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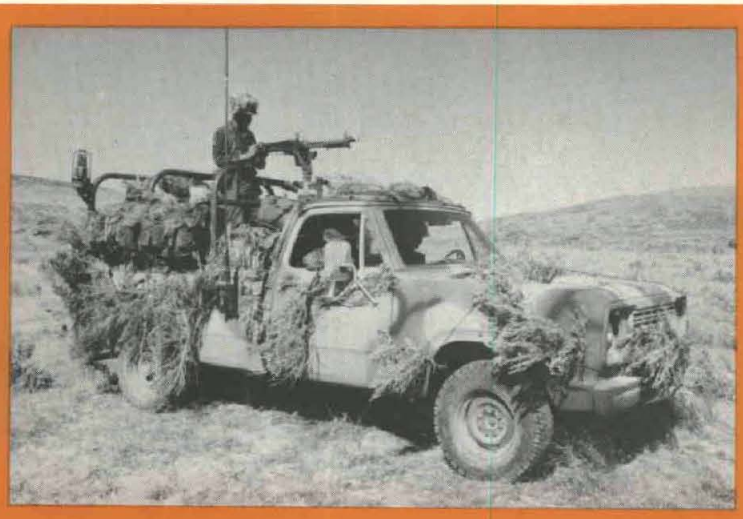
JANUARY - FEBRUARY 1983



the high technology light division

ARMY R,D&A

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ABOUT THE COVER:

Shown on the front and back covers are some of the items associated with the Army's prototype High Technology Light Division. Surrounding the Division's emblem on the front cover are the Light Infantry Carrier Surrogate M882 Mod (top), Fast Attack Vehicle (right), and the Dragoon Armor Vehicle Electronic. The Canadair Remote Air Vehicle is displayed on the back cover.

FEATURES

DEPARTMENTS

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Purpose: To improve informal communication among all segments of the Army scientific community and other government R,D&A agencies; to further understanding of Army R,D&A progress, problem areas and program planning, to stimulate more closely integrated and coordinated effort among Army R,D&A activities; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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PM Conferees Focus on Key Materiel Acquisition Issues

Critical and timely factors involved in developing and procuring major weapon systems and equipment were discussed in detail by participants at the 12th Annual Army Project Managers' Conference, 15-17 November, in Orlando, FL.

Sponsored by HQ U.S. Army Materiel Development and Readiness Command, the conference drew more than 130 individuals, including the Army's PMs, representatives from HQ Department of the Army, and representatives from major subordinate commands. A relatively unstructured agenda, which was established at last year's gathering, also prevailed at this year's conference.

DARCOM Commander GEN Donald R. Keith opened the meeting with a "fast-paced" 2-hour briefing on the 1982 Army Commanders' Conference. He noted at the outset that the Commanders' Conference had provided a very positive feeling relative to the "state-of-the-union."

GEN Keith was followed at the podium by DARCOM Comptroller BG James F. McCall who discussed the FY 83 Nunn/McCurdy Amendment. General McCall explained that this amendment originated as separate bills in the House of Representatives and in the Senate.

The Senate portion of the bill sought to make unit cost reporting permanent, while the House bill was intended to increase the number of Selected Acquisition Reporting systems. The bills were combined and became the "Improved Oversight of Cost Growth in Major Defense Acquisition Programs." Simply known as the Nunn-McCurdy Amendment, it became law on 1 January 1983.

BG McCall stated that this amendment imposes significantly increased requirements, both in terms of the number of systems that must be reported and the amount of information required when reporting unit cost increases.

Relative to the PM, the Amendment states that the PM for each major program that must be reported upon, must submit a report to the Secretary of the Army on the cost status of the program. The report must include the program acquisition unit cost; current fiscal year procurement unit cost; any cost or schedule variance in any major contract under the program since the baseline Selected Acquisition Reports; and any changes from program schedule milestones or program performances in the baseline Selected Acquisition Report that are known or expected.

Following BG McCall's presentation, Mr. Seymour J. Lorber, director of the Product Assurance and Test Directorate, HQ DARCOM, introduced MG Peter G. Olenchuk (USA Ret.) who discussed the DARCOM Quality Control Study.

MG Olenchuk noted that the panel which conducted the study reviewed about six programs. Relative to the execution of quality assurance functions, the panel found that the primary production problem was lack of discipline in program application. It was found that quality assurance is not in the mainstream of the development process, and is generally considered a less than attractive career field. It was stressed that funding be provided to major subordinate commands for independent design and quality reviews.

Another finding, said Olenchuk, was that most development schedules are unrealistically success oriented and that there is a failure to use in-house capabilities to solve production, design, and quality assurance problems. A recommendation was to include quality design and producibility as milestone factors, coequal with schedules and costs, in the acquisition process.

Additionally, Olenchuk said that cost, schedule, and performance goals were found to be overly optimistic in order to sell programs and that actual risks are not always identified. He suggested that requirements should be made more feasible. Relative to ammunition programs, the General stressed that failure to have proven designs prior to production is the fundamental cause of ammunition quality problems.

In order to meet schedules and cost restraints, PMs, said Olenchuk, often must subordinate quality and they sometimes don't fully apply DARCOM in-house expertise. Also, PMs sometimes become too much of a proponent for a system rather than an objective evaluator. Results of the study, said Olenchuk, call for a redefinition of the role of the PM in order to have him serve as a problem surfacer for the major subordinate commands; greater use of in-house expertise; and restructuring of the PM course to include case studies of program failures in order to reveal quality problems.

The DA Review Process and the PM Monthly Program Status Report was the subject of a formal briefing by Mr. Jack E. Hobbs, deputy for the Management and Programs, Office, Assistant Secretary of the Army (RDA). He related what the Army staff is doing relative to the status and costs of major Army programs. The new monthly status report, now required of the PMs, will hopefully improve things, said Hobbs.

Hobbs indicated that some of the things the Army staff is looking at are how the PM is doing on his planned and actual financial obligations, delivery plans, and contract data. Specifically, he said, we are looking at how much money is being spent versus how much time is being consumed. Relative to contract data, Hobbs noted that DA is reviewing the *trend* of the data more than the actual program. He told the PMs that he realizes the PMs may not agree with the need to submit the new report, but that in the long-term it will serve a very positive function for all concerned.

Mr. Roy Greene, deputy director for Program Management, Directorate for Development, Engineering and Acquisition, HQ DARCOM, followed Mr. Hobbs with a discussion of product improvement, and what DARCOM is doing to improve its management of improvement programs. He stated initially that affordability issues were a key priority in formulating the last budget request.

Greene stressed that product improvements play a vital role in the materiel acquisition process, and that a first priority is to fix readiness-related hardware problems. All product improvement programs, he added, should be challenged for their cost effectiveness and their contribution to readiness. Said he: "We must intensify our management of product improvements."

He indicated that a HQ DARCOM review board has been established to review new proposals and that DARCOM will also continue to review already approved product improvement programs. He emphasized that product improvements must be planned so as to use resources wisely.

The final two presentations of the first session of this year's PM Conference were devoted to discussions of the "Carlucci Initiatives" and the competitive acquisition strategy associated with the Bradley Fighting Vehicle System Program.

LTC Thomas E. Reinkober, assistant chief of the Procurement Management Division, HQ DARCOM, said that the Carlucci Initiatives contain few really new or revolutionary ideas. However, if implemented they will definitely improve the acquisition process. He noted specifically that $11.2 billion in cost savings for the three Services have been forecast through FY 1988.

BG Donald P. Whalen, PM, Bradley

Fighting Vehicle System, discussed a competitive acquisition strategy in use with the Bradley program. He commented that competition has played an important role in the Bradley Program.

A mix of good and bad news was contained in a warmly received dinner address by Assistant Secretary of the Army RDA Dr. Jay R. Sculley, who also presented two 1982 Secretary of the Army Awards for Project Management. He began his presentation by stating that the greatest challenge we have in peacetime is the task we face in the acquisition of hardware.

Dr. Sculley said that during the past year he was encouraged by the progress made in implementing some of the acquisition initiatives. Said he: "DARCOM has done a good job in getting the word out on the Carlucci Initiatives." Specifically, he praised DARCOM's progress in business clearance reviews, should cost, and in the increase of competition.

He added that there is still a great deal that remains to be done. His basic concern is that bad news is sometimes withheld and it should not be withheld. Dr. Sculley maintained that cost growth will continue to be the major Congressional issue.

He stressed that if we can't convince the Congress that we can manage our programs, then the programs will fail to pass the Congressional review process. He told the PMs that acquisition strategies must be reviewed before the fact, not after the fact, and that requirements must be more realistic.

He closed his formal address by stating his continued emphasis on cost discipline and capital investment issues. "I am convinced," he concluded, "that we have the right people to accomplish our goals."

Dr. Sculley presented 1982 PM awards to COL Ronald K. Andreson, PM, Black Hawk Helicopter and COL Clinton H. Black, PM of the Vertical Installation of the Automation Baseline.

COL Andreson's citation, which covered the period of July 1981 through June 1982, read, in part, as follows: *Through his initiative, technical competence, sound judgement, and astute managerial ability, COL Andreson directed and coordinated activities of a complex multilevel program, interfacing the development, production, and fielding of the Black Hawk Helicopter and its engine. This direct leadership and superior knowledge of planning, programming and budgeting resulted in the first major Army system to transition on schedule from development to readiness and from contractor to organic Army support, and the first to receive Congressional approval for multiyear approval.*

PM Awards for 1982 were presented to COL Ronald K. Andreson (photo not available), PM, Black Hawk Helicopter, and COL Clinton H. Black (shown above), PM, Vertical Installation of the Automation Baseline. Assistant Secretary of the Army Dr. Jay R. Scully presented the awards at the 12th Annual Army Project Managers' Conference at Orlando, FL.

COL Black, who is assigned to the U.S. Army Computer Systems Command, is believed to be the first non-DARCOM PM ever selected to receive the Secretary of the Army's PM Award. His citation read in part: *COL Black's superb management allowed his project to enter production and deployment of modern, state-of-the-art ADP technology to 47 installations. This technology dramatically enhances the Army's data processing capability during peacetime, mobilization, and war. Specifically, this was the first time an ADP procurement contract has been awarded under provisions of OMB Circular A-109. Additionally, under a prompt payment clause, the Army will realize substantial savings over the next 10 years.*

The second session of the PM Conference opened with a briefing on the U.S. Army Depot Systems Command (DESCOM) by DESCOM Commander MG Henry H. Harper. General Harper specifically directed his remarks at the services available to the PMs from DESCOM and what DESCOM is doing to meet the challenge of force modernization.

Harper emphasized that one of his first jobs, in order to support the PMs' systems under force modernization, was to organize the Army's depots. He added that by getting involved in the early stages of the life cycle process, the Depot Systems Command could have its greatest impact.

The depot maintenance workforce is just over 20,000 personnel, said MG Harper, and consists of a large variety of skills. He repeatedly stressed the availability of these resources for use by the PMs.

MG Harper then shared with the PMs some of the DESCOM's past successes. For example, Red River Army Depot did the depot maintenance study on the Bradley Fighting Vehicle System. This in-house preparation, said Harper, gave Red River an early involvement with the Bradley system and saved the government more than a million dollars.

Another area of assistance has been package processing points where a depot will hold and package an item for a unit until its shipment is requested. Computers which provide management information are also playing a major role in the force modernization effort for DESCOM. MG Harper concluded his remarks by once again appealing to the PMs to look to the Army's depots for assistance.

BG Lynn H. Stevens, commander, DARCOM-Europe, followed General Harper with an overview of the new DARCOM-Europe activity and its available resources for use by the PMs. Activated in July 1982, DARCOM-Europe represents the DARCOM commander as the single DARCOM manager and focal point for the European theater.

Additionally, DARCOM-Europe is responsible for centralized emergency/mobilization planning for all DARCOM elements in Europe; monitors and coordinates force modernization in Europe; performs liaison to improve customer service; and provides logistics assistance.

LTC Henry Sobieski, director of DARCOM-Europe's Directorate for Force Modernization and ILS, expanded on BG Stevens' remarks in noting that

DARCOM-Europe's scope of operations include new systems, product improved systems, and displaced systems.

Relative to new equipment fieldings, he said that 400 new systems are programmed for fielding from now through FY 1990, and that more than 170 are to be fielded in Europe during FY 1983-84. Major concerns, said Sobieski, are resources and supportability. In addition, he said that "quality of life" is another major concern.

'Sobieski was followed by COL (P) Charles C. Adsit, PM, Sergeant York, who explained program funding relative to the Sergeant York. One of our proudest achievements, he said, was how costs were controlled.

Mr. Anthony R. Battista, a staff member on the Subcommittee on R&D in the House of Representatives, was the first of two luncheon speakers at this year's PM gathering. He presented a lively discussion of the perception of the Army in Congress. He said he believed the Army's main problem stems from the perception that the Army is unclear on its R&D priorities.

Battista stated also that the Army sometimes tends to undertake technology just for the sake of technology without having a real goal in mind. He stressed the importance of considering user needs when undertaking 6.2 and 6.3 research. Battista called on his audience to be more selective in establishing their priorities and to take a closer look at preplanned product improvements.

Readiness and sustainability were identified by Battista as the two most important issues for the Army. Relative to the Army's acquisition strategy, he commented that the Carlucci Initiatives are only as good as the people who are going to carry them out.

Under Secretary of the Army James R. Ambrose also addressed the luncheon audience. He focused on the rising cost of programs and indicated that "downstream" costs must be given greater emphasis. Solutions to cost problems may rest with greater use of joint programs and the possible cancellation of others.

Ambrose also said that DARCOM and TRADOC must learn to work more closely, and that greater competition should be stressed early in the acquisition cycle. The Under Secretary added that he knows that a great deal of emphasis is being placed on testing and requirements. We need to do some real housecleaning in this area and we must look at the extremes in all directions, relative to our requirements, said Ambrose. The Under Secretary concluded by stating that the PMs must learn to be businessmen in the real sense of the word.

Following the luncheon, COL Walter J. Gabrysiak, PM, Test Measurement and Diagnostic Equipment, opened the afternoon session with a review of a test and measurement equipment study and its results. He was followed by COL Richard L. Nidever, deputy director, Force Modernization and Integrated Logistics Support, HQ DARCOM.

COL Nidever presented an overview of DARCOM's Integrated Logistics Study and its potential impact. Objectives of the study, said Nidever, were to examine the current integrated logistics system; to identify weaknesses in the system; and to recommend potential improvements to the system. The study team was composed of a chairman, a vice chairman, and members from HQ DARCOM, DARCOM, and PMs.

Nidever stressed that ILS management and its organizational structure is a challenging area. Additionally, he indicated that retention of and promotion progression for ILS personnel was a significant concern of the study.

Another planned action is the realignment of the HQ DARCOM Directorate for Supply, Maintenance, and Transportation early in 1983 in order to place greater emphasis on ILS, and to bring ILS and the major functional areas of ILS under a new Senior Executive Service deputy director.

COL Nidever announced that an ILS conference has been scheduled for March 1983, and that a DARCOM ILS Master Plan is now in preparation and will address the objectives of the DARCOM ILS program.

Paula Ingram, formerly with HQ DARCOM and now employed at the U.S. Army Missile Command, concluded the second session of the PM Conference with a report on the "Project Management Study." This study was prompted by GEN Keith's concerns and by recommendations of the Cost Discipline Advisory Committee. Recommendations are pending final approval.

The final session of the conference began with an address by MG Jerry M. Bunyard, PM, Patriot. He discussed some of the lessons learned relative to his program. He emphasized the importance of having a strong functional staff and announced that new Patriot Battalions are being activated both in CONUS and in Europe.

COL Thomas P. Kehoe, PM Joint Tactical Fusion Program, followed MG Bunyard with a brief synopsis of his program's mission and problems associated with establishing a new Joint PM Office from scratch. Mr. John Jury, HQ DARCOM Production and Procurement Directorate, then gave a well received discussion of the "should cost" process, including its pros and cons. He noted that one of the key benefits of should cost is that it often helps identify some of the contractor's inefficiencies. Negotiation teams are also better prepared to meet with contractors as a result of the should cost technique, he added.

Concluding speakers at the PM Conference were BG Thurman D. Rodgers, PM Defense Communications Systems, who spoke on some lessons learned as the result of the Army's involvement in a foreign military sales program, and COL Glen L. Rhoades, PM, Army Tactical Communications Systems.

COL Rhoades specifically discussed "Changing User Requirements After Initial User/Developer Agreements." He noted that some of the causes of user changes are writing in too many specifications, personality differences among the players in the acquisition process, and technology advances during the acquisition process. He appealed to his audience not to assume people know what and why things are done and to challenge the "it has always been done this way" philosophy.

The 1982 PM Conference is being touted by many participants as the most successful and productive one in recent years.

Light Division Bridge Prototypes Ordered

The U.S. Army Mobility Equipment Research and Development Command (MERADCOM) has awarded $766,000 to Foster-Miller Associates, Inc., of Waltham, MA, for the design and fabrication of prototypes of a new assault bridge for the Army's light infantry division.

This award is the first increment of a 4-year, $4.2 million contract for the engineering design, software, fabrication, and testing of three prototype bridge systems that can be towed and launched by various vehicles.

The new assault bridge will be a 25-meter long, double fold scissors design capable of supporting 30 tons. Constructed of aluminum, it will weigh approximately four tons. It will be mounted and launched from a trailer that can be towed behind any standard vehicle with a 15,000 pound towing capacity. Delivery of the first prototype is set for June of 1984 with the remaining two bridges arriving in January 1985.

Accelerating the Army Acquisition Process

By COL Frank G. Szustak

The Army has long been concerned about its acquisition process. There have been at least seven previous studies of acquisition problems since 1970, and nothing has really changed. Early last year then, the Secretary of the Army challenged his acquisition community to take a fresh look at methods to accelerate the acquisition process.

In response to this challenge, and under the leadership of Dr. Jay R. Sculley, ASA(RDA), a select group of experienced Army acquisition managers assembled at West Point to discuss the matter. Attendees were: Dr. Jay R. Sculley, ASA(RDA); Dr. Paul Arvis, manager, Army Procurement Research Office; Mr. John Blanchard, principal assistant deputy for RDA, DARCOM; Mr. George E. Dausman, Acting Deputy Assistant Secretary of the Army (Acquisition); MG Robert Herriford, director of P&P, DARCOM; Mr. Walter W. Hollis, Deputy Under Secretary of the Army (Operations Research); Dr. Thomas Keenan, director of P&P, TSARCOM; BG C.M. Matthews, deputy CG, R&D, TACOM; Mr. Al Muller, director of P&P, MICOM; Mr. Douglas Munroe, chief, RDE Procurement Division, P&P Directorate, TACOM; MG Ben Register, CG, ARRCOM; MG L.F. Skibbie, then director of Combat Support Systems, ODCSRDA; Mr. Robert Stohlman, OASA(RDA); and COL Frank Szustak, OASA(RDA).

After some very open discussions of the problems and management options, the overwhelming concensus was that the Army needed to better discipline the acquisition system. As Dr. Sculley reported, "For the most part, policies and procedures are in place, Often, however, we let the bureaucracy strangle us in implementation and thus frequently miss opportunities to tailor new acquisition programs to shorter more logical schedules."

The Secretary agreed with Dr. Sculley's recommendation that we needed to get started with a program to correct our system's discipline weaknesses, including taking excessive technical risks, failure to prioritize, unrealistic budgeting, contracting delays and deficiencies in program planning.

The underlying philosophy was that meaningful progress begins with a self-searching process. Accordingly, an Acquisition Steering Group was chartered by the Secretary of the Army to consider ways to "make a meaningful contribution in accelerating the Army's acquisition program and direct changes to procedures that impede timely action." It is chaired by Dr. Sculley and includes: LTG James H. Merryman, Deputy Chief of Staff (RDA); LTG William R. Richardson, Deputy Chief of Staff for Operations and Plans; LTG Richard H. Thompson, Deputy Chief of Staff for Logistics; LTG Robert J. Lunn, Deputy CG for RDA; and MG John B. Oblinger, Jr., Deputy Chief of Staff, Combat Developments, TRADOC.

The Group met 16 June, 11 August and 20 October. During these meetings, ideas on what caused the Army's difficulty in the acquisition process were discussed and developed. For example, when discussing excessive technical risks, the Group felt that generally, weapons system development should not push the state-of-the-art because of the high risks. However, some proposed systems, by pushing the state-of-the-art, may promise an exceptionally high payoff in terms of enhanced capability. When the value of such enhancement outweighs the risk, it properly should be considered. Further, such high "payoff" systems are to be candidates for extraordinary management concepts.

The failure to prioritize has caused inadequate funding for early R&D, uneconomical production rates and program and budget instability. The Group recognized the prioritization of

TOPICS FOR INITIATIVES

TOPIC	LEAD	FOLLOW
Long Range R&D Planning	DCSRDA	DCSOPS OCSLOG
Protecting R&D Thrusts	DCSRDA	DCSOPS
Adequately Fund to Reduce Risk	DCSRDA	DCSOPS
Develop Sound Acquisition Strategy	DCSRDA	DARCOM
Discipline Engineering Changes During Development Process	DARCOM	
Improve Preplanned Product Improvement	DARCOM	DCSLOG
Provide Logistics Prototypes	DARCOM	DCSLOG
Discipline Priorities	DCSOPS	
Integrate Data Bases	DCSOPS	
Insure Realistic Testing	DCSOPS	DCSRDA
Discipline Requirements	TRADOC	DCSOPS
A. Needed vs. State-of-the-Art		
B. Changes		
Balance Readiness vs. Support Requirements	DCSLOG	TRADOC DARCOM
Front End Funding for ILS	DCSLOG	DCSRDA

a new system must be consistent with future plans for force structuring.

Starting new systems only when prior requirements have been identified avoids unwarranted rivalry for resources. In developing priorities, the acquisition process can often be accelerated by a determination to field an adequate system "now" with preplanned product improvement later.

The Group exchanged ideas on realistic estimating and budgeting. The estimating system for cost, schedule and performance must be realistic. Adequate front-end funding to include allowances for unknowns can significantly reduce the risk of increased monetary, time and other cost factors.

The budget process must recognize real inflation and provide a direct connection of funding and program decisions. Analysis of these ideas have identified program stability or lack thereof, as the key to controlling the length of the acquisition cycle.

Interestingly, the Chicago Cost Discipline Conference held 21-22 July 1982 was designed to provide industry executives with an opportunity to offer the Army their views and recommendations on controlling costs of weapons systems, concluded that "program instability is the fundamental problem." The report said:

"The Army launches its acquisition programs based on a set of seemingly desirable and achievable requirements, but without a full appreciation of the technical complexity, the level of risk, and most significantly, the costs and problems involved in producing the weapons system that finally emerges from the development phase.

"After their initiation, these programs have generally followed a standard pattern of instability and turbulence. As the development phase proceeds, it becomes clear that to achieve the large increases in performance promised by the new technology, many detailed technical problems have to be resolved. The resolution of these problems requires an exten-

sion of the programmed sequence of design, test, failure, redesign, and retest. Any changes in requirements cause further redesign. The effects of this experience have been stretched-out development cycles, reconsideration of programs by higher authorities, delayed funding, and redirection of effort. In some cases, significant technical problems remain to be resolved when production is initiated, thereby inducing additional stretch-outs, reduced production rates and quantities, and delayed deliveries to the force."

At the 20 October session, each of the members developed specific topics in which they felt they had the opportunity to provide for program stability improvement (self-discipline, self-searching process). These topics, along with the proponent staff agency are shown on the accompanying chart. Associated with the topics are a number of initiatives being pursued which heretofore were considered belonging to the "too hard" to do category.

Implementation of these initiatives should dramatically contribute to change in the Army's way of doing business and will lead to a more affordable overall acquisition program for the Army. It is clearly recognized that the price of stability will be the loss of some flexibility in management and a probable reduction in the number of programs being pursued. To insure a unified effort and the desired program stability, the Long-Range RDA Plan is looked upon as the effort's cornerstone.

The effect of reduced flexibility will have an impact on program stability objectives during the programming and budgeting process. The Army has already fenced 65 percent of the total RDTE funding. If it budgets to the most likely cost in R&D (as an initiative), by providing adequate timely funding for producibility, integrated logistics support and Total Risk Assessing Cost Estimate, then the percentage of funds not fenced will be reduced. Consequently, the flexibility to respond to changing requirements or the OSD/OMB Congressional guidance will also be reduced.

While the Acquisition Steering Group recognizes that initiatives may not yield identifiable results in the near term, there is agreement that only drastic action will result in meaningful improvement. The discipline required to make tough decisions will not be easy, but the commitment to "get moving" is unanimous.

COL FRANK G. SZUSTAK, deputy for Production and Quality, Office of the Assistant Secretary of the Army (RDA), is the executive secretary of the Acquisition Steering Group. Graduated from Gannon University, he holds an MS degree from Florida Institute of Technology and is a certified professional contracts manager.

HEL Uses Helicopter Simulator to Assess Pilot Responses

Experiments to assess a pilot's ability to control an expensive and sensitive piece of machinery like an Army helicopter are being conducted almost daily at Aberdeen Proving Ground. . . minus the helicopter.

These experiments are possible because of a sophisticated helicopter simulator located on the second floor of the U.S. Army Human Engineering Laboratory (HEL), the Army's lead laboratory for studies of how man interacts with machine.

The simulator serves a unique purpose. While most simulators are used for pilot training, HEL's simulator is used to conduct experiments on controls and displays.

The simulator is like those used for training purposes. It simulates most aspects of helicopter flight such as hovering, diving, banking, and climbing. However, all "flights" take place within the confines of the second floor of the HEL building.

"The simulator serves our purposes well," says Mr. Bill De Bellis, an engineer (human factors) who is the project engineer responsible for setting up tests and experiments on the simulator. "It's a relatively inexpensive piece of equipment and it's always had minimal to no down-time. When we want it to fly, it flies."

"We use the simulator to test pilot reactions to controls and displays," De Bellis explained. "A pilot needs to know certain information in order to fly, and that information is given to him in different forms on the instrument panel. We see how he reacts to the information and. . . to the way it is supplied."

The simulator duplicates a helicopter's instrument panel. It has been with HEL for 12 years, but has had to undergo certain modifications in recent years because of the new advances in technology.

"We have been able to keep the simulator up-to-date with the current changes in technology," De Bellis said. "Two years ago we installed a cathode ray tube video display screen in the simulator which is becoming standard in some helicopters. It enables us to test pilot reactions to modern displays and controls."

Another modification was due in part to the recent relocation of HEL. "We had the simulator hooked into one type of computer system in our old building," De Bellis explained. "Now we have it hooked up to a new, large computer system, the VAX/11780. This system allows us to record all parameters of a particular flight and provide modified control signals to the simulator. It also generates the video display.

"We have to work out some problems right now to get the two systems to work together," he added.

Once the two systems are compatible, the simulator will be used for a series of new projects. One project involves experiments with a second generation single controller, which is a new concept for helicopter flying.

"The single controller will allow the pilot to fly the helicopter with only one hand and possibly without the use of his feet. It ordinarily takes a pilot two hands and both his feet to fly a helicopter," De Bellis said. "The controller will have four degrees of freedom: fore and aft, left and right, up and down, and rotationally. With this new controller, the pilot's other hand will be free for switch manipulation and access to radio or navigational gear."

HEL will be looking at the human factors aspects, or pilot reactions, to such things as angle placement and switch and button manipulation of the controller. Also, HEL will be looking at how much information one person can absorb.

Human factors experimenting with the single-controller prototype is expected to begin early in 1983.

"One other major project we will undertake in the next couple of years is what we call a 'hot mock-up'," stated De Bellis. "We plan to build a generic crew station, or cockpit, that allows us to change the instruments and displays to match any instrument panel of any helicopter. We will be able to compare cockpits and/or the technology used, and also decide which is the best arrangement that enables the pilot to fly the best way possible."

DARCOM CG's Materiel Acquisition Progress Report to CofS

"People. . . and a continuous development and revitalization program to update and sharpen their acquisition management skills," are among major considerations in upgrading DARCOM's procurement practices to ensure that the Army is getting a fair return on its procurement dollar.

These considerations were reported to The Chief of Staff, U.S. Army, by General Donald R. Keith, in an accounting of the progress in materiel acquisition improvements during his first year as commanding general of the U.S. Army Materiel Development and Readiness Command (DARCOM).

Against a background of manpower cuts, reorganizations, increased workloads, backlogs, economic conditions, and national priorities that have made procurements increasingly complex over the past several years, General Keith set a new stage that. . . "must become a way of life in DARCOM."

"Without question, my paramount thrust in improving the acquisition process is, and will continue to be, good, solid, up-front planning. We need a well thought-out and documented acquisition strategy wherein all essential elements affecting the downstream program execution and cost for development, acquisition, and support are developed, and a course of action selected and set in concrete.

"To that end, we are institutionalizing an overwatch system by top management using the expertise of our most competent people. In doing this, I have established a senior level panel to review the acquisition plans of our most important programs.

"The panels will evaluate acquisition strategies, costing techniques, program funding and executability, production strategies, delivery requirements, test and evaluation plans, mobilization considerations, and supportability.

General Keith reported on past actions of many of DARCOM's on-going, long-term initiatives, which he feels will result in real, auditable improvements in the Army's acquisition practices and procedures.

Among these are Program Management and Control System, known as PMCS; Total Risk Assessing Cost Estimate-Production, called TRACE-P; and the military and civilian Materiel Acquisition Management Program, often referred to as MAM.

"People, however, remain the most important of DARCOM's commodities."

DARCOM has hired more than 2000 new people for the procurement function since 1979. These employees include new professionals recruited from college campuses, our local workforce, and Office of Personnel Management registers. "These new careerists are highly motivated," he said, "but [they] require extensive classroom and on-the-job training to become fully proficient.

"Right now, 38 percent of our procurement workforce is still in some stage of initial training. When they take their places in the workforce as fully qualified professionals, we will begin to realize their full benefit—but that will take time.

"For our seasoned veterans, there is continuing professional development through mid-level and executive refresher courses at DMET schools: Defense Systems Management College, Air Force Institute of Technology, Air Training Center, Army Logistics Management Center, and Naval Material Command-sponsored contract courses."

"Formal training is not enough," Keith continued. "We also need to rapidly convey new policies and policy changes to the working level."

He then reviewed programs directed to this end, such as, video and source-book training, college tutorials, command-wide and locally-developed workshops and courses, and conferences and symposia designed to exchange information on current acquisition improvement topics and techniques with industry.

"Competent people need not only good procedures, but adequate tools," the General said. "We have a number of process improvements in the works to reduce the administrative and paperwork burden, increase accuracy, and reduce document review and rework." To do so requires a heavy dependence on automation."

To illustrate, he reported on the progress of the Procurement Automated Data Documentation System, which automatically produces procurement documents, and the Procurement Automated Manpower Utilization and Projection System, which will soon give us a systematic means of establishing performance objectives (time) for each step in each type of procurement.

In a transition from what DARCOM is doing to what DARCOM needs to improve its professional development programs, General Keith asked for continuing support of RESHAPE.

"RESHAPE notwithstanding, civilian end-strength continues as our biggest constraint. We have identified, with some precision, the fundamental elements of the MAM and other hard-core professional development programs. A big help would be the establishment of a transient account—spaces not counted against our end-strength ceiling—to allow for education of our professionals, much as we do for officers.

"The Army resource allocation system does not provide the flexibility to balance among elements of the total system, and/or to react to changes as they occur without burdensome administrative reprogramming. . . What we need is a systems view of the procurement functions. Workload increases which drive our procurement manpower also affect direct and indirect supporting functions, such as maintenance of procurement packages, supply management, maintenance support, and finance and accounting.

"We have an effort underway to describe these relationships mathematically so that adjustments can be made to end-strength in supporting functions concurrent with procurement workload changes. We will present appropriate recommendations to the DCSPER when we complete our work.

"The procurement intern program is caught up in a general proposal to reduce all intern training from three to two years. Three full years of training are required if we are to create the expertise and breadth necessary to develop and execute professional procurements.

"In a macro sense there are two overriding needs that require more work. Stability leads the pack. Stability in requirements, in funding programs, in manpower authorizations, in audit and oversight—all will contribute to a reduction in turbulence, administrative burden and cost growth," said Keith.

"The second is to determine how best to measure progress at the working level and how to measure the relationship of professional development to performance."

"Finally," Keith reported, "we ask that new programs assigned to DARCOM be fully resourced—the dollars to execute them and the end strength and high grades to manage them."

Merryman Urges Innovation Before Army Science Board

Speaking at the recent meeting of the Army Science Board in San Francisco, CA, LTG James H. Merryman said that the Army must strive "to create an environment that encourages innovation and is receptive to new approaches. . . " Merryman, Deputy Chief of Staff for Research, Development and Acquisition, DA, called the audience's attention to the fact that such a course was essential if the Army's materiel acquisition community was to be successful in carrying out its Future Development Goal.

The Future Development Goal is a unique one among seven goals set by the Chief of Staff under a program called Performance Management, Army. The other goals are: management, leadership, human, readiness, materiel, and strategies deployment. The Future Development Goal is unique, said Merryman, in that it transcends the others, and will influence the extension of all Army goals one to two decades hence. The key, he contends, is for the Army to be "sensitive to innovative approach."

How will the Army achieve this objective of creating the innovative environment, queried the General? The answer, he said, will come from determining the nature of the innovative challenge. Where is the Army headed if it remains on its present glide path? Where should it be headed? The difference will provide the magnitude of the innovation challenge, said Merryman.

The recent Army study, Airland Battle 2000, is good as far as it goes, he contended, but is based primarily on mid-intensity warfare. It does not address adequately such things as nuclear conflict of varying intensity, unconventional warfare, and terrorism.

Further, doctrine is often out of synchronization with development, frequently following the equipping phase. But the Army cannot unilaterally develop doctrine, he stressed. It must be in concert with the other services as well as our allies.

The Army, said Merryman, must address the full spectrum of conflict, integrating all functional areas, and make the development process concept based.

The Army's force structure is headed for Army 90, which is based on the Heavy and Light Division 86 and higher echelon concepts. Army 90, Merryman said, does not specifically consider the Airland Battle 2000 requirements such as seeing deep, kill deep, and the requisite command, control and communications needs. It is dependent, he continued, on grossly inadequate air and sea lift for rapid strategic deployment, to say nothing of affordability aspects.

Needed, said Merryman, is a flexible force structure capable of supporting the Airland Battle and Airland Battle 2000. It will be a manpower constrained force, so technology must be utilized to the utmost to compensate, contended the General. Robotics, for example, could ease manpower needs in the fields of mine clearing and mine laying, ammunition handling, artificial intelligence and computer-aided design of equipment.

Designers of both equipment and force structure need to consider carefully, stressed Merryman, manpower implications of demographic trends such as higher numbers of non-English speaking recruits, educational levels, knowledge retainability, and technology adaptability.

Turning then to training, General Merryman told the group that one of the toughtest Army challenges of the future is to train to fully exploit the Army's personnel and equipment capabilities. How does one train people to see deep and kill deep, or to handle the identification, friend or foe problem, he asked?

As for equipment, Merryman told the audience that the Army will continue to have a mix of high-low technology equipment on into the far term. This will cause supportability problems due to the dual support base required. Future fielded equipment must have the capability to exploit Airland Battle 2000, having the always-sought after characteristics of simplicity, supportability, lethality, mobility, interoperability, etc.

He called attention again to the desirability of shortening the acquisition cycle, and to capitalize on areas of national strength. There should be a deliberate effort on the part of those concerned with our technology base efforts to utilize technology to reduce logistical constraints.

The nation today, said Merryman, is in an environment that places renewed emphasis on the mobilization problem. While the President has a mobilization preparedness program, and the Army is selecting items for surge funding, the model generally continues to be based on World War II experience, and that model, contended Merryman, does not fit the realities of the future. A new practical and affordable mobilization concept should be developed.

The U.S. currently has a number of areas of technological superiority, said Merryman, areas such as electronics in general, optical and microwave sensors, computers, computer-aided displays and controls, and materials. Many have high military relevance, and most are affordable. The imaginative use of technology can keep the cutting edge and provide multiples of effectiveness on much of our control equipment, whether applied through product improvements or new systems.

To help achieve the desired environmental characteristics for the innovative Army, General Merryman suggested that the following should be considered: emphasize long-range planning, create a center for innovative excellence, undertake meaningful changes to the materiel acquisition process, improve the technology base program, create a forum for unsolicited ideas, change the environment of the Army school system, put creative people in key positions, institute an incentive program to encourage professional writing, and finally, develop a mentality that provides opportunity to try new ideas—and allow failures without prejudice.

The General closed by stressing that there was need for help, and urged people to send him comments and suggestions.

The High Technology Light Division

By Mr. Jack R. Tate

During the past few decades, the Army's force structure has increasingly included heavy divisions able to defeat heavy armored forces far superior in numbers to those of America and her allies. Such heavy divisions are not readily deployable for military options in other parts of the world.

Army leaders are now looking for a force which is light, mobile, and tough enough to survive a battlefield in Europe and still be one that is quickly deployable to any other part of the world.

Army Chief of Staff GEN Edward C. Meyer felt that the solution to developing this fighting force and implementing the new AirLand Battle concept could be found through the use of technology.

The 9th Infantry Division, one of the four infantry divisions in the active Army, was given a mission to develop a High Technology Light Division (see Figure 1). The purpose of this project is to produce a lean, hard-hitting infantry division that will exploit technological opportunities and be designed for rapid deployment and sustainability.

This prototype division, produced by the 9th Infantry Division, will be capable of reinforcing NATO and responding to world-wide contingencies, with a primary focus on operations in the Middle East and Southwest Asia.

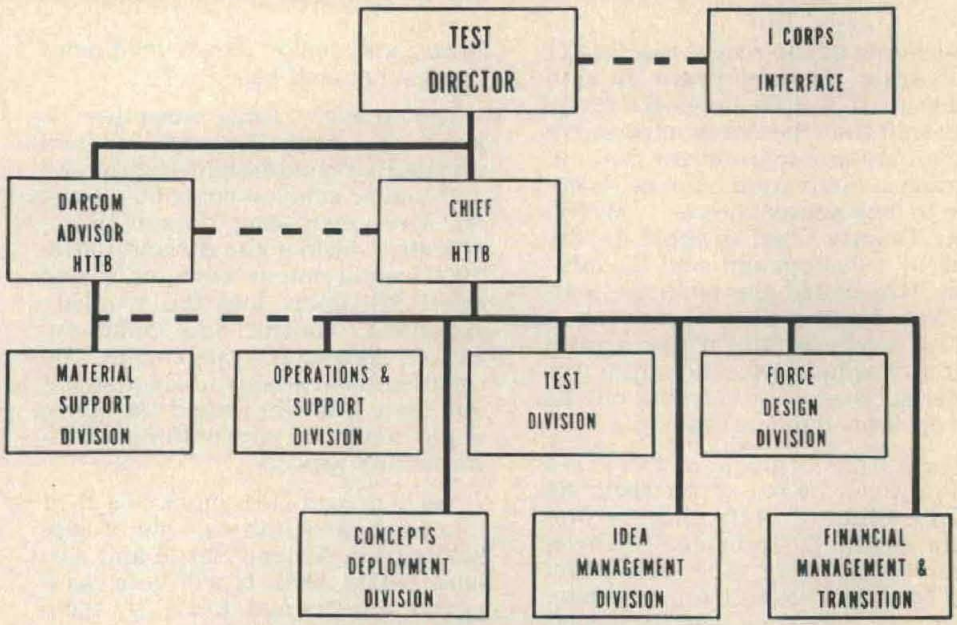

Fig. 2. High Technology Test Bed Organization

The High Technology Test Bed, at Fort Lewis, WA, is the focal point for the application of high technology for the Army. It consolidates the efforts of the 9th Infantry Division, various Army commands, civilian industry, other services, our allies, and other Department of Defense agencies.

The test bed has the responsibility for creating the High Technology Light Division. The objective is to expedite the incremental fielding of equipment and organizations to produce a prototype division by 1985. The new light division will make use of off-the-shelf, state-of-the-art technology.

One of the major questions which had to be answered was how to fight the new division. Using AirLand Battle doctrine and Infantry Division 86 as a base, the test bed set about developing an operational concept on how to fight. At the 9th Infantry Division, through map exercises and command post exercises, joint tactics are being developed that the Army and the Air Force must use in a synergistic manner in order to accomplish the imperatives for modern combat called for in the AirLand Battle doctrine.

As concepts are examined to see what must be done tactically to execute the AirLand Battle, insights are gained on what the force structure should be like and what kinds of capabilities must be designed into a high technology light division. As these generic capabilities are identified, they must filter through the constraints of deployability because the division must be rapidly deployable.

The new light division will have all the tactical mobility, firepower, and survivability of a heavy division —a tough, but light and rapidly deployable division.

The airlift target for the division is

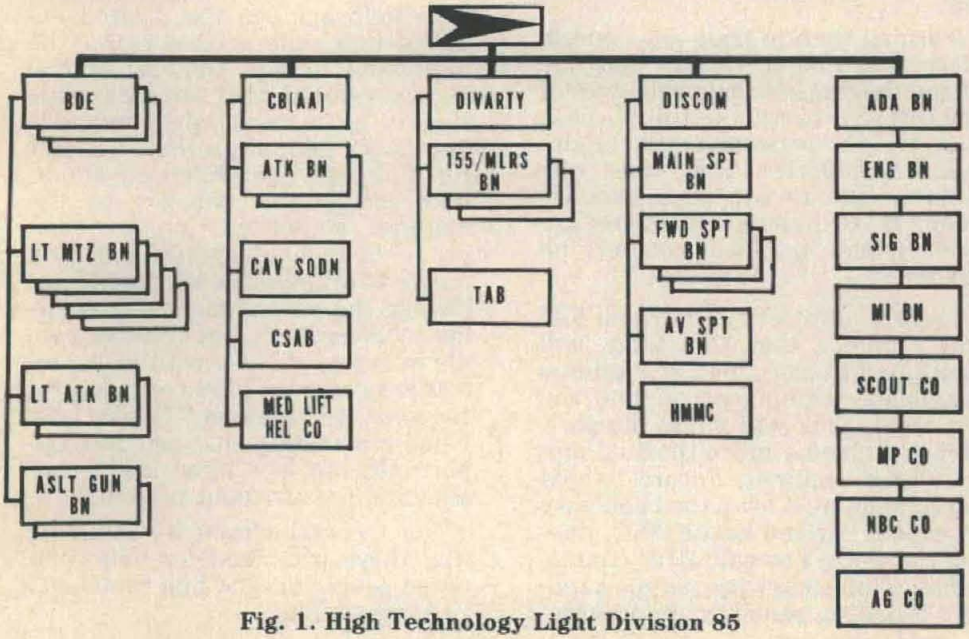

Fig. 1. High Technology Light Division 85

to deploy, ready for combat, in no more than 1,000 C141B sorties; no C5As will be used. This limits the type of equipment that will be contained in the light division to what will fit in a C141B. The bottom line of the whole effort is to be strategically deployable. It does no good to design a new division if it can't get to the fight on time.

Our forces must be able to get to the fight on time, not only intertheater, but intra-theater as well. In coordination with the Air Force, techniques by which the new light division can be inserted into the battlefield are being examined. The Air Force and the Army, using their assets together, can conduct intelligence preparation of the extended battlefield better than the Army can do alone.

In the same fashion, the Army must be able to work with the Air Force to see all the targets, prioritize them as to their significance, and designate which force should take on what targets. This is the synergistic employment of firepower.

Logistics cannot be forgotten. Certainly, the Air Force capabilities provide and enhance logistic support capabilities to the Army forces committed in the AirLand Battle.

Capabilities are developed and validated through a variety of techniques in the High Technology Test Bed. Through the use of field exercises and map war game exercises, the commanders and their staff conduct simulated military operations in contingency areas to gain insight into those generic capabilities and requirements that must be in the light division. Computer simulation is used, when appropriate, to validate and enhance the results, to take advantage of all the expertise that exists within the Army.

The results of the war game exercises have been to produce problems, which, when identified, lead to development of requirements for solutions. Requirements may be in many areas—doctrine, tactics, organizational equipment, individual equipment, and deployability.

The first key element of creating a High Technology Light Division capable of accomplishing its mission is to establish what the configuration of this mission should be. There are two driving factors that guide the configuration. It must have strategic and tactical deployability, yet while being lighter, the division must have enough combat power to survive and win on future battlefields.

The second key element is that the test bed is also interested in introducing into the Army those techniques that create a positive environment for soldiers and increase their confidence in themselves, their unit, and their leaders. To examine both of these elements, operational concept exercises are conducted where small prototype forces are equipped, move to the field, and identify on-the-ground problems associated with these forces and necessary solutions.

As an example for the close combat task, a light mobile maneuver element is needed, consisting of units with fast attack vehicles armed with a variety of weapons, possibly including hypervelocity, not only antitank, but also antilight armor vehicles, antipersonnel, antiair, and employing semi-indirect fire systems. This division force must be completely air mobile with organic aviation assets and must be able to operate and fight at night.

Prototype organizations of a light attack battalion, light motorized infantry batallion, and assault gun battalion have been designed and will continue to be refined through further evaluation with the addition of newer equipment.

To validate equipment requirements to support these operational evaluations, many sources are utilized to obtain commercial off-shelf items, R&D prototypes, or foreign equipment by either procurement or on a loan basis. This equipment may have to be modified or adapted to meet a military configuration. Some of this equipment is modified through the Installation Maintenance Office "Skunk Works" (see Article, p. 11, this issue) utilizing OMA funds to support the test bed evaluation.

If an equipment shortfall is identified for fielding items, then the test bed writes the requirement document for the materiel development. Based on the results of operational concept evaluation, exercises, and subsequent decisions by the Chief of Staff, units are formed to transition into a prototype High Technology Light Division.

This is a revolutionary approach. Traditionally, the force development process can take 5 to 10 years, or longer, in an evolutionary process which merely builds on or enhances force structure which already exists.

To have a prototype light division by 1985 is an extremely short period of time in which to sort all the problems and solutions associated with what such a high technology division will look like, how it will operate, and how it will be equipped, and then get funds approved by Congress for purchase of new equipment.

Using the technology available today calls for taking advantage of the perspective of leaders in the 9th Infantry Division to wrestle with the questions of how to fight on the extended battlefields and what capabilities are needed beyond those which are currently fielded.

The men in current command and staff assignments know better than any others the complexities of balancing training and mission readiness with equipment maintenance and the reality of what can be accomplished with the U.S. soldier today. This will be a force designed by the soldiers who will live with the product.

In order to conduct deep strike operations, there will be a need for units such as light attack battalions designed for deep insertion and able to remain in enemy-held territory for an extended period of time. To retain the capability for the close-in fight, the maneuver brigades would also have assault gun battalions and light motorized infantry battalions for those missions requiring more staying power than the light attack battalions.

Generically, fire support, consisting of highly mobile lightweight cannon, heavy mortars, and lightweight rockets, would have the ability to integrate the fires of a variety of munitions including smart, self-contained, and conventional munitions.

Using existing TOE structure and the Infantry Division 86 studies, the test bed has developed a proposed organization (Figure 2) consisting of four maneuver brigades, one of which is a consolidation of the division air asset into a cavalry brigade, air attack.

This brigade concept was evaluated at the test bed and its organization has been restructured to include two attack helicopter battalions, an air cavalry squadron, a combat support aviation battalion (Blackhawk), and a medium lift

helicopter company (Chinook).

The brigade will enhance the air assault capabilities of the division by providing new dimensions in mobility and antitank capability.

The remaining brigades will consist of light motorized infantry battalions, light attack battalions, and assault gun battalions. These maneuver brigades will have appropriate support forces of military intelligence, signal, engineer, and logistical capability. The division support command has been restructured to provide autonomous support to the maneuver brigades. A forward support battalion has been formed to provide this direct support to each brigade.

While the High Technology Test Bed activities are interested in increasing the combat power of a light division and lowering the deployability requirements, the needs of the individual soldier in the light division have not been forgotten. These soldiers will be accomplishing missions previously attempted only by the Army's elite forces.

The high technology solider must have equipment which will support him on these missions. First of all, it is known that the infantry soldier today is required to carry too much weight—167 pounds—in fighting load, existence load, and maintenance load. The goal is to cut this total load to 72 pounds.

These loads can be broken down into capabilities the soldier must have, such as carrying various kinds of ammunition for a fighting capability, carrying rations and sleeping bag for survival capability. All of these capabilities are essential, so the best way to keep them, but lighten the load at the same time, is through combination.

Use of Goretex technology incorporated into a battle uniform to provide protection from the weather and immediate protection against enemy warfare agents is an example of combination efforts. Another example would be the use of an extremely lightweight sleeping bag that is also waterproof and available on the commercial market.

Possible, perhaps, is the adoption of a new rucksack which enables the soldier to mount or dismount pouches from the rucksack to his fighting vest so he could tailor his load for a combat mission. The fighting vest could reposition the ammunition magazines to the chest area to protect the critical heart and lung region from small arms, thereby increasing the soldier's survivability.

The test bed has identified priority equipment items for evaluation and also several items for fielding in the prototype light division. This has caused the Army staff and the DARCOM community to come up with expedient ways of doing business in order to accelerate the acquisition cycle to meet the 1985 goal.

Quick Reaction Program (QRP) materiel need statements have been prepared and submitted through TRADOC and DARCOM for conceptual approval by the Army staff for money to be programmed to equip the High Technology Light Division for these particular operational requirements. Additional QRPs are continuing to be identified and developed to be submitted as evaluations are completed.

The mission faced by the 9th Infantry Division and the High Technology Test Bed is an exciting challenge: to create a light, tough High Technology Light Division by 1985 and man it with soldiers trained and capable of conducting the AirLand Battle.

In an effort to break out of the mold and to make revolutionary advances in the area of tactics, force structure, equipment, and soldiers needs, much work has already been done with more to do in an extremely short period of time.

Personnal at the test bed are confident of success, convinced of the value of what they are doing for the Army, and certainly aware of the support they received from the Chief of Staff on down as the High Technology Test Bed works to "Make It Happen."

MR. JACK R. TATE is the R&D coordinator for the DARCOM Materiel Support Activity of the High Technology Test Bed at Fort Lewis, WA. He holds a BS degree from the University of Nebraska, has completed the U.S. Army Command and General Staff College, and has served in a variety of engineering assignments in the U.S. and abroad.

ALMC Commandant Reviews MAM Course Status

In a letter dated 14 January 1983, COL Billy C. Holland, commandant, U.S. Army Logistics Management Center (ALMC), Fort Lee, VA, reviewed for DARCOM Commander GEN Donald R. Keith, the status of ALMC activities in support of Materiel Acquisition Management (MAM), particularly as it pertained to the Center's role as the educational proponent for the MAM program.

Holland noted that in September 1982, Keith conceptually approved the program of instruction for an introductory level MAM course. The Center was working toward a 9-week course to meet this requirement, and the proposed course curriculum was then out for comments by interested agencies and commands. Target date for the course final version is 1 February 1983.

While the need for such a course at the earliest date was recognized, Holland cautioned that "the availability date relates closely to the question of personnel resources." The original goal was the first quarter of FY 84 at the earliest, assuming the necessary personnel were obtained. This requirement was included in the ALMC FY 85-89 Program Analysis Resource Requirement and the FY 83-84 command operating budget, though not as authorized spaces on their current (ALMC) TDA. While temporary resources were being used currently, the additional needs had to materialize, said Holland, if the October 1983 date was to be met.

The Center has concluded, he continued, that there are two essential elements to the program. The first was the need for an introductory MAM course, a need already being addressed. The second part is a MAM Cooperative Masters Degree Program—perhaps based on the Logistics Executive Development Course and involve participation of a suitable university. This element is still to be worked out, however.

Currently the Center's efforts have been directed toward active officers "who, currently or in the foreseeable future, will carry additional skill identifier 6T, MAM." The Center recognized the need, said Holland, to broaden as soon as possible, the program so as to support the civilians in their comparable career field and members of the Reserves.

'Skunk Works' Aids in Development of New Light Division

The preceding article provided an analysis of the development, objectives, and structuring of a new Army High Technology Light Division. The article which follows, submitted by the 9th Infantry Division Public Affairs Office, describes some specific efforts to modify existing equipment and develop new equipment so as to enhance the new light division. Some of this work is being carried out by a "Skunk Works" activity.

The Skunk Works, an element of the Installation Maintenance Office, Fort Lewis, WA, is staffed by civilian and military engineers, and civilian technicians. It has developed projects that have practical use in the 9th Infantry Division and the entire Army. Significant projects that are currently underway are, Operation Looking Glass, Reliable Slip, a remote controlled robot vehicle, the new Fast Attack Vehicle and the M882 Surrogate High Mobility Multipurpose Wheeled Vehicle.

A Skunk Works mission is to develop concepts that allow oversize vehicles to be transported on C141s without modification to the aircraft. Two ideas have originated that will assist in the completion of this task.

The "Reliable Slip" was conceived after an evaluation indicated which vehicles were oversized and would not be able to fit in the cargo area of the aircraft. It was discovered that all the vehicles and vans could be loaded if they are loaded separately.

By placing polyurethane strips on both the vehicle chassis and where the van made contact with the frame, the van could be easily slipped off by use of a pulley. Since the rollers on a C141 align with the vehicle frame supports, the same procedure can be used to pull the van off the vehicle and on the aircraft.

If vehicles are available at the deembarkation point then the vans can deploy without their original vehicles and be mounted on those present at the arrival point. If the vehicles will be required to accompany the vans then they can be loaded in the same aircraft.

The space conservation study led to the next project which palletized ammunition and fuel. This project has been tested by a civilian trucking corporation for civilian use, but according to Mr. Harold S. Feutz, Skunk Works chief, the concept can be applied to military specifications. "The flat bed of a truck would have the capabilities of a dump truck and by using the polyuranthane strips, the pallet would be pulled onto the flat-

High Mobility Multipurpose Wheeled Vehicle

bed for transport and then slid off for use," he said.

Mr. Dale Brown, an industrial engineer working with the Skunk Works, noted that the organization has developed into a permanent agency. "The original purpose of the Skunk Works has been expanded to the point that it is not only a research and development agency for the 9th Infantry Division but also an integral part of the Army's research and development program. A good example is Operation Looking Glass," he said.

Operation Looking Glass is a long-range optical electronic observation device that has a multikilometer range. The material that is needed to construct this high powered telescope is available on the open market. With minor adaptations the device proved highly effective for long-range observation.

Another Skunk Works project involves modifications for the Fast Attack Vehicle. Some 80 Fast Attack Vehicles have been leased in order that a light attack vehicle can be evaluated here. The Fast Attack Vehicle has a dune buggy chassis, with a reinforced suspension system. This two-man vehicle will be equipped with an antitank weapon or a Mark 19 40mm grenade launcher.

The Skunk Works modified the original dune buggy into a fighting vehicle the Army could use. The vehicle was evaluated to identify limitations and problems. Vehicle modifications include: a weapon mount that accommodates the respective weapon system, and an improved suspension system that withstands the shock of firing antitank missiles and the MK19. Engineers are also working on storage space for the soldier's individual equipment that will be maintained on the vehicle.

Brown said, "We have militarized the vehicles so in a hostile environment the crew will be able to get in, attack and get out. The vehicle has been altered to the point that the only way it resembles a dune buggy is by its speed."

A related project is the Remote Controlled Robot Vehicle. It can be operated by remote control up to a mile away from the operator. The robot concept is an independent project underway in Hawaii. The projects were combined to test and evaluate the idea of a surrogate driver in a combat environment. The robot is actually a projection of the driver operating the vehicle from a distance.

Motions of the driver will be transmitted electronically to the surrogate driver. Equipped with audio and optic sensors, the environment that the robot is in will be transmitted back to the driver. "This concept is similar to aircraft drones and can provide integral intelligence without endangering a soldier," said Brown.

The 9th Infantry Division is scheduled to receive the High Mobility Multipurpose Wheeled Vehicle as a carrier in light motorized infantry battalions. In order to train the soldiers in the tactics and maneuvers of the new battalions, the division has requested the Skunk Works to develop a surrogate until the actual high mobility vehicle arrives.

The Skunk Works tested many different vehicles to see if they would meet the requirements specified and finally developed the M882 Surrogate High Mobility Vehicle.

In order for this vehicle to meet the requirements necessary, they modified the M880 so that its rear bed would accommodate six to nine soldiers. A weapons mount was added and the vehicle was modified to move across open terrain at a relatively high rate of speed. The vehicle was also modified to allow it to be sling-loaded from a UH-60 Blackhawk.

Training With Industry:
An Alternative Approach to Military Education

By CPT (P) Russell L. Clark, Jr.

When we think about education in the Army we tend to think in terms of the traditional approaches involving formal courses of training or instruction. However, the Army sponsors a unique approach in educating its officer corps which relys on a dynamic interaction of the student officer in a real world environment not contained within the walls of any formal or traditional military school system.

This education program, Training With Industry, is as much of a variety of media and methods, as it is an interchange of ideas and facts.

The Training With Industry Program was established to provide an intense, hands-on, practical educational experience to select officers for middle and upper management positions in the procurement, production, and research and development career fields. Logistics, public affairs, and comptroller also have a training with industry program for officers in those career fields.

Operating under the guidance of HQ DARCOM and the Military Personnel Center Education and Training Branch, Army officials have found that private industry best provides the environment for this alternative management apprentice education. Its goal is simultaneously improving the government and industry understanding of the Department of Defense materiel acquisition processes.

Corporate affiliation with the Program is purely voluntary, and current industry representation includes leaders such as RCA, IBM, Raytheon, TRW, General Motors, Hughes, Boeing, and Martin Marietta. The Program for officers in speciality codes 97 (Procurement) and 51 (R&D) is managed at HQ DARCOM using a no-cost contract between each firm and the Army.

Each company is given the right to reject any, or all, of the candidates offered by the Army or to terminate their training contract. Mutual benefits are gained through the active participation of the trainee officers in a government/industry dialogue.

THE AUTHOR CPT Russell L. Clark (standing) reviews strategies for an upcoming major subcontract negotiation with the contracting team (from left) Jeff Tillwick, Ike Shotenfeld, Dom Pileggi, Theresa Moore and Jay Klein.

Training objectives are extremely ambitious, yet within the grasp of all participants. The training is designed to assist the student officer in understanding corporate management philosophy and procedures, while being exposed to industry state-of-the-art and advanced technology.

The Program provides the Army with a nucleus of officers trained in high level management techniques, industrial procedures, and knowledge of the relationship of specific industries to related Army functions. To make these goals realistic, each officer is responsible for assisting his company in the development of his own training program.

All individually developed training programs are comprehensive and are usually comprised of three basic elements: work assignments, corporate training courses, and a self-study program. All programs must be consistent with graduate level university study.

Overall, the Training With Industry philosophy is to provide the student officer with an environment that is conducive to individual exploration and the development of an integrated understanding of the multifaceted disciplines that constitute modern industry.

Because the Program is not designed to train the officer to perform specific tasks, he must be prepared to receive a broad, generalized exposure to all aspects of the company's operations through active participation and working experiences during the training period. Since programs are not traditional or formal courses of instruction, the Program's success is derived solely from each officer's initiative, commitment, and effort, but is consistent with the officer's specialty.

Industry execution of training varies widely. Corporate approaches range from formal, structured training programs to actual on-the-job working assignments for their apprentice executives. RCA's program, for example, is designed to have the student officer's activities follow an agenda that is mutually developed at the beginning of the training year and includes a mix of RCA training courses and working assignments in purchasing, major subcontracts, project management, contracting, quality control, and proposal preparation.

Essentially, it is a management development program that is designed to improve the student officer's management abilities and professional competence. All trainee progress is closely monitored by an experienced RCA senior manager mentor. This mentor is knowledgeable in all company operations appropriate to the Training With Industry officer's training area, and he assists in individual program development in a fashion similar to that of a college professor.

As in all company programs, the student officers are encouraged to explore individual areas of specialization, to study corporate internal and external interfaces, and to gain insights to that in-

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dustry's planning and decision making processes.

During each phase of training, the education of the officer is continually stressed. Also throughout the Program, special emphasis is provided to the corporate workforce to assure them that the student officer is present for training only and that he will in no way displace regular employees nor disrupt normal company work operations.

A complete knowledge of the Training With Industry Program and its participating student officer requirements, by all personnel concerned, benefits both the company and student officer during the training tour.

Competition for the Program is keen: only a handful of officers are selected to participate in this intense educational program.

In FY82, DARCOM was authorized 17 industry positions. The annual requirement is 6 procurement, 5 production, and 6 research and development. These officers were generally Majors or Captains in the SC 97 or 51 career fields, with a master's degree in business or engineering. All have excellent performance records and display exceptional future potential to the Army. Their training tour involves the initial 1-year training period with a civilian firm and a 3-year follow-on utilization assignment.

Due to this long commitment, the officer must consent to enter the Training With Industry Program. While most officers are selected for participation, application for the program can be submitted in accordance with AR 621-1.

Training With Industry is a memorable and pleasant learning experience. This year-long training program will prepare an individual for the everyday realities of the Department of Defense acquisition process. All participants gain an appreciation for the controversies that accompany change, for making difficult decisions, and for creating feasible solutions to situations where none have previously existed.

When one considers the importance of the military/industrial complex and its relationship in the maintenance of a strong military force—the time and effort invested in Training With Industry participation seems well spent. It is definitely an alternate and worthwhile approach to military education!

If you are an officer with a specialty in the materiel acquisition management field, specifically procurement and production or research and development, and are interested in the Training With Industry Program, the Training with Industry Office at HQ DARCOM would like to share its information with you. You may write: HQ U.S. Army Materiel Development and Readiness Command, ATTN: DRCPP-M or call AUTOVON 284-8093/8094.

Technical Manuals Will Expedite Combat Vehicle Battlefield Repairs

When something happens to tanks or other fighting vehicles on the battlefield, they generally have to be removed and this results in a loss of strength and fighting power for the combat unit.

However, other ways to salvage damaged tanks and vehicles, while keeping them in the battle, are being generated by an Army team led by the U.S. Army Materiel Systems Analysis Activity (AMSAA), at Aberdeen Proving Ground, MD.

A Battlefield Damage Assessment and Repair (BDAR) Technical Manual Task Group has been established to write pilot technical manuals for the Army. The group was formed under a directive from MG James Welch, director of the U.S. Army Materiel Development and Readiness Command's Supply, Maintenance and Transportation Directorate.

"This is the first time the Army has taken the initiative to produce structured manuals on battlefield expedient repairs on specific combat vehicles. The manuals will detail procedures which could be used in emergency or battle conditions," explained Mr. William O'Connor, acting chief of AMSAA's Industrial and Logistics Systems Branch.

"There is an Army battle damage repair program which has been in effect for several years. Our manuals however, will be aimed at fixing the tanks or vehicles on location rather than removing them to a maintenance area. Our emphasis is on where the tank was damaged and where it will be fixed rather than how it was damaged," said O'Connor.

"We also have to consider that time in limited in a combat situation," he said. "The repairs and fixes detailed in our BDAR technical manuals have to be able to be completed in two to six hours."

O'Connor noted that the primary aim is to fix the tank so it can return to action in the same battle in which it was damaged or at least make it available for the commander to use in the next battle. The repairs detailed in the manuals will include many improvised techniques, some of which are rather unorthodox.

Some of the improvisations will include by-passing switches, repairing broken radio antennas, and short tracking methods. Few battlefield fixes are expected to be permanent. After the battle, the tank will have to be refurbished properly.

Some of the improvisations can be performed by the crew with their limited tools. However, most are aimed at the field maintenance teams which have the basic issue of tools. Each improvisation in the manual will also include the proper warning and cautions so the crew will know what to expect.

The Battlefield Damage Assessment and Repair Technical Manual Task Group will write two manuals. One will be specifically for the M1 Abrams tank and the other for general combat vehicles.

In writing their manuals, the group is enlisting the aid of many activities such as Forces Command units, Depot Systems Command depots, and Training and Doctrine schools, including the Ordnance Center and School at APG. Data are also being taken from battle-damage assessment teams and from APG's Ballistics Research Laboratory and AMSAA shooting programs.

Completion of the draft pilot manuals is expected in September 1983. The U.S. Army Materiel Readiness Support Activity will then assume responsibility for manuals, continuing the validation and verification and possibly expanding the battlefield fixes to include aircraft and general automotive systems, according to O'Connor.

What's Coming?

The March/April issue will be largely devoted to TRADOC and the combat developments aspect of the materiel acquisition process. The May/June issue will feature OTEA's role.

A Career for You!...

Materiel Acquisition Management (MAM)

By LTC John G. Miscik

DARCOM, as the Army's proponent agency, has just developed a concept for a new career program for materiel acquisition managers. The acquisition community has been in need of a more comprehensive professional development program for some time.

During the past several years, a program to develop project managers (PM) has been in effect. Known as the Project Manager Development Program (PMDP), it was designed to provide qualified officers to perform successfully in project manager positions. These positions, however, represent only a small number of the positions in the acquisition community within the Army.

There are many other duty positions, within the hardware development commands, the DA staff, TRADOC and elsewhere, that require officers and civilians with the qualifications of materiel acquisition managers.

Materiel Acquisition Management (MAM) is a multidisciplined complex field requiring managerial expertise across a broad range of functions. Some of the key functions are shown in Table 1. Today's technology, system complexity and rising production costs, make it vital that the Army professionally develop personnel to be successful materiel acquisition managers throughout the entire acquisition arena.

The Chief of Staff Army was briefed in August 1981 on a program concept to develop materiel acquisiton managers. He gave the go ahead to develop the program. The concept made provisions for the following: The MAM Program will be consistent with the Officer Personnel Management System dual specialty tracking system; officers will be identified early with entry into the program by approximately the sixth year of service; intensive career management will be established to ensure accomplishment of program objectives; officers must achieve full qualification in two specialties and will receive a minimum of two MAM assignments to ensure developmental experience.

Initially, a concept was being developed where specialty code 51 would be expanded into MAM. This concept was briefly described in an article in the November-December 1981 issue of this magazine as written by MAJ Brendan P. Blackwell. As development of that concept progressed, it became evident that many specialties have positions requiring MAM skills; therefore, no one specialty would completely fill the bill as an acquisition specialty. Consequently, another concept has been developed using the additional skill identifier (ASI) 6T to identify positions with materiel acquisition duties on appropriate TDA's as well as identifying personnel in the program who possess the qualifications to fill those positions.

By using the ASI 6T, it is conceivable that any specialty with positions requiring officers with MAM skills could be included in the MAM Program.

The MAM Program does recognize the need for both commissioned officers and civilians who are fully qualified for acquisition assignments. Two subprograms, one for military and one for civilians are being developed separately but only the military MAM concept will be covered in this article.

Even though MAM applies to reserve officers, the emphasis of this article is on active officers.

The military MAM Program is designed to develop selected commissioned officers in defense materiel acquisition management through intensive proactive management of training and assignments. The program enables development of officers through assignments in MAM positions while in grades 03 and 04. Ultimately, these assignments will develop officers in the multidisciplinary management skills required of materiel acquisition managers at the 05 -06 level and above.

Entry into MAM will be a selective process. Not all officers who apply will be accepted. Minimum selection criteria for acceptance into the program, are shown in Table 2. Officers, who desire to be a member of the

TABLE 1

Key MAM Functions

- Mission Area Analysis
- Requirements Documentation
- Doctrine Development
- Concept Formulation
- Training Requirements Identification
- Cost and Operational Effectiveness Analysis
- Research
- Development
- Manned/Systems Integration
- Integrated Logistics Support
- Systems Engineering
- Configuration Management
- Testing
- Evaluation
- Procurement
- Production
- Quality Assurance
- Distribution
- Financial Management
- Personnel Management
- Data Management
- Security Assistance

TABLE 2

MAM Minimum Selection Criteria

- Be in a Branch Managed by OPMS.
- Be in the Grade of Captain.
- Have Demonstrated Company Grade Proficiency and Potential for Field Grade Duty.
- Be at Approximately the 6th Year of Service.
- Have a Desire to Participate in the Program.
- Hold a Baccalaureate or Higher Degree that is MAM Related.
- Have Demonstrated a High Level of Potential for Development as a MAM Officer.
- Select or Already Hold a Specialty Requiring MAM Officers.

TABLE 3

MAM Certification Criteria

- **Military Schooling—OBC/OAC/CGSC.**
- **Civilian Schooling—Baccalaureate or Higher (MAM-Related Discipline).**
- **MAM Schooling—MAM (ALMC) and PMC (DSMC).**
- **Two MAM Assignments.**
- **Have Demonstrated Potential to Successfully Serve at the 05 Level in MAM.**
- **Fully Qualified in Both Specialties.**
- **Selected for Promotion to LTC.**

MAM Program, will formally apply, and if selected, will ordinarily enter the program in the grade of captain at approximately the sixth year of service.

The MAM Program will provide for the education of its members. Entry level officers will attend a basic course in MAM at the Army Logistics Management Center. Later, all officers in the program will receive advanced training by attending the Program Management Course at the Defense Systems Management College. Opportunity for post graduate civilian schooling will also be available.

Upon selection to lieutenant colonel, another screening point to ensure quality will be reached. A MAM certification board will meet to consider LTC MAM members for certification as materiel acquisition managers. Criteria for certification are as shown in Table 3. Officers who do not meet the criteria will have ASI 6T removed from their records and will be withdrawn from the program. Conceptual depiction of the program is as shown in Table 4.

To provide an opportunity for officers to enter the program who are past the MAM entry level stage in their careers, there will be a transition period with a slight relaxation of requirements. Officers in the Project Manager Development Program will be screened and if they meet the transition criteria will be administratively transitioned into MAM.

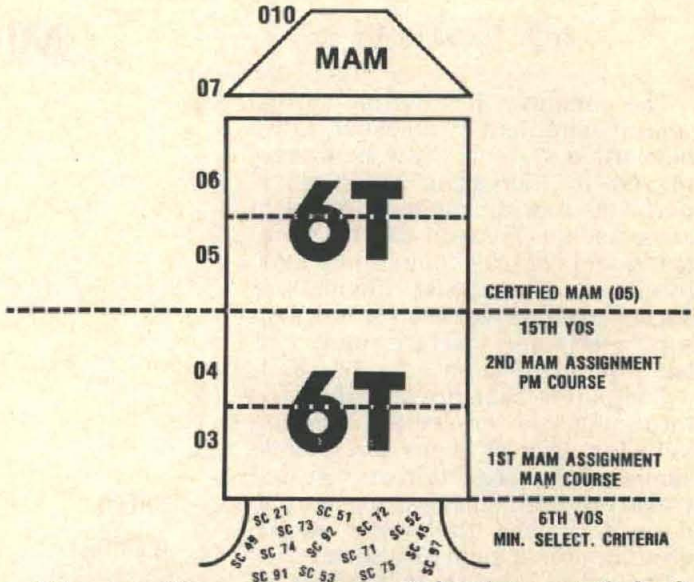
All officers in grades LTC and COL will be screened against the criteria for certification. Again, a provision for relaxation of certain requirements will be considered along with focused management to satisfy, where possible, each officer's developmental needs.

The entire program is requirements driven. Position identification must be accomplished with command emphasis to ensure that only positions requiring materiel acquisition management duties are coded with ASI 6T for the program. Neither extraneous nor incorrect identification can be permitted if we are to implement and maintain a successful program.

The program requires two MAM developmental assignments by the 15th year of service. The first MAM assignment will normally be in the grade of captain and the second in the grade of major. Subsequent MAM assignments will be in one of the approved MAM Program specialties and will require acquisition duties. Officers may receive MAM assignments in either their initial or additional specialty, as appropriate.

TABLE 4

MAM CONCEPT



When considering developmental assignments in both specialties, military schooling in both specialties, MAM schooling, Command and General Staff College, and possibly civilian post graduate education, it is apparent that time is restricted. Therefore, assignments outside a MAM officer's two specialties are not envisioned if dual specialty qualification and appropriate MAM development is to be achieved around the 15th year of service.

There is no doubt about it, MAM is an intensive program and will require a concentrated effort in personnel management if the program is to succeed. MILPERCEN has been involved throughout development of the program and will be establishing procedures to manage the careers of MAM officers to ensure appropriate professional development (training and assignments).

MAM is a comprehensive, competitive and challenging program whereby successful officers can reach the highest levels of the Army. It is an exciting program with its own checks, balances and rewards. As you read this article, MAM should be nearing its initial stages of implementation.

Although all of the details of the program are not presented in this article, all of the saliant points are covered. In addition to feature articles, look in future issues of *Army RD&A Magazine* for "News from the MAM Proponency Desk" for current developments.

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The Military Computer Family

By Dr. Edward Lieblein

The computer has become an essential ingredient in almost all Army battlefield systems. Now being employed in increasing numbers, it performs a wide range of tasks in areas such as weapon control, command and control, communications, intelligence analysis, navigation, surveillance, target acquisition, sensors, electronic warfare, and combat support services.

Computers that are incorporated into manpacks, projectiles, tracked vehicles, aircraft, jeeps, and mobile shelters must function at the extreme environments encountered in deserts, jungles, the Arctic, in the ground, and at high altitudes.

The rapid growth in the use of "go-to-war" computers over the last six years has resulted in an extensive proliferation of different and incompatible types. In 1979 an initial survey indicated there were 35 different types of computers employed in 49 Army battlefield automated systems. A wider survey in 1981 indicated 50 computer types in 65 systems.

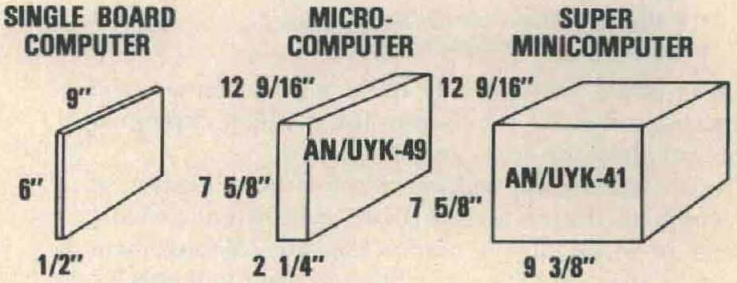
Army management is seriously concerned about this situation for two reasons. First, the proliferation of types adversely affects system survivability. Second, it increases significantly the cost and complexity of hardware logistics support, maintenance, training, and acquisitions, as well as that for software development and support.

A survey conducted by HQ DARCOM in the fall of 1981 indicated that there were 131 Army battlefield systems, some deployed, some undergoing development, in which the computer was an essential and integral element.

Proliferation is directly responsible for increased costs. The cost to the Army of continued computer proliferation has been estimated to reach $360 million per year by 1990 and $880 million per year by the year 2000. The cumulative cost to the Army of proliferation over the 30-year period from 1981 through 2010 has been estimated to be about $9 billion.

In order to make battlefield automation affordable, supportable, and survivable, the Army, in 1980, established the policy that future systems must use a standard software compatible computer family. Details of the policy, which are reviewed annually, are contained in AR 1000-1. Development of this family commenced in 1981.

MILITARY COMPUTER FAMILY



	SINGLE BOARD COMPUTER	MICRO-COMPUTER	SUPER MINICOMPUTER
SPEED	500 KIPS	500 KIPS	3 MIPS
MEMORY	128K BYTES	1M BYTE	2M BYTES
COST	$5K	$25K	$75K
RELIABILITY	100K HRS MTBF	33K HRS MTBF	10K HRS MTBF
VOLUME	0.02 cu ft	0.12 cu ft	0.52 cu ft
POWER	5 WATTS	20 WATTS	100 WATTS
WEIGHT	12 OUNCES	10 POUNDS	40 POUNDS

Figure 1

Members of the family shown in Figure 1, will include a super-minicomputer (AN/UYK-41), a microcomputer (AN/UYK-49), and a 6" by 9" single-board computer that is a component of the microcomputer. Smaller, single-board computers for use in missiles, armaments, tanks, and helicopters may be added to the family prior to the start of full-scale engineering development.

An Army Military Computer Family Working Group, formed in the summer of 1982, has been addressing these and other needs. Comprised of representatives of DCSRDA, DCSOPS, DCSLOG, DARCOM, TRADOC, CACDA, CSC, and each of the major DARCOM commands, including several PMs, the group was formed to assure that the attributes of the family dovetail with the broad spectrum of Army needs and that that approch is cost effective.

The group also has been identifying specific systems for which the use of the Military Computer Family is planned in order to coordinate schedules and assure the early availability of models. In addition to the family members described above, a set of very large-scale integrated circuit chips, commonly called a "chip-set," will also become available as a byproduct of the basic development, for smaller computing requirements.

All members of the family will enjoy standard interfaces and will be software-identical and fully plug-compatible in order to facilitate replacement of faulty units, and to support mobility of software, distributed processing, and graceful degradation.

The Army recognizes that in standardizing it must prevent future lock-in to obsolescent technology and must also provide for competition on a long-term basis. These are particularly difficult to achieve with respect to the computer field where technology is advancing so rapidly and where the legal protection of software invariably leads to

lock-in to individual vendors.

To avoid technological obsolescence, multiple production phases are planned. Advanced technology products will be introduced in each phase while maintaining software and interface compatibility. Open competition will be held at the start of each phase.

Products resulting from successive phases are expected to have improved reliability, maintainability, power, size, weight, cost, speed, and memory capacity. Upgraded units will maintain instruction set (software) and interface compatibility with units produced in previous generations in order to provide the potential for upgrade/replacement of older units in the field.

The Military Computer Family Program will not, in itself, develop new technology but will attempt to extract the best technology available from the commercial/industrial base. Direct use of commercial technology and components will be encouraged. Commercial off-the-shelf computers will be employed for software development and post deployment support because they offer lower purchase costs, they are readily available and offer low cost maintenance, and have existing software.

The first phase of the program is underway. It will take five years to go from inception (1981) to production (1986). The Military Computer Family approach differs from the usual where the initial technology ends up as the final technology used in production units.

During the first phase, two technology efforts are being pursued, one oriented toward the use of 1981 technology for the prototypes, and the other toward selection of technology for production. The latter requires analysis and assessment of potentially suitable technologies for use in late 1983 to early 1984. Thus, production units will embody the latest advanced computer technology. Contractors are free to choose their own approach to technology as well as to hardware system architecture.

Competition has been a hallmark of the Military Computer Family Program. The approach, which is aimed at reducing risk and achieving the best solutions, will provide for extensive competitive industry participation throughout the successive phases of the program.

To keep the competition focused, the most important evaluation factors and their relative priorities will be specified "up front." Evaluation factors and their priority order are as follows: reliability and maintainability; life-cycle cost and power; size and weight; and speed and memory capacity. The planned phasing and extensive competition are expected to prevent lock-in and, make available the best possible military computers at the lowest possible life-cycle costs.

When each new production commences, one of several alternative choices could be made with respect to Military Computer Family computers already in a fielded system: continue to support such computers; replace all such computers with those from the new production (This will require retesting of the system to qualify the use of the new product); or qualify the use of the new computers as interchangeably equivalent to those currently in the system and use both types in the system.

The first phase of the program started in 1981 with awards made for advanced development to four of 12 bidders, GE/TRW, IBM, Raytheon, and RCA. In March 1982, IBM was eliminated from the competition. Another company will be eliminated in August 1983.

Significant deliverables during the advanced development phase include reliability and maintainability projections, lifecycle cost analyses, technology insertion (projection) plans, prototype models, prime specifications, and producibility plans. Prototypes are expected to be delivered soon.

There has been a strong emphasis on computer and system survivability in the Military Computer Family Program due to the degree of future dependence of our fighting forces on automation. The need for survivability has provided the impetus for fielding a family of standard, software-compatible computers. Should a high-priority system malfunction during a battle because of a computer failure, if parts or replacement computers are not available due to a shortage or due to cut lines of supply, then it would be possible to restore operations quickly by taking parts or entire computers from lower priority systems.

Further, standardization will facilitate the completion of repairs quickly due to the use of common parts and the availability of maintenance personnel. To minimize the probability of computer failure after the shooting starts, very high levels of reliability, maintainability,

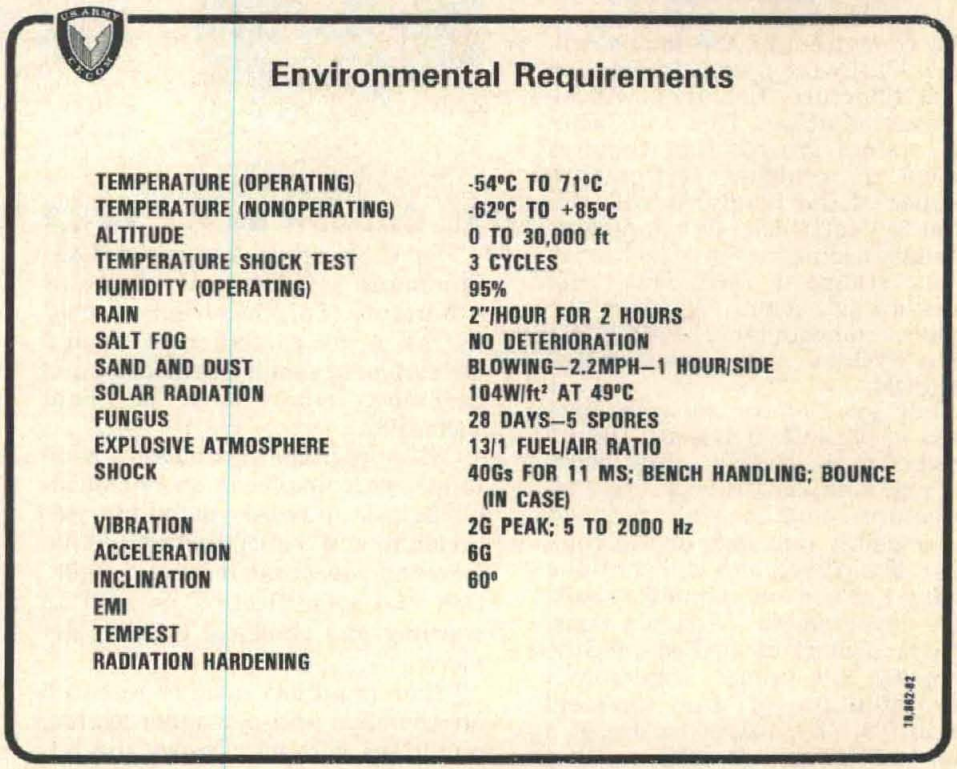


Figure 2

and ruggedness are being sought.

Mean time between failures (MTBF) for the AN/UYK-41 is 10,000 hours (14 months). The AN/UYK-49 and the single-board micro MTBF goals are 33,000 hours (3.3 years) and 100,000 hours (11.6 years) respectively.

To simplify maintenance it is required that 98 percent of all faults that would degrade performance be detected automatically by built-in-test circuits. Of these, it is required that built-in-test automatically isolate the fault to the removable unit in 95 percent of the cases and to one of two units 98 percent of the time.

MIL-SPEC requirements, shown in Figure 2, will insure that the Military Computer Family computers will operate over the required range of tactical environments. High survivability over the system lifecycle is further enhanced through the potential ability to substitute superior (i.e., more reliable, more maintainable, etc) plus-compatible equivalents in each successive phase.

In the event of damage or failure, provision has been made for graceful degradation (to keep systems functioning), for interchangeable hardware (to restore functionality without repairing) and to facilitate normal maintenance.

All computers of the family will execute fully the Nebula instruction set architecture, i.e., they will be software-identical. This will facilitate system growth that requires change to a higher performance member of the family. It will also simplify software development. Nebula is a joint Air Force and Army 32-bit standard (MIL-STD-1862) under an agreement signed by the deputy commanders of HQ Air Force Systems Command and HQ DARCOM.

While most of the software executed in battlefield systems will be designed in the new DOD high-order language Ada, the instruction set architecture, sometimes referred to as the assembly language of the computer, has played and will continue to play a major role in military software development. (Ada is a registered trademark of the Federal Government). It's primary function is the definition of the top-level logical (vs. physical) structure of a computer. Thus, any software that will execute on the battlefield in a Military Family computer will be a stream (sequence) of individual Nebula instructions.

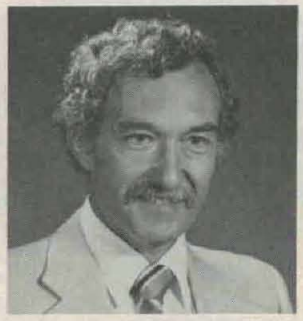
Nebula, rather than being taken from the marketplace, was developed by the government. In this way, lock-in to a commercial instruction set architecture (almost all of which are protected by virtue of the existence of patents, copyrights or proprietary data) and the company that created it will be avoided. The difficulty with this type of arrangement is that the company that holds the protection would reap rich rewards on a long-term basis: sale of support software; sale of commercial computers with the same instruction set architecture; royalties, and publicity.

The design of Nebula commenced in September 1979 under a contract with Carnegie Mellon University and was completed in November 1981. It is now being managed by the joint Army and Air Force Nebula Control Board which has seven voting members from each service. Nebula has evolved through a series of public and government reviews.

Nebula's major strenghts are: 32-bit address space; efficiency for military real-time software; support for Ada; support for multilevel security; compatibility with advanced technology; government ownership; suitability for high speed implementations; and accommodation of inexpensive low performance members of the family having the full instruction set.

The approach presented above addresses the challenge to field the most cost-effective, survivable family of standard MIL-SPEC computers. The acquisition strategy provides for time-phased introduction of advanced technology units through an intense amount of competition.

The standardization approach is simple (one language, Ada; one instruction set, Nebula; one software support environment; a common integrated logistics system; and identical AN/UYK-41 and AN/UYK-49 hardware units on the battlefield), yet the capabilities to be provided will be, at the same time, powerful, efficient, reliable, maintainable, affordable, and state-of-the-art.



DR. EDWARD LIEBLEIN is director of the Military Computer Family Project at the U.S. Army Communications-Electronics Command, Fort Monmouth, NJ. He holds a BEE and a MEE from New York University and a PhD in computer science from the University of Pennsylvania.

CSL Chosen as FY 1982 'Most Improved' Laboratory

The U.S. Army Armament R&D Command's Chemical Systems Laboratory (CSL) has been selected by the Army as the research and development facility demonstrating the most improvement in Fiscal Year 1982.

CSL's programs encompass a wide range with emphasis on chemical-biological defense including individual and collective protective systems, decontamination, detection and identification as well as warning and chemical training devices.

Other programs include research on chemical anti-personnel agents, munitions systems, smoke and obscurants and riot control material. CSL is also the Army center for environmental technology relating to the effects of chemicals and other materiel.

All Army R&D facilities conducting research or development programs are rated annually on contributions to the Army's capability and readiness. labs are designated by a panel of judges for a special award by demonstrating the greatest improvement, as well as for a Laboratory of the Year Award, and an Award for Excellence.

Readiness facilities eligible for the annual awards include all DARCOM R&D laboratories and all research facilities in the Corps of Engineers and the Army Medical Research and Development Command.

Replica Soviet Equipment Adds Realism to Training

With the development of high technology equipment and the even more rapid evolution in theories of modern warfare, so must the development of training keep pace with the combat soldier's possible future mission.

The Training and Audiovisual Support Center at Fort Huachuca, AZ, is helping to set the pace with a program entitled "Visual Modifications" (VISMOD). The program provides replica equipment of items used in combat by an opposing force.

The support center produces replica kits of Soviet tracked vehicles, such as the Russian T-72 tank and the Russian BMP (personnel carrier), which are mounted on U.S. Army armored personnel carriers. Each replica is exact in detail and built on a scale of one-to-one.

VISMOD is relatively new. According to Mr. Ed Eckert, chief of the Visual Aids Branch, "about a year ago, the Army Transportation Center's Training Support Center at Fort Eustis, VA, tasked us to produce working prototypes of the T-72 and BMP for Army-wide use as a training aid."

Following the production of the prototypes, representatives from Eustis came to Fort Huachuca to view the operation and visual effectiveness of the models. After close scrutiny, the models were approved and DA ordered the production of some 70 T-72s and 115 BMPs.

Each kit is made from a special temperature-resistant, vacuum-molded plastic which is attached to the armored personnel carrier with an aluminum frame. Kits are sent to various locations throughout the United States unassembled with all the necessary hardware and instructions. Each kit takes less than two hours to assemble.

So far, kits have been sent to Forts Benning and Stewart, GA, with future distribution to Forts Knox, KY; Polk, LA; Carson, CO: Hood, TX; and Riley, KS. Eventually, kits will be sent to Europe.

These kits, along with other replication military hardware are designed to enhance training and aid soldiers in recognizing Soviet equipment in a field situation. Along with replicas of Soviet tracked vehicles, replicas of other types of military hardware such as anti-track and antipersonnel mines, hand grenades and some uniform items, like Soviet-styled helmets, are produced.

About 40 to 50,000 Soviet-styled helmets have been made over the years. Actually, the Army has produced enough replica hardware to field a total Soviet force, Eckert explained. Some foreign military organizations have even expressed an interest in the replica hardware.

The concept of visual training is nothing new. It might be said that the growth of Army training is proportional to the onward march of technology; going well beyond the classroom and blackboard setting.

The first BMP replicas were made by stretching canvas over a metal frame and attaching it to a jeep. But the essence of realism was lacking; it not only had shortfalls in the use of durable materials, but it didn't sound like a tank or diesel powered vehicle. With the new VISMOD replicas, not only does the equipment look real, it sounds real.

How valuable is visual realism in training? "When the Soviets moved their equipment into Poland last year, I was able to recognize some of their vehicles, like the BMPs. If it wasn't for the models we were producing, I would never have known what types they were. I think this 'one' example shows the importance of realistic training for our soldiers," Eckert said.

Cruise Missile Completes APG Performance Tests

The New Ground Launched Cruise Missile (GLCM) weapons system has completed performance and reliability testing at Aberdeen Proving Ground, MD.

The system went through performance and reliability, availability, maintainability and dependability testing during its brief stay at APG. A key objective was to see how the system would hold up on the road shock and vibration tests. Test results show that the system successfully traversed the courses.

The GLCM is extremely mobile and capable of firing four cruise missiles. It is designed to operate effectively in all anticipated environmental extremes and to survive the conventional arms and/or nuclear battlefield environment, according to Mr. Dave Zupko, the Materiel Testing Directorate's (MID) test director for the GLCM.

The system's features include a rapid transition from dispersal mode to launch readiness, an automatic system checkout, rapid targeting and retargeting, and multiple communications networks.

"The GLCM is composed of a transporter-erector launcher and a launch control center," Zupko explained. "The integrating contractor of the system is the General Dynamics Convair Division. We have one system here and the other is at Dugway Proving Ground, UT, undergoing launch testing."

An important characteristic of the launcher is that it is mounted on the transporter trailer so that the erection mechanism may raise the launcher from its stowed position to the missile's launching elevation.

The transporter-erector launcher subsystem is mounted on a semitrailer which is towed by a German-built M.A.N. 8×8 truck-tractor (M1013). It can also be towed by the standard M818 5-ton tractor. "It can travel over highways and roads and, if necessary, it can travel off the road. But its off-road capability is limited for relatively level, unprepared open fields and clearings," Zupko said.

The launch control center includes the command launch control center, communications subsystem, major components of the weapons system and other related equipment. Subsystems are housed in a forward equipment box, an armored shelter and an aft equipment box. The three units are mounted on a semitrailer (XM999) which is similar to the transporter-erector launcher and can be towed by the same tractors.

"The two systems are integrated," Zupko added. "You can't fire the missiles without the launcher control center being linked up."

Contracts Exceed $5 Million for Helicopter RDT&E

Contracts totalling $5,700,140 for helicopter research, development, test and evaluation efforts have been awarded by the Applied Technology Laboratory, one of four labs of the Army Research and Technology Labs (AVRADCOM).

Boeing Vertol will fabricate redesigned gearing applicable to aircraft such as a heavy lift helicopter. They will also assemble and test the combiner transmission and evaluate this transmission in terms of its contribution to the lift capability of a heavy lift helicopter. This research will be provided under a 28-month, $2,840,000 contract.

Boeing Vertol and Sikorsky Aircraft are each receiving a 16-month contract to develop an advanced composite rotor hub for a current operational Army helicopter. Boeing, which is getting $459,005, will perform its work on the CH-47D Chinook helicopter.

Sikorsky is receiving $455,167 and will use the UH-60 Blackhawk helicopter. Design technical goals for the rotor hub concept are a 15 percent reduction in weight of affected components; 25 percent production cost savings; high field repairability for external damage; and a 20 percent improvement in reliability and maintainability.

Garrett Turbine Engine Co., Phoenix, AZ, will make and test a high-work, single-stage, axial-flow gas generator turbine under a 34-month, $797,958 contract. The reported goal is to evaluate a potential replacement for a 2-stage turbine and still meet efficiency and durability requirements.

A manual showing how to inspect and repair combat damage to Blackhawk helicopter airframes is being developed by Sikorsky Aircraft, United Technologies, under a 25-month $490,700 contract. Written assessment techniques covering combat damage will be developed and the guidelines will eventually be used for similar manuals for other helicopters.

Development of a helicopter external load acquisition system that can visually acquire a load during bad weather and night conditions and eliminate blind hook-up attempts, will proceed under a 17-month, $370,188 contract to Bell Helicopter, Textron. Recent advances in fiber optics and imaging technology will reportedly be applied in this effort.

ARINC Research Corp. was awarded a 12-month, $151,072 contract to demonstrate a method to improve the testability and maintainability of Army aviation systems using advanced computer programs. The goal is to decrease the costs of fault isolating efforts and maintenance procedures.

Under a 5-month, $106,700 contract, Sikorsky Aircraft Div., United Technologies, will conduct tests to demonstrate the capability of a tandem, 2-hook external cargo system on the UH60A Black Hawk helicopter in place of the current single-hook system. Increased external load-carrying performance and stabilization is expected with the 2-hook configuration.

Whitehall Manufacturing Corp. designed and built Kevlar sling legs for 25,000-pound capacity sling systems for helicopters, under a 5-month, $29,350 contract. These sling systems are expected to replace the heavier nylon ones now used by Marine Corps and Army aircraft and should also result in longer service life and improved resistance to environmental induced degradation.

Communications Jammer Termed 'Gun-Rugged'

Successful engineering tests were conducted recently on the artillery delivered expendable communications (barrage) jammer. Developed by the Army Electronics Research and Development Command's (ERADCOM) Signals Warfare Laborabory (SWL), the jammer was found to be gun-rugged and safe to fire.

During tests, at Yuma Proving Ground, AZ, jammers were loaded into 155mm cargo rounds and fired from howitzers at various ranges.

"The concepts and hardware were demonstrated successfully," said Mr. Howard Phalan, a jammer project leader. According to Phalan, "the expendable jammer will significantly influence the battle planning of the future. Nearly every type of communications may be disrupted by this system."

Mr. Joseph W. Miller, a project engineer on the jammer, pointed out that the jammers are less susceptable to detection than those now in the field and are much less expensive to produce. "Artillery crews can carry them with other types of rounds," he said.

Several jammers are loaded into each round. During flight, the base plate of the round is blown off, and the jammers are ejected from the round one at a time, according to preset timers.

As the jammers, or pucks, clear the projectile, de-spin fins are deployed by centifugal force and a streamer is released. The fins de-spin the jammer while the streamer provides a righting force to orient the puck.

The puck impacts at a velocity of about 130-feet-per-second and is imbedded one to three inches into the ground at the proper angle. The antenna/ground plane is then deployed and within seconds the transmitter is automatically turned on and the jamming begins.

The next series of tests at Yuma will involve testing 1,000 jammer units. Phalan said these formal developmental and operational tests would take place late in fiscal year 1984.

Artillery-delivered Communications Jammer

XV-15 Completes Navy Shipboard Evaluations

Completion of a series of Army/NASA supervised tests of the XV-15 Tilt Rotor Research Aircraft for the U.S. Navy has been announced by the U.S. Army Research and Technology Laboratories (AVRADCOM), Ames Research Center, Moffett, Field, CA.

The aircraft underwent the series of Navy shipboard evaluations aboard the USS Tripoli (LPH-10), Landing Platform Helicopter, maneuvering off the coast of San Diego, CA.

The purpose of the tests was to evaluate the potential of the tilt rotor concept in the Navy shipboard environment. Piloted by LCDR John Ball of the Naval Air Test Center, and test pilot Mr. Dorman Cannon of Bell Helicopter Textron, Inc., the craft received maintenance support from Bell Helicopter.

Some 54 landings and takeoffs were conducted aboard the Tripoli in varying conditions of wind velocity and wind angle across the deck. Operations included short takeoffs in the tilt mode, operations over the deck edge, varying approach procedures, and evaluations of downwash/outwash effects on the flight deck crew.

The Navy sea trials were conducted in two phases; a shore-based build-up phase and a sea-based evaluation phase. The shore-based phase included preliminary evaluations of aircraft handling characteristics, hover landing dispersion, and short takeoff characteristics. Field deck landing or practice was conducted to familiarize the pilots with shipboard operations and to acquaint the flight crew of the Tripoli with the characteristics of the XV-15.

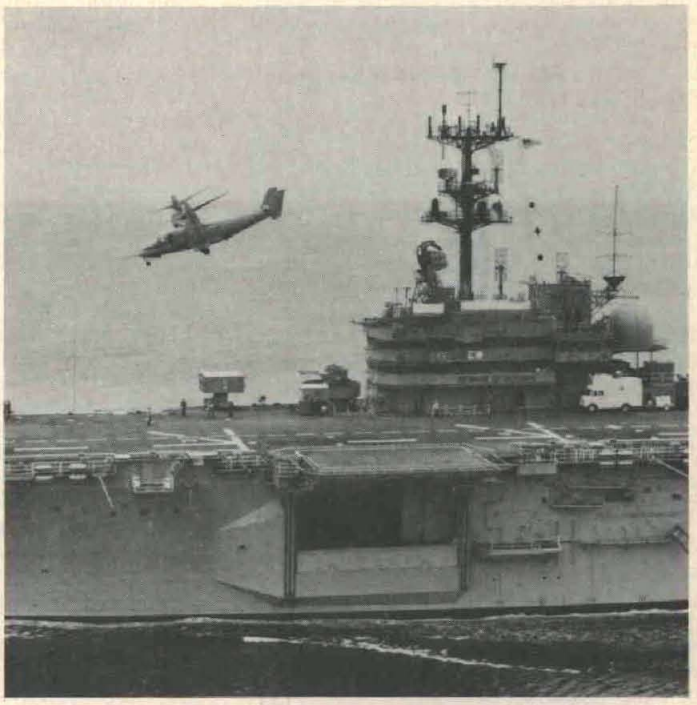
The sea-based tests were conducted approximately 20 nautical miles off the coast. Initial tests evaluated "deck-edge" effects. It had been assumed that a potential problem for tilt rotor aircraft would be the amount of control power required to hover with one rotor in ground effect over the surface of the deck and the other rotor out of ground effect over the water. Additionally, turbulent air flow around the ship's hull and upward past the deck was thought to be a potential problem.

To investigate these phenomena, the XV-15 was brought to a 30-foot hover above the deck and the aircraft moved slowly sidewards until the entire left rotor was over the water. Since no noticeable effect was observed, the test was repeated at 20 and 15 feet above the deck. No discernible change in control or in pilot workload was noted as the aircraft crossed the deck edge.

Testing continued by conducting landings, starting at the Harrier short take-off and landing line and working progressively closer to the deck edge until the XV-15 was landing at the normal helicopter landing line. Combined with the results of numerous subsequent approaches, these tests confirmed that the translation workload over the deck edge is similar to that of conventional helicopters.

The hover tests, designed to evaluate pilot workload and the effect of downwash/outwash on the flight deck crew, were performed at heights varying from 30 feet to five feet. Optimum hover height was found to be at 15 feet. At lower heights, workload increased and stability decreased.

The flight deck crewmembers commented that the XV-15 downwash caused them no difficulty and was



XV-15 undergoes tests aboard *USS Tripoli* (LPH-10)

comparable to that of a UN-1 or a NH-2 helicopter. The XV-15 did not, however, exhibit the sudden gusts typical of most helicopters. Absence of a severe gust environment made working around the aircraft an easier task.

Tests then centered on normal helicopter style approaches and landings. Several techniques were evaluated: a 90-degree slide-in from off the deck edge, a 45-degree slide-in, a 45-degree straight-in approach over the stern. The most comfortable approach was the 45-degree slide-in due to low flare attitudes and the excellent field of view. Pilot workload was low for all approach modes.

The short takeoff capability of the tilt rotor aircraft was evaluated to determine takeoff distance. The XV-15 was loaded over 1,000 pounds above its rated hover gross weight. With the nacelles tilted to 15 degrees ahead of vertical, and the power reduced, takeoff distances less than 100 feet were easily achieved. Pilot workload was minimal and the aircraft was kept to within one foot of the takeoff line even during wind conditions of 12 knots at 90 degrees relative bearing.

Within the scope of the tests, the tilt rotor aircraft was found to be compatible with the standard Landing Platform Helicopter procedures and to have excellent potential for use in the Navy shipboard operating environment.

The preceding article was authored by LTC Clifford M. McKeithan, deputy program manager, Tilt Rotor Aircraft Office, (Army Liaison) Aeromechanics Laboratory, and Mr. James W. Lane, deputy program manager, Tilt Rotor Aircraft Office, (Technical) Aeromechanics Laboratory, Army Research and Technology Laboratories (AVRADCOM), NASA Ames Research Center, Moffett Field, CA.

Batelle Forecasts $83.6 Billion for U.S. R&D During 1983

Federal Government support for R&D during CY 1983 is expected to be about $39.3 billion, an increase of 8.8 percent from 1982. This represents 47 percent of the total 1983 national projection of $83.6 billion for R&D.

Industrial funding for R&D during 1983 is estimated to be $41.4 billion, up 7.6 percent from 1982. This will account for 49.6 percent of total R&D funding. Funding by academic institutions is expected to be $1.8 billion (2.1 percent of total), and other nonprofit organizations will provide $1.1 billion (1.3 percent).

These estimates were prepared by Drs. Jules J. Duga and W. Halder Fisher of the Department of Resource Management and Economic Analysis at Battelle Columbus Laboratories. Data were drawn from many sources, including the National Science Foundation reports, and the McGraw-Hill Annual Survey of Business Plans for R&D Expenditures.

A national increase of $6.3 billion (8.2 percent) over the $77.3 billion that the National Science Foundation estimates was actually spent for R&D in 1982 is forecast. Although most of the increase will be absorbed by inflation, Battelle forecasts a real increase in R&D expenditures of 3.5 percent.

Battelle indicates that industry will remain as the dominant *performer* of R&D. In 1983, performance of R&D by industry is expected to rise to $60.7 billion, or 72.5 percent of all research performed. This compares with $10.8 billion (13 percent) for the Federal Government, $9.7 billion (11.6 percent) for academic institutions, and $2.4 billion (2.9 percent) for other nonprofit organizations.

The Battelle forecast notes that Federal funding supports research performance in all four sectors. Currently, about one-fourth goes to support R&D conducted by the government itself; almost half goes to industry; approximately one-fifth goes to colleges and universities; and the rest, about one-twentieth, goes to other nonprofits.

Four government agencies dominate the Federal R&D scene and are expected to account for 91.2 percent of total Federal R&D funding in 1983. These are the Department of Defense, 56.6 percent; the National Aeronautics and Space Administration, 14.9 percent; the Department of Energy, 10.4 percent; and Health and Human Services, 9.3 percent.

The forecast notes that increases in defense spending are primarily directed toward the aquisition of major weapons systems and the R&D that will be necessary to support them. Additionally, it is noted that budgets also increased for space and general science programs—despite appearances during 1982 that only defense appropriations would increase. Battelle foresees continued small-scale increases in these major fields, but declines in energy R&D.

The success of the space shuttle program, and the potential use of the shuttle as an instrument for economical orbital insertion and repair of satellites, is seen as justifying continued support for space R&D, the forecast says.

However, funding will continue to decline for energy research since there is little evidence that energy will be perceived as a national problem requiring massive Federal R&D support. Energy projects involving short-term or low-risk R&D likely will be financed by industry.

The report also anticipates that R&D dollars will continue to support the biological sciences areas. However, less emphasis will be placed on "soft" sciences, except those environmental, ecological, and socioeconomic impact investigations presently mandated by law.

Industrial support of research is growing in fields related to electronics, communications, advanced machinery and in those fields most directly influenced by the need for more energy-efficient products and processes.

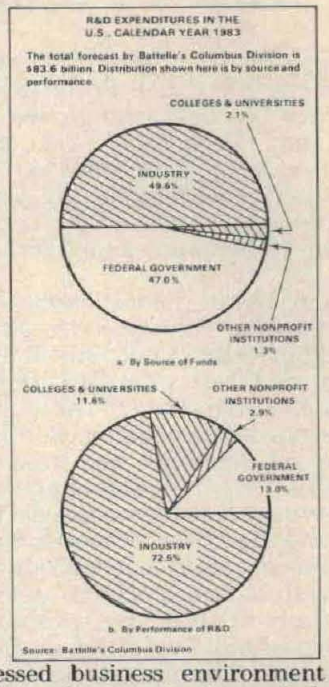
R&D will be heavily self-funded in the manufacturing industries, where on the average, only 32 percent of the total will be supported by the Federal Government. The non-manufacturing industries do relatively little R&D, and support for this activity will be divided almost equally between the Federal Government and industry.

As part of the forecast, Battelle estimated the industrial versus Federal support for R&D performed by several broad industrial sectors. In 1983, Battelle expects the electrical machinery and communications industry to be the leader in total R&D, with funding of more than $12.8 billion, and of that, 59.1 percent will be industrially funded.

The aerospace industry is forecast to have the second largest total R&D support with $11.8 billion, and of that, 20.3 percent will be industrially funded. Other industrial sectors Battelle estimates will receive more than $1 billion in R&D funds include:

- machinery—$9.1 billion, 83.3 percent of which will be industrially funded.
- autos, trucks and parts, and other transportation equipment—$7.2 billion, 85.6 percent of which will be industrially funded.
- chemicals—$6.8 billion, 90 percent of which will be industrially funded.
- professional and scientific instruments—$3.4 billion, 93.6 percent of which will be industrially funded.
- petroleum products—$2.5 billion, 87.5 percent of which will be industrially funded.

The Battelle forecast indicates that industry is taking over short-term R&D projects and is reacting to the growing pressure from foreign technological competition. However, it cautions that a depressed business environment may lead to reductions in future industrial R&D support. This is because corporate R&D decision-makers generally tend to lag R&D commitments about 1-year behind cash flows. Thus, poor business conditions in the recent past may tend to offset real increases in funding.



The Battelle forecast also compares the four performing sectors in terms of their relative costs of R&D. During 1983, the overall cost increase for all R&D is estimated to be 4.5 percent. By sectors, the increases are estimated as government, 8 percent; industry, 4.2 percent; colleges and universities, 2.2 percent; and other nonprofits, 4.8 percent.

From 1972-1983, costs of all R&D, as an average, are estimated to have risen by 111.14 percent. Increases in the individual performing sectors—over this same time period—are expected to be: Federal Government, 122.74 percent; industry, 108.12 percent; colleges and universities, 122.25 percent; and other nonprofits, 97.18 percent.

As part of the forecast, Battelle also examined R&D trends during the past and identified what impact they may have on the future. The report concludes that over the past few years, Federal support has tended to shift toward more "development" and less basic and applied "research." If such trends continue, the long-range consequences may pose significant problems in terms of the science base upon which economic vitality grows.

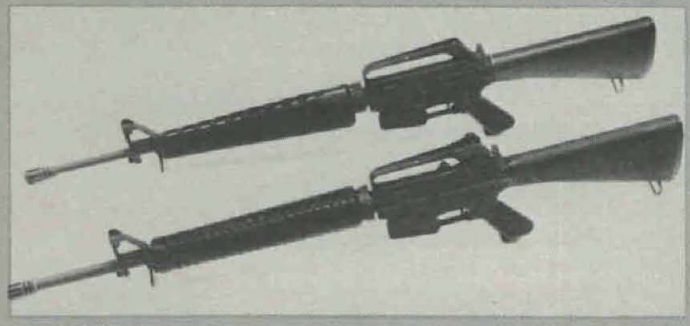
Such problems may, in part, be mitigated by a continuation of the recent resurgence of basic research support by industry, the forecast notes. However, the volatility of indicators—such as sales, profits, and cash flows—which influence industrial R&D budgets, precludes stability for long-term planning.

From the Field . . .

Armament R&D Command

M16A2 Rifle Approved by USMC. The M16A1 rifle, standard weapon of American and some allied forces for more than a decade, recently went through some changes as the result of testing conducted specifically for the U.S. Marine Corps at Aberdeen Proving Ground, MD, and Quantico, VA. The resulting model, the M16A2, was approved by the USMC for service use Sept. 17, 1982. The contract was placed for initial quantities and the Corps plans to satisfy its total requirements over the next five to seven years.

The differences between the M16A1 and the M16A2 are: the addition of a heavier barrel; a new forward hand guard; building the butt stock of high impact plastics; removing the full-automatic capability and substituting a three-round burst control device; replacing the flash suppressor with a muzzle compensator; the addition of new adjustable rear sights which should give shooters a better aiming system; and altering the barrel rifling from one twist in 12 inches to one in seven inches, to make use of the new NATO standard 5.56mm ammunition more feasible. (APG PAO Release)



The M16A1 rifle, top, compared to the Marine Corps' M16A2.

Weapons Test System Utilizes Laser Technology. An innovative weapons testing system using laser technology has been developed by Aberdeen Proving Ground, MD. The system, called a "Live Fire Evasive Target System," features laser target beam steering and automatic video scoring for use in testing new Army weapons such as the M1 Abrams tank.

The $500,000 system was developed by Aberdeen engineers in the Materiel Testing Directorate, the organization which conducts most of the live-fire test programs.

Many target system features are unique. For example, the use of a laser beam to project the target, especially in daylight, has never been done before, according to Mr. David Brown, project engineer, Instrumentation and Development Branch.

"The laser, a four watt argon ion, projects a brilliant green spot on an 18 inch-high screen some two miles away," Brown explained. "The visibility of the spot is better than what we anticipated."

The beam steering system has many advantages. "Target motion is precisely controlled by a computer, and this gives us the advantage of knowing exactly where the target is and gives us the ability for multiple, exact replications for proper statistical analysis," Brown said.

Brown added that with the laser target beam steering system, moving targets can be simulated and will enable proper evaluation of maximum tracking rates of present and future tracking systems.

The automatic video scoring system is another unique feature of the target system. The video system automatically scores the rounds as they pass through an imaginary target plane defined around the spot of light that the laser beam projects. An electronically-gated video camera is mounted to the system's beam steerer which controls spot motion. When a round is fired, its tracer can be tracked as it appears in the field of view of this bore-sighted camera. A sky screen at the target generates a pulse as the round passes through the target plane, and the video and sky screen pulse are then sent to the processing system, explained Brown.

"A video disc freezes the image to allow copying, and a computer calculates impact coordinates by curve fitting the round trajectory and sampling at the time of target plane passage," he summarized.

The target system is installed at the new trench warfare tank range in two buildings. The laser is in a projection tower and the computer and instrument control building is adjacent. The target system can test fire in all situations such as moving vehicle-stationary target, moving vehicle-moving target, and stationary vehicle-moving target. (APG PAO Rel.)

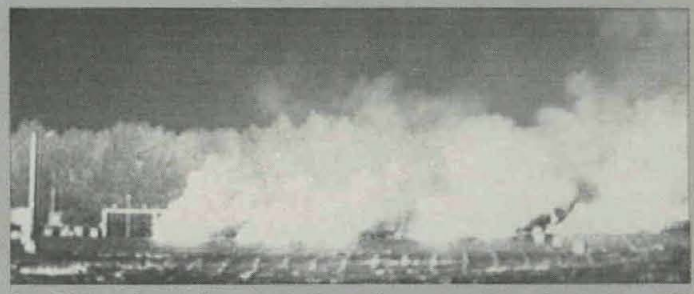
NATO Smoke Tests. Military and civilian personnel assigned to the Office of the Project Management for Smoke/Obscurants (PM Smoke) and scientists and engineers from the Army's Chemical Systems Laboratory (CSL), represented the U.S. in tests conducted in France with NATO allies on self-protection smoke grenade candidates for armored vehicles.

The two-week summer trials conducted in Bourges, France, included representatives of the host government, the Netherlands, Norway and the Republic of West Germany.

A self-protection grenade fielded by the U.S. Army was among the nine candidates evaluated for enhanced screening capabilities as well as infrared screening.

The PM Smoke Office had four personnel observing the French sponsored testing including COL Samuel Eure, PM Smoke; Mr. Randy Loiland, project officer for the American candidate grenades; Mr. Walter Kilmek, the American representative to the planning group, and MAJ Dan Adams, a test coordinator.

A series of final tests, winter trials, are scheduled for February, in Norway. (PAO Rel.)



Looking through an infrared screening device, self-protection candidate smoke grenades have obscured armored vehicles during NATO tests conducted in Bourges, France.

Mobility Equipment R&D Command

New Petroleum Hoseline. A new petroleum hoseline system for rapid deployment in military tactical operations is undergoing operational troop testing.

Developed by MERADCOM, the system represents a unique advance in technology. At present, no military or commercial system is capable of mechanically laying and retrieving six-inch hoseline.

The system is designed to deploy or recover up to 20 miles of 6-inch diameter, 600 gallon-per-minute capacity hoseline per

day. It incomes a skid-mounted reel assembly capable of cross-country operation from a 5-ton military truck, hoseline in 500-foot sections, and a trailer-mounted diesel engine driven pump assembly rated at 600 gallons-per-minute.

The reel assembly design resembles that of a record player. Multiple reels of hose are stacked in the same manner as records on a player. Four hose sections are stored flat within each reel and are power-deployed/retrieved and evacuated of fuel. The prime power for driving the hydraulics and air compressor is from an on-board diesel engine. Three separate control systems provide a high mission availability. A guide roll system ensures hose orientation and stability and provides the signal for proper reeling operation with relation to vehicle speed.

In operation, the system will be used to supplement the Army's four-inch hoseline system. It will be deployed in corps and divisional rear areas where there is a need to move large quantities of bulk fuel and when other methods are not tactically feasible.

Plans are to purchase prototpye systems in 1984. (PAO Rel.)

The petroleum hoseline system operates cross-country from a 5-ton truck to handle 20 miles of the 600-gpm capacity hoseline per day.

LACVs To Be Produced. A $22.5 million contract has been awarded to Bell Aerospace Textron for the production of four Lighter, Air Cushion Vehicles (LACV-30).

The LACV-30 can carry two 20-foot MILVAN containers with a combined weight of 30 tons. It can also haul wheeled and tracked vehicles, engineer equipment, pallets and other cargo. Since it rides on a cushion of air, the craft can operate on water, in marginal areas, on beaches and over ice and snow. In operation, the LACV-30 will be used for logistics-over-the-shore missions, in combat service support operations, to support secondary missions in coastal, harbor, and inland waterways, and for search and rescue and medical emergency missions.

The Army is currently procuring 12 craft under a $70 million contract with Bell Aerospace Textron. This new award is the first portion of an additional multi-year contract for 12 more craft.

The first craft is scheduled to be delivered to Fort Story, VA, in February 1984. All 12 craft are expected to be completed by November 1986. (PAO Rel.)

Stirling Engine Contract. A contract for more than $1 million has been awarded Mechanical Technology, Inc. of Latham, NY, for the development, testing, and production of 3kW free piston Stirling engine linear alternator generator sets.

Conceived in 1817 by Robert Stirling, the Stirling cycle engine is only now becoming a practical power source. Improvements in metals, heat exchangers, and generators —along with advances in design, such as free pistons, microprocessor control, and the use of helium as a working fluid, have produced an engine which has great potential for military use.

The Stirling engine is an external combustion engine which can operate using a variety of energy sources, such as military fuels, combustible gasses and concentrated solar radiation. It is inherently quieter than conventional gasoline or diesel engines. Since it has only two moving parts and requires no oil lubrication, it offers reliable operation with little or no maintenance.

Two prototype engines will be produced under the terms of the contract. Delivery is scheduled for the fourth quarter of FY84. (PAO Rel.)

Human Engineering Laboratory

Voice-Operated Computer Tested for Cockpit Use. The Aviation and Air Defense Directorate, Human Engineering Laboratory (HEL), Aberdeen Proving Ground, MD, is investigating appropriate applications of voice-interactive technology when integrated in the cockpit of a helicopter.

"Essentially what the system does, is allow a pilot to talk to the computer, with or without the use of a keyboard," explained Mr. Frank Malkin, engineering psychologist for HEL. "The voice recognizer is the main part of the system. It processes the speech and changes the speech frequency signals to binary codes, which the computer can interpret. Then the computer can act on the speech input."

The Directorate is investigating the applicability of the system in aviation. For specific application, they will be looking at the AH-64, the Army's newest helicopter.

One of the Army's major concerns is the workload of its aviators, and other technology is being developed in attempts to free the crew from many of their tasks.

Malkin said that with computers being introduced into helicopter cockpits, pilots won't have hands and eyes free for flying if they have to operate a keyboard. By using voice interactive technology, pilots will be able to operate the computer and perform other tasks as well.

"The system takes no additional space on the instrument panel of the cockpit. When integrated in the cockpit, aviators can use the microphones in their helmets," he continued.

Another aspect of the system is the ability to accommodate two types of feedback; a visual on a video display screen or voice synthesis. For voice synthesis, the system processes the binary codes back to speech.

"Some types of information have to be provided by the screen and other types are best provided orally," Malkin said. "This is what we have to look at and decide which tasks are more suitable for what type of feedback."

The system is tentatively scheduled to be test flown at Fort Monmouth, NJ, later this year. (PAO Rel.)

Corps of Engineers

CERL Completes Photovoltaic System Acceptance Test. The Energy Systems Division, U.S. Army Construction Engineering Research Laboratory (CERL) at Champaign, IL, recently completed the acceptance test of a 5-kW photovoltaic (direct transfer of solar energy to electricity) power system. The system is installed on the roof of the Holman Guest House at Fort Huachuca, AZ, and is part of the Department of Energy-funded Federal Photovoltaic Utilization Program.

The system, which has 196 photovoltaic panels, operates in parallel with the local utility grid without battery storage, the grid providing power to meet peak demands and at night. CERL, with the assistance of Arizona State University, will conduct a one-year evaluation of the system performance and reliability to learn more about using photovoltaic power for Army buildings without electrical energy storage, a major expense item in photovoltaic systems. Design and installation cost was $112,000. (PAO Rel.)

Conferences & Symposia . . .

Natick Hosts R&D Associates Conference

More than 250 representatives of the food processing and packaging industries and research and educational institutions attended the fall meeting of the Research and Development Associates for Military Food and Packaging Systems, Inc., at the U.S. Army Natick R&D Laboratories, Natick, MA.

"Coupling New Technologies with New Challenges" was the theme of the program presented by Cochairmen Dr. J.T. Clayton, head, Food Engineering Department, University of Massachusetts and Dr. Irwin A. Taub, chief, Plant Products Branch, Food Engineering Laboratory, U.S. Army Natick R&D Laboratories.

Prior to the eight sessions covered during the 2-day conclave, COL James S. Hayes, commander, Natick Labs, set the tone for the discussion with his welcoming message, "The Future—What We Must Do."

MG Harry L. Dukes, Jr., commander, U.S. Army Quartermaster Center, Fort Lee, VA, delivered the keynote address and LTC M.D. Hogg, Royal Army Ordnance Corps, British Army, discussed the feeding plan for support of the British Forces during the Falklands operation.

Twenty-seven speakers covered various subjects related to the following major topics: Evolving Technology in Retort Pouch Processing; Food Processing with Electromagnetic Energy; State of Art Applications and Future Prospects for Structured Foods; Doing Business with the Military; Food Service Equipment; Future Prospects to Include Energy Considerations; Controlled/Modified Atmosphere Storage for Extended Shelf Life; and Frozen Foods: Physical and Economical Aspects.

Dr. Gerald Hertweck, special assistant, DOD Food Programs, Natick Laboratories, chaired the closing session dealing with special committee update reports.

ETDL Plans Frequency Control Symposium

The 37th Annual Frequency Control Symposium will be held from 1-3 June 1983 in Philadelphia, PA, according to a recent announcement by the U.S. Army Electronics Technology and Devices Laboratory, Fort Monmouth, NJ.

Considered to be the leading technical conference addressing all aspects of frequency control and precision timekeeping, the meeting will feature authored papers dealing with, but not restricted to, the following topics: fundamental properties of natural and synthetic piezoelectric crystals; theory and design of piezoelectric resonators; filters and signal processors; surface wave devices; clocks; laser frequency standards; and specifications and measurements.

Additional symposium information may be obtained from Mr. Michael Mirarchi on commercial phone (201) 544-1510, or 280-0410.

Career Programs . . .

ALMC Announces New Correspondence Course

The U.S. Army Logistics Management Center recently announced the availability of an 80-hour correspondence course on "Cost Estimating for Engineers." Suitable for home study, the course was previously available only in a live classroom setting as part of a 5-phase R&D Education Program course.

Designed for personnel in the R&D community, the course is also available in a Learning Resource Center format. Both offerings are reportedly equal to 2 weeks of formal training and may be obtained by submitting a DA Form 145 (correspondence enrollment form) to: Commandant, U.S. Army Logistics Management Center, ATTN: DRXMC-ET-C, Fort Lee, VA 23801. Applicants for the course should have their Form 145 endorsed by their learning center coordinator.

Additional information on these courses and others in this series may be obtained by calling AUTOVON 687-1839/3378/3601 or commercial phone (804) 734-1839/3378/3601.

Personnel Actions . . .

Babers Takes Over as DARCOM Readiness DC

LTG Donald M. Babers

LTG Donald M. Babers received his third star recently when he assumed duties as deputy commander for Readiness at HQ U.S. Army Materiel Development and Readiness Command, Alexandria, VA. He served formerly as commander of the Army Communications-Electronics Command at Fort Monmouth, NJ.

Commissioned as a second lieutenant in the Ordnance Corps in 1954 following graduation from Oklahoma State University, LTG Babers holds a master's degree in business administration from the University of Syracuse. He has also completed requirements of the Industrial College of the Armed Forces, Command and General Staff College, Ordnance Officer Career Course, and the Army Project Manager's Course.

During 1975-80, he served successive assignments at the Army Tank-Automotive Materiel Readiness Command, Warren, MI, as director of Procurement and Production, deputy commander, and project manager of the M1 Abrams Tank System.

Listed among his other key assignments are project manager, M60 Tank Production; commander, 46th General Support Group, 18th Airborne Corps; deputy for Logistics Support and project manager, M561/XM705 Truck Vehicle Programs, Army Tank-Automotive Command; and commander, 126th Maintenance Battalion, U.S. Army Europe.

LTG Babers is a recipient of the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal, Meritorious Service Medal, Army Commendation Medal with two OLC, and the Purple Heart.

Skibbie Takes Over as CECOM Commander

MG Lawrence F. Skibbie

MG Lawrence F. Skibbie, director of Combat Support Systems in the Office of the Deputy Chief of Staff for Research, Development and Acquisition (DCSRDA) since June 1980, has assumed new duties as commander of the U.S. Army Communications-Electronics Command, Fort Monmouth, NJ.

A 1954 graduate of the U.S. Military Academy, MG Skibbie holds a master's degree in mechanical engineering from New Mexico State University. Additionally, he is a graduate of the Industrial College of the Armed Forces, Army Command and General Staff College, Ordnance School courses, and the Artillery School basic course.

During 1978-80, MG Skibbie served as deputy director of Materiel Plans and Programs, ODCSRDA. This followed tours as deputy commander for Ammunition Readiness, Armament Materiel Readiness Command, Rock Island, IL, and commander, Rock Island Arsenal.

Listed among his other assignments are chief, Program Management Division, PM for Munitions Base Modernization and Expansion; operations research analyst, Weapons Systems Analysis Directorate, Office Assistant Vice Chief of Staff; and executive officer, Cost Analysis Directorate, Office of the Comptroller of the Army.

MG Skibbie is a recipient of the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal, Meritorious Service Medal, and the Army Commendation Medal with three OLC.

Oblinger Assumes Key TRADOC Assignment

MG John B. Oblinger

MG John B. Oblinger, Jr. is now serving as deputy chief of staff for Combat Developments, HQ U.S. Army Training and Doctrine Command. He was formerly commander of the U.S. Army Air Defense Center and Fort Bliss and commandant of the U.S. Army Air Defense School.

A 1953 graduate of the U.S. Military Academy, MG Oblinger holds a master's degree in nuclear physics from Tulane University. He completed requirements of the U.S. Army Command and General Staff College, U.S. Army War College, and the United Kingdom Joint Services Staff College.

In 1976, MG Oblinger was assistant commandant of the Army Air Defense School, following a tour as commander of the 38th Air Defense Artillery Brigade, Osan, Korea.

Other key assignments have included chief, Missiles and Air Defense Systems Division, Office, Deputy Chief of Staff for Research, Development, and Acquisition; commander, 94th Air Defense Artillery Group, Germany; Air Defense Directorate, Office, Assistant Chief of Staff for Force Development; and commander, 5th Battalion, 1st Air Defense Artillery, Wiesbaden, Germany.

Breslau Becomes CRREL Technical Director

Dr. Lloyd R. Breslau

Dr. Lloyd R. Breslau has been appointed technical director of the U.S. Army Cold Regions Research and Engineering Laboratory (USACRREL), Hanover, NH. He was previously technical director of the U.S. Coast Guard Research and Development Center, Groton, CT.

Breslau received his formal education at the Massachusetts Institute of Technology, in the disciplines of electrical engineering, geology and geophysics, and oceanography. He conducted his doctoral research at the Woods Hole Oceanographic Institute, MA.

In addition to the assignment in Groton, Breslau also worked at the U.S. Coast Guard Office of Research and Development, Washington, DC; U.S. Naval Oceanographic Office, Washington, DC; and Office of Naval Research, La Spezia, Italy.

Breslau has a background in applied research as a researcher, manager, and administrator. He has participated in oceanographic, riverine, and Arctic field operations. His cold regions background includes management of the Coast Guard's Polar Marine Transportation Research Project; ice breaker operations in the Arctic and Great Lakes; on-ice operations to profile sea ice pressure ridges and ice island underwater shapes; and airborne remote sensing of sea ice.

Breslau is a member of the Institute of Electrical and Electronics Engineers, Inc. (IEEE), a member of IEEE's Council on Oceanic Engineering, and vice president of IEEE's Geoscience and Remote Sensing Society.

Johnson Chosen as ARI Technical Director

Dr. Edgar M. Johnson

LTG Maxwell R. Thurman, Army Deputy Chief of Staff for Personnel, recently announced that Dr. Edgar M. Johnson has been named technical director of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) and chief psychologist of the U.S. Army.

As technical director, Dr. Johnson will have primary responsibility for the technical planning, development, and execution of the Army Research Institute Army-wide mission to maximize combat effectiveness of the Army through research in the acquisition, training, and use of soldiers in military systems.

Dr. Johnson is the fifth chief psychologist of the Army to be so named since 1917. He has a PhD in psychology from Tufts University, held a commission in the U.S. Army from 1968 to 1970, and he served as a research psychologist at Aberdeen Proving Ground, MD.

Employed with ARI since 1970, he became chief of ARI's Human Factors Technical Area in 1978 and in 1980 he was appointed director of the Systems Research Laboratory, where he emphasized the integration of manpower, personnel, and training factors into the design, development, and acquisition of systems.

Dr. Johnson is associate editor of *Human Factors* and also a member of the editorial boards for several scientific journals. He is a member of the Human Factors Society, and the Society for General Systems Research. In 1980, he received the Washington Academy of Sciences Award for Distinguished Service in the behavioral sciences.

Acchione Named NVEOL Deputy Director

Lawrence J. Acchione

Mr. Lawrence J. Acchione has been appointed deputy director of the U.S. Army Electronics Night Vision and Electro-Optics Laboratory, (NVEOL) Fort Belvior, VA.

Employed at the Night Vision Laboratory since 1964, Acchione served formerly as NVEOL's associate director for Development and Engineering. Prior to this assignment he was director of Systems Integration.

In 1969, Acchione was selected as the team leader of the Lab's Combat Vehicle Systems Team. This included responsibility for development of all night vision equipment for the

Army's tanks and armored personnel carriers. During 1975-77, he was associate director of the Night Vision Lab.

Graduated with a master's degree in optical engineering from the University of Rochester's Institute of Optics, Acchione is credited with conducting the first comprehensive field tests of night vision equipment. He is also credited with development of the microchannel plate, an electro-optical amplifier that has reportedly become the heart of the Night Vision Lab's image intensification devices.

Botts Chosen as Telecommunications Deputy PM

COL Robert H. Botts has been selected as deputy project manager for Telecommunications Automation and Control Systems, U.S. Army Communications Systems Agency/Project Manager DCS (Army).

Graduated from Arkansas Tech University in 1956 with a BS degree in business administration, he also holds an MS degree in organizational communications from Shippensburg State College and has completed requirements of the Army War College.

Since May 1979, COL Botts has commanded the U.S. Army Communications Command-Western Command and served as deputy chief of staff for Communications-Electronics, U.S. Army Western Command. He was assigned prior to this as division chief, Combat Development, Plans and Resources, Office, Deputy Chief of Staff, Plans and Operations, Army Communications Command, Fort Huachuca, AZ.

Listed among his other tours are action officer, Office, Deputy Chief of Staff for Logistics, DA; commander, 41st Signal Battalion, Korea; and chief, Defense Communications Agency Presidential Communications Support Branch.

COL Botts is a recipient of the Legion of Merit, Bronze Star Medal, Meritorious Service Medal with two Oak Leaf Clusters (OLC), and the Army Commendation Medal with two OLC.

Lewis Named Command and Control Deputy PM

LTC Donald H. Lewis

LTC(P) Donald H. Lewis has been appointed deputy project manager for Command and Control Systems, U.S. Army Communications Systems Agency/Project Manager DCS (Army).

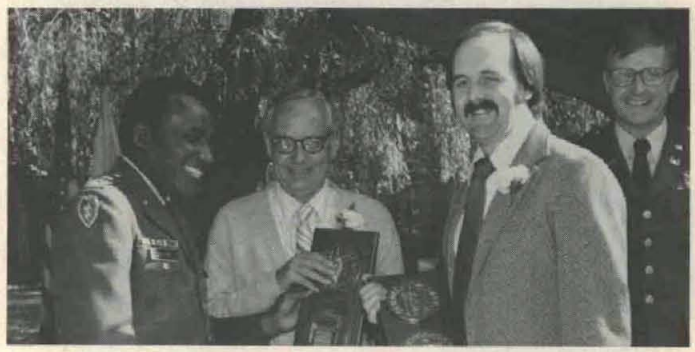
In his new position LTC Lewis is responsible for the centralized management—from engineering and development to acquisition, installation and life cycle support—of communications systems and equipment.

LTC Lewis comes to Fort Monmouth after graduating from the U.S. Army War College, Carlisle Barracks, PA. He holds a bachelor of science degree from the United States Military Academy and a master's degree in business administration from the New York Institute of Technology, and he is a graduate of the Armed Forces Staff College, the Communications-Electronics Systems Engineering Course and the U.S. Army Signal School Basic and Advanced courses.

LTC Lewis served as an operations officer, J6, UNC/USFK/EUSA in Korea from January to December 1975; as military plans officer and then later as executive officer, Army Automation Directorate, Office, Chief of Staff, Army, as battalion commander/division signal officer from February 1978 to August 1979, 501st Signal Battalion, 101st Airborne Division (Air Assault); and as commander, USACC-Fort Bragg and director, Installation C-E from September 1979 to July 1981.

Awards . . .

MERADCOM Presents Commander's Awards



DARCOM Chief of Staff, MG Henry Doctor congratulates Carl J. Heise and Michael A. Mando, who shared the MERADCOM Commander's Award for Scientific Achievement. MERADCOM commander, COL Theodore Vander Els is at extreme right.

Achievements in science, technology, leadership, and technical and administrative support were recognized during presentation of 1982 Commander's Awards at the U.S. Army Mobility Equipment R&D Command, Fort Belvoir, VA.

Mr. Carl J. Heise and *Mr. Michael A. Mando*, employees in MERADCOM's Electrical Power Laboratory, received the commander's medal for science. They were cited for their design of insulation systems for pulse power generators.

Honors for technology went to *Mr. R. Donald Sherwood*, Product Assurance and Testing Directorate, for his adaptation of government instrumentation and computers to MERADCOM test programs which resulted in significant new capabilities in mobility equipment tests and evaluation.

The Walter C. Gelini Medals, named in honor of the late MERADCOM commander, were presented to *Mr. Aubrey Thomas, Jr.* of the Product Assurance and Testing Directorate for technical support and to *Mrs. Helen K. Jordan*, Force Development and Training Office, for administrative support.

Thomas was recognized for his efforts related to materials handling, and earthmoving and construction equipment tests. Jordan was honored for processing special command management programs in hiring and staffing.

Mr. Maurice E. LePera, Energy and Water Resources Laboratory, received the medal for leadership associated with the Army's fuels and lubricants program.

MERADCOM Commander's Award winners for 1982 include (front row, l. to r.) Maurice E. LePera, Mrs. Helen K. Jordan and Aubrey Thomas; (second row) Carl J. Heise, R. Donald Sherwood and Michael A. Mando. In the third row are DARCOM Chief of Staff MG Henry Doctor; Mrs. Walter C. Gelini (widow of former MERADCOM commander, Walter C. Gelini); and the current MERADCOM commander, COL Theodore Vander Els.

Mermagen Gets Meritorious Service Medal

William H. Mermagen

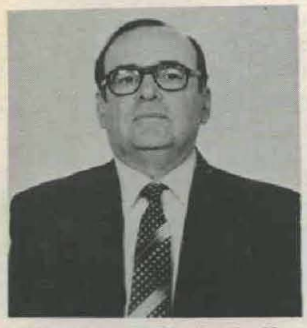
Mr. William H. Mermagen, a physical scientist assigned to the Army Armament R&D Command's Ballistic Research Laboratory, Aberdeen Proving Ground, MD, has been awarded the Meritorious Civilian Service Medal, the second highest Department of the Army award for outstanding accomplishments.

He was cited for his work in projectile flight mechanics and for the design and development of an advanced laboratory flight simulator that added an increased area of technology to research in BRL's Launch and Flight Division.

Mermagen entered Federal service in 1959 after serving two years on active military duty as an Army ordnance officer at APG. He advanced through a series of supervisory positions to his current assignment as chief of the Launch and Flight Divison's Flight Dynamics Section.

After winning a New York State Scholarship in 1952, he attended Fordham University where he was awarded a bachelor of science degree in physics and was a distinguished military graduate in the ROTC program. He was awarded a master's degree in physics by the University of Delaware, and in 1957 he was elected a BRL Fellow.

Eccleshall Chosen as Kent Award Recipient



Dr. Donald Eccleshall

Dr. Donald Eccleshall, a research physicist who is chief of the Applied Physics Branch in the Ballistic Research Laboratory's (BRL) Ballistic Modeling Division, has been awarded the 1982 Kent Award, an honor recognized at BRL as the highest annual commendation for achievements in scientific and engineering research.

Established in 1956, the award honors BRL's prominent scientific leader, the late Dr. Robert H. Kent.

Dr. Eccleshall was recognized for numerous scientific research achievements that will reportedly help to keep the U.S. Army in the forefront of weapon technology.

A native of Warrington, United Kingdom, Dr. Eccleshall served active duty with the British Army from 1946 to 1948. He was educated at the University of Liverpool, where he was awarded a BS degree in physics (with honors) in 1952 and a doctorate degree in the same discipline in 1956.

The author of more than 50 published scientific papers and reports, he was the recipient of an Army Science Conference Award as well as his first Army R&D Achievement Award in 1978. This year he was awarded his second R&D Achievement Award as a member of a BRL research team. In addition, he was awarded a 1982 Significant Accomplishment Award.

Dr. Eccleshall served with the U.K. Atomic Energy Authority as the principal scientific officer from 1956 until 1966. He was in the United States for the next two years as a research fellow at the University of Pennsylvania before starting work at BRL in 1968.

Zeidner Receives DOD, Presidential Awards

Dr. Joseph Zeidner

Dr. Joseph Zeidner, U.S. Army Chief psychologist and technical director of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) was presented the Department of Defense Distinguished Civilian Service Award during his recent retirement ceremonies. It was announced also that he is a recipient of the Presidential Meritorious Senior Executive Rank Award.

His award citation upon retirement read, in part, ". . .He has demonstrated time and again, the wisdom to foresee the second and third order effects of current actions, and the courage to take those actions to improve the Army's combat readiness. . . Dr. Zeidner's accomplishment and leadership have contributed to an Army that is better manned with duty-oriented, competence-based soldiers."

Dr. Zeidner retired after having been in government service for nearly 40 years, most of which were with ARI in positions of research management. He first joined one of ARI's predecessor organizations in 1950, as a research psychologist. During the next 32 years, he held various positions of increasing responsibility in the organizations that, in 1972, became ARI.

Dr. Zeidner received his BS degree from the City College of New York in 1949, a Master of Arts degree from Fordham University in 1951, and his PhD in experimental and industrial psychology from Catholic University of America, in 1954. His numerous awards include the Army R&D Achievement Award, the Meritorious Service Award (1972) and the Exceptional Civilian Service Award (1978).

He is a fellow of the American Psychological Association, Member of the District of Columbia Psychological Association, Member of the Armed Forces National Research Council Committee on Vision and a licensed psychologist in the State of Maryland.

BRL Receives DA 'Award for Excellence'

For the sixth time since 1974, the Army Armanent R&D Command's Ballistic Research Laboratory (BRL) has received the Department of the Army "Award for Excellence."

Presentation of the annual award for laboratory excellence is based on the degree that each Army R&D laboratory fulfills its potential, relative to mission assignments.

Dr. Richard L. Haley, the Army Materiel Development and Readiness Command's assistant deputy for Science and Technology, presented the award to Dr. R.J. Eichelberger, BRL's director, at a ceremony conducted at the BRL headquarters.

BG Howard C. Whittaker, ARRADCOM's acting commander and the commander of the Army's Chemical Systems Laboratory, also spoke at the presentation ceremony.

In his remarks, BG Whittaker said, "It is a proud day for the BRL workforce. The significant contributions you have made to Army weapon technology are a result of time, talent and dedication."

The Army presents five awards for laboratory excellence as a runner-up to the annual Lab-Of-The-Year Award. BRL was recipient of the Lab-Of-The-Year Award in 1976.

1982 Index of Army RDA Magazine Articles

The following is a headline list of feature articles published in the ***Army RDA Magazine*** *during calendar year 1982.*

JANUARY-FEBRUARY

- The ABCA (American-British-Canadian-Australian) Program.
- 11th Annual PM Conference
- Improving Helicopter Survivability Through Smoke/Aerosol Technology
- MERADCOM Improves Army's Mobility Via Vast R&D Programs
- The Army's Improved Scout Helicopter
- IMEP Provides Alternative to Conventional R&D

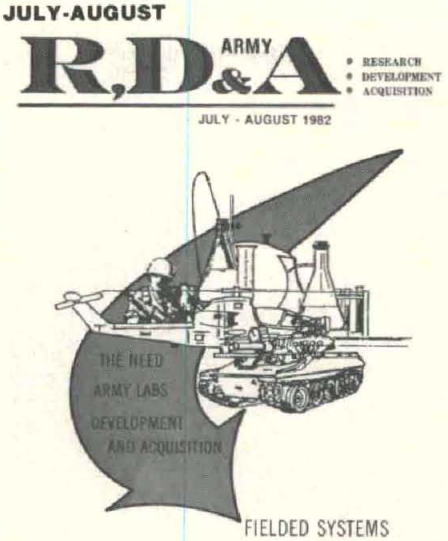
MARCH-APRIL

- Integrated Logistics Support
- A Multiplex System for Combat Vehicles
- Improving Army Acquisition of Nonmajor Programs
- Dangers of Relying on Industry as a Partner in Materiel Development
- HQ DARCOM/ODCSRDA Directory
- Quiz on RD&A Terms and Processes
- Fuel Quality vs. Engine Performance
- Division 86: Designed to Fight and Win
- Ballistic Modeling

MAY-JUNE

- Smoke and Obscurants Technology
- Atlanta Seminar Focuses on New Acquisition Initiatives
- Interview with ASA(RD&A) Dr. Sculley
- Space Age Materials Application to Military Bridging
- Impact of the Technology Base on Soviet Weapon Development
- PALS Robotics System: A New Look in Ammunition Handling
- Defense Against Terrorism: The Army's Physical Security Mission
- Spares Provisioning for the PM
- Battelle Forecases $37 B for Federal R&D

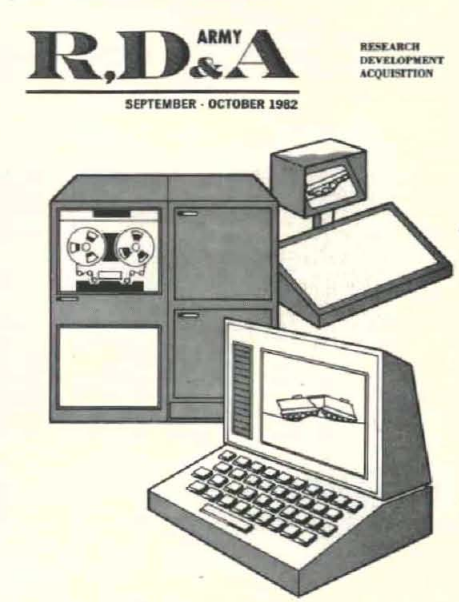
JULY-AUGUST



THE ROLE OF ARMY LABS IN RDA

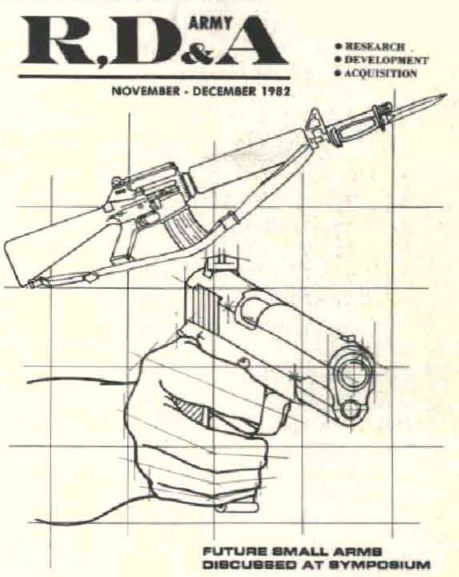
- Army Laboratories
- Lab and Tech. Mgt. at the Army Staff
- Introduction to DARCOM Labs
- DARCOM Subordinate Command Labs
- Other DARCOM Laboratories
- Army Corps of Engineers Labs
- Army Medical R&D Command Labs
- Army Research Institute

SEPTEMBER-OCTOBER



- Full-Scale Simulation
- Army R&D Achievement Awards
- New Directions in Embedded Computers
- Energy Self-Sufficiency for the Airland Battle 2000 Thrust
- BRL Improves Technology for Projectile Performance

NOVEMBER-DECEMBER



- Small Arms Meeting Draws More Than 150 Representatives
- A Developmental History of Small Arms Ammunition
- Small Arms Training Ammo for the 1980's
- MERADCOM Mine Detection Division Establishes New Test Site
- Annual Listing of DARCOM PMs
- Cost Discipline
- Interview With BRL Director Eichelberger
- 2 Fighting Vehicle Concept Designs
- Composite Helicopter Airframes

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