistic battlefield training exercises.
- Environmental and Health Effects Studies and Regulations. This session includes ongoing studies and results of environmental and health effects of smoke/obscurants and the regulations governing the use of smoke/obscrants in training and field exercises.

For additional technical information please contact Walter G. Klimek, OPM Smoke/Obscurants, AMCPM-SMK-T Aberdeen Proving Ground, MD 21005-5001 or Telephone (301)278-5411 or 5605 (AV)298-5411 or 5605. Administrative information is available from Carolyn Keen at (804)865-1894.

## Mobilization Conference Call for Papers

A call for papers proposed for presentation at the Fifth Annual Industrial College of the Armed Forces (ICAF) Mobilization Conference has been issued. The conference will be held May 22-23, 1986 at the National Defense University, ICAF, Fort McNair, Washington, DC.

The theme of this year's meeting is "The Future Role of Mobilization in National Security." Key discussion areas will be national security and mobilization, manpower resources management, and industrial resources management.

Conference attendees will include senior executives from labor and industry, university professors and scholars, representatives from research organizations, senior managers from DOD and other government agencies, and faculty and students from senior service colleges.

Individuals and organizations interested in presenting results of their research or studies should submit an abstract of not more than 500 words by Feb. 18, 1986. Abstracts and supporting material must be typed, single spaced, on 8½ by 11-inch paper, using one side only, and submitted in duplicate. The principal contributor's name, address and phone number (home and office) should appear at the head of the first page. There should be a concluding one paragraph statement that ties the author's ideas or concepts to the conference theme.

Copies of artwork may be attached to the abstract but should be limited to three pieces. A brief biographical sketch of the contributor should also be submitted. Submitted material will not be returned. Authors will be notified of acceptance or non-acceptance of their topics by March 15. Accepted authors will receive final presentation instructions prior to April 15.

Submissions should be sent to: Mobilization Conference Committee, Industrial College of the Armed Forces, Washington, DC 20319-6000. Additional conference information may be obtained by calling COL William Barber or COL Richard W. Scott Jr. on AUTOVON 335-1794 or commercial (202) 475-1794.

# Career Programs. . .

## King Chosen as Distinguished MAM Graduate

***CPT (P) Kenneth W. King (right) receives congratulations from COL Johnny M. Humphrey (left), deputy commandant, U.S. Army Logistics Management Center (ALMC), for selection as the Distinguished Graduate of Materiel Acquisition Management (MAM) Course (Class 84-04). King, who is assigned to the Office of TRADOC System Manager for Tank Systems, U.S. Army Armor Center, Fort Knox, KY, is one of approximately 400 individuals to graduate from the MAM Course since its inception in October 1983. The nine-week course, which supports the MAM program, is taught at the ALMC, Fort Lee, VA. (A feature story on the MAM Program appears on Page 1 of the September-October 1985 issue of* Army RD&A Magazine.)**

## Chemical Technology Centers Established

The U.S. Army Chemical Research and Development Center (CRDC), Aberdeen Proving Ground, MD, has established Chemical Systems Technology Center Programs at four leading universities.

CRDC's new and innovative program will enhance its R&D capability through close and continuing association with university scientists participating in the Chemical Systems Technology Center Program. The program provides research and engineering support to CRDC's mission related technology areas, training opportunities for CRDC personnel, and the opportunity for collaboration between CRDC and university scientists.

Participating universities were selected on the basis of the quality of their research programs, relevance to CRDC's research, development, and engineering programs, and the training opportunities provided.

Dr. Bill Richardson, CRDC's technical director, said, "CRDC has established Chemical Systems Technology Centers in the research areas of biotechnology, air purification, and chemistry." The University of Pittsburgh and Carnegie Mellon University, also in Pittsburgh, PA, serve as CRDC's Technology Centers for biotechnology. Professor Lemuel Wingard of the University of Pittsburgh, and Professor William Brown of the Carnegie Mellon University attended a contract signing ceremony at CRDC headquarters.

Other academic institutions participating in the Technology Center Program are the State University of New York at Buffalo, serving as the center for air purification research, and the University of Florida, Gainesville, FL, serving as the center for chemistry research.

Training opportunities for CRDC personnel provided through the Chemical Systems Technology Center Program will include courses taught on-site at APG, individual and group instruction at the university, cooperative research projects, scientist exchange visits, and colloguia and workshops.

## Results of MAM Selection Board

A materiel acquisition management selection board convened on Oct. 7, 1985 to review the files of applicants and nominees. Results of this board are as follows:

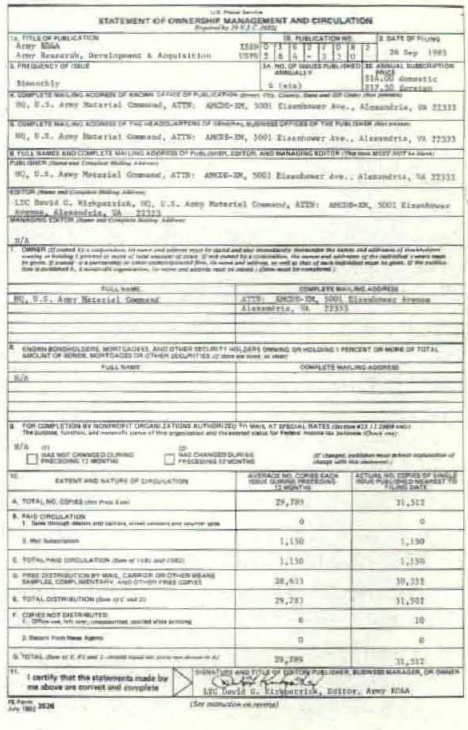
Total Considered: 90 Total Selected: 63 Selection Rate: 70%

Selection Rate By Branch:

| | | |
|---|---|---|
| AD 6/11 = 54.5% | CM 0/1 = 0.0% | QM 5/7 = 71.4% |
| AR 9/9 = 100% | MI 1/1 = 100% | OD 17/21 = 81% |
| AV 8/12 = 67% | EN 4/5 = 80% | FI 1/2 = 50% |
| FA 3/4 = 75% | MP 1/1 = 100% | AG 2/3 = 67% |
| IN 3/6 = 50% | SC 1/4 = 25% | TC 1/2 = 50% |
| CAD Total: 30/43 = 70% | CSAD Total: 7/12 = 59% | CSSD Total: 26/35 = 74.2% |

Selection Rate By Grade:

| | |
|---|---|
| LTC 7/10 = 70% | Selection Rate By Sex: |
| MAJ(P) 7/10 = 70% | Male 59/83 = 71% |
| MAJ 19/25 = 76% | Female 4/7 = 57% |
| CPT(P) 5/7 = 71.4% | |
| CPT 25/38 = 66% | |



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# Executive's Corner. . .

## Deputy Chief of Staff for RDA LTG Louis C. Wagner Jr. Discusses . . .

# RDA Decision Support Systems Initiatives

### Introduction

The demand for detailed information that supports the Army's RDA budget requests has steadily increased over the past years, with the Congress adding significant numbers of staffers who intensively review those requests and formulate questions to be answered by the Army. Pressures on the budget process in the overall context of deficit reduction have led to a need to justify the Army's requests for RDA funding not merely from a war fighting capabilities perspective (and we need to do that better, as I will discuss later), but in terms of analytical, economic and political considerations as well.

Changing guidance and funding allocations require rapid re-evaluation of the executability of the resulting programs and assessment of the impact on the Army's total efforts. We must be proactive in our approach, not reactive as in the past, and be able to clearly state those impacts in real world terms that are meaningful to all who participate in that decision process. To do so requires an automated decision support structure throughout the Army that is vastly more sophisticated than anything envisioned even a few years ago.

I recognize that we are not far enough along in achieving that total support structure, but collectively we have the rapidly evolving technology, the management focus and some of the brightest and best educated personnel, both civilian and military, involved in some very exciting initiatives that will lead to that end.

### VCSA Involvement

The vice chief of staff of the Army is personally directing a series of milestone sessions to accelerate the integrated development of Army Decision Support Systems. The initial meeting was held in mid-November of last year to review the current status of Decision Support Systems with each Army Staff principal and subsequent sessions are planned following the FY87 budget submission in January. The objective is to build on what we have in place and under development to achieve an integrated Decision Support System with an underlying corporate data base. The key word is "integrated," with the emphasis being on a shared effort and with each element aware of the other's system development. For the first time, we have a forum for that sharing, unlike the past when we developed "stove-pipe" systems to satisfy individual requirements.

To direct my office's role in this process, I have designated the deputy director of materiel plans and programs as the Office, Deputy Chief of Staff for Research, Development and Acquisition (ODCSRDA) information management officer. We have begun to outline our "business plan" to build the RDA portion of the corporate data base in close coordination with the efforts of all those who are involved in the RDA information process, not just at HQ, Department of the Army.

### Procurement by Unit Sets

As I mentioned earlier, we must do a better job in assessing our RDA funding requests in terms of war fighting capability. We must be able to translate dollar increments or decrements into organizational unit readiness and sustainment terms. To this end, we have an effort underway to assess the organizational impact of budgetary decisions, sometimes referred to as "Procurement by Unit Sets." The unique aspect of this endeavor is that we have abandoned the "pre-specification" approach and adopted a method that depends more on the interaction with the user than on a set list of specifications. There is, however, an immediate dependency on output of other systems, such as the Total Army Equipment Distribution Program, the Structure and Composition System, and the Army Materiel Plan, to mention a few. This particular on-line, interactive capability, to be available for use in developing the FY88-92 RDA Program Objective Memorandum, is called a Decision Support Experimentor. The Decision Support Experimentor is our first step toward a full RDA Decision Support System and will be continually enhanced as we get feedback from its various users.

### Consolidated Data Base

As a part of the redesign of our RDA information system and in preparation for providing the RDA portion of the eventual Army corporate data base, we in ODCSRDA, in conjunction with our support organization, the U.S. Army RDA Information Systems Agency, are consolidating what were formerly five RDA data bases. This consolidated data base will contain RDTE, procurement, operations and support costs (for modernization systems), and relevant military construction information for the years of budget execution, the five year program and the extended planning annex.

This consolidation will also permit interactive coupling with the Army Materiel Plan modernization procurement data system and subsequently, through the same network capability, link up with the Mission Area Materiel Plan, the Program Management Control System, and the TRADOC Battlefield Development Plan. The obvious need is not only for a secure network for timely exchange of this data, but for an established and coordinated identification of data ownership, access, currency, integrity and validity.

We need to develop a common data dictionary to be used by all RDA related systems that provides information for decision making throughout the Army. Several cooperative efforts are underway, with the area of munitions being the first.

***(Continued on Page 28.)***

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