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PREPLANNED PRODUCT IMPROVEMENT

A NEW APPROACH TO THE ACQUISITION PROCESS

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ABOUT THE COVER:

This month's cover story features a detailed discussion of Preplanned Product Improvement. P³I, as it is termed, is an "evolutionary" approach to the materiel acquisition process.

FEATURES

DEPARTMENTS

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PREPLANNED PRODUCT IMPROVEMENT

By MAJ Phil Miller

In early 1981, the Secretary of Defense initiated actions designed to significantly improve the defense acquisition system. This effort included decisions to make major changes both in acquisition philosophy and the acquisition process itself. These decisions became known as the "Carlucci Initiatives" and have evolved into the Defense Acquisition Improvement Program.

The Defense Acquisition Program represents a considerable change in the procedures associated with the acquisition of weapon systems. This change is driven by escalating costs of new development, and the need to improve the complex acquisition cycle.

A major element which has influenced the increased time and cost associated with developing a strong national defense has been our desire for high technology systems. In many cases, this desire has grown from necessity and will continue for those areas where choice is not a factor.

Most system development since the end of the Korean War has followed a revolutionary development approach which applied new technology throughout the process. This type of acquisition strategy was the result of cost effectiveness predictions, the goal of staying ahead of the threat, and long range projections of system requirements.

The impact of this type of development was generally large cost and schedule overruns, both in development and production. In addition, uncontrolled cost growth prevailed after fielding due in large part to inflexible designs and the restricting effect this had on system improvements.

While we should not discount the gains achieved through high technology programs, an evolutionary development strategy should be adopted for programs where a lower technology concept is acceptable. This type of acquisition strategy will allow us to put more systems in the hands of the user sooner and at lower cost, while continuing to develop higher capability product improvements. This concept is called Preplanned Product Improvement (P^3I) and it is changing the infrastructure of the acquisition process.

Evolutionary development is not new, indeed the evolution of systems has been a part of the materiel acquisition process for many years. The M-60 tank evolved to M-60A3, Hawk to improved Hawk, and the UH-1A aircraft to UH-1H, just to mention a few. The difference between this type of evolution and that which is envisioned in the P^3I initiative is the "preplanning" element.

In the past, the vast majority of product improvements were not "preplanned", in fact, product improvements themselves were developed along the same lines taken by the system they were to improve. This "revolutionary" development of product improvements averages 5½ years for major systems. This is nearly half the time required to develop and field a completely new system.

By the use of P^3I to control the evolution of systems (and product improvements to these systems) we are moving away from the revolutionary development approach toward one of planned incremental improvement throughout the life of a system. This P^3I development philosophy is being institutionalized within the Army and it must be clearly understood if we are to derive the maximum benefit from our efforts.

One of the major obstacles to implementation has been the inability of people to see the difference between "standard" product improvements and those which are "preplanned". Preplanning of an improvement does not simply mean adding growth provisions to an already difficult near term development effort.

Preplanning improvements to systems requires an evolutionary development strategy. P^3I is applicable to new starts, ongoing programs, and already fielded systems no longer in production.

Much has been written about the philosophy behind evolutionary development, but little has been said about the specifics of its implementation. The P^3I initiative will impact Army materiel acquisition in the following areas:

New Starts

The Army will structure P^3I, to the extent feasible and practical, into all new starts. This is not to say that our objective is a P^3I chicken in every pot; what we're after is the assurance that preplanned product improvements are considered and used when it's cost effective and the need can still be satisfied.

The fundamental notion associated with P^3I is that we reduce the near term requirement for a specific system and plan for the phased introduction of incremental improvements at specifically defined points in time. Each evolutionary change is planned to meet a postulated change in the threat or to accommodate projected technological advancement.

The key to succes in the P^3I approach is in two areas. The first is the reduction of the near term requirement in order to not pressure the state of the art, and the second is the accurate projection of changes in the threat and technology.

The reduction of near term requirements leads one to believe that our intentions are to field less capable systems against the same threat. This is not the case because the reduction of near term capabilities are offset by a shortened development time (Figure 1). In other words a system produced under this approach is still responsive to the threat because the closer time frame for IOC addresses a less technologically advanced enemy.

The benefits of not pressuring the state of the art translate into reduced cost and schedule risk. Other benefits include the maintenance and repair parts knowledge gained from fielding a system sooner, not to mention the training benefits. Most important, the ownership costs can be greatly reduced.

Ownership costs can be controlled because of the P³I principle of modular design. Modular designs allow technology insertion to control cost growth associated with maintenance and the repair parts of already fielded systems. Product improvement costs decrease because of design characteristics built into the system to facilitate improvements.

At this point I feel it important to address an area that many of you are probably concerned with. Specifically, what happens to the technological edge that we have used to justify new starts, loaded with high technology, if we follow a P³I approach that calls for not pressuring the state of the art? The answer may surprise many of you.

The fact is that technological advancement is more apt to result from the phased product improvements planned under an evolutionary approach, than from revolutionary development calling for the latest "Buck Rogers" type weapons. This is because a product improvement effort has both a start and an end point that allows research to focus in on specific areas resulting in higher returns.

One of the major concerns expressed by the development community has been the need to project technological advances and threat changes with enough accuracy to design growth provisions for future improvements. Our experience indicates that this concern is valid when the projected time frame is in the mid to long term.

However, projecting both threat and technology advances in the near term (five years) is possible, as indicated by the few programs which have used P³I in the past. This is clearly the case when higher technology subsystems are already under development such as the improved engine for the joint vertical aircraft.

Thus, a "Five Year Plan" for system upgrade is indicated. Design considerations for the next improvement are applied, when applicable, at each upgrade. Ideally, they would be applied in blocks containing both standard product improvements and those which were preplanned.

The process of reducing near term requirements and then upgrading a system to match changes in the threat and technology (Figure 1) should be accomplished within the time frame where accurate projections are possible (Five Years). The cost effectiveness of this strategy must be compared against proceeding with a full capability system.

The risk of proceeding with a full capability system that pressures the state-of-the-art may be off-set by the risk of not following through with preplanned improvements. These same considerations apply to block improvements where P³I is used to evolve a system (Figure 2).

Ongoing Programs

The Army has never acquired a major system that wasn't improved during it's active service life. This fact has not changed with high technology, in fact product improvements have been increasing at a fairly constant rate since 1978 (Figure 3). Costs of these improvements are significant, $1.3 billion for FY82 alone.

A large part of the cost is associated with the "revolutionary" development of the improvement. Failure to accommodate growth provisions in the original system leads to high cost for reengineering the system for upgrade. Although P³I may be limited by the original design parameters to subsystem changes and other modifications which don't require total redesign, it can be used to evolve subsystems in the same manner as new starts.

When basic system redesign is a must, P³I will be considered and when applicable, used to influence the redesign so that the next improvement is facilitated. In July 1982, DARCOM issued interim guidance for the application of P³I in the materiel acquisition process. This guidance was specific information necessary to begin the implementation process.

The first step in the development of a P³I acquisition strategy is a properly written requirement document. TRADOC has issued guidance calling for requirement documents that are initiated after 1 March 1983 to include, where possible, provisions for P³I.

These provisions will outline the growth requirements and the time period the capability is estimated to be required, e.g., basic system modularity required, fire and forget preferred but required NLT six years after IOC. This type of requirement statement will allow a program manager to continue the development effort (past MS III) needed for the specific improvement.

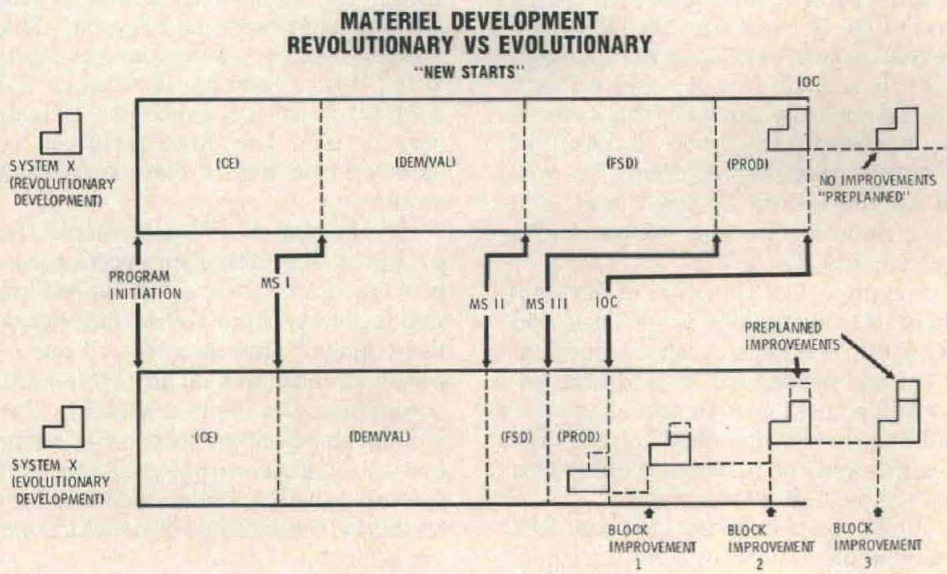

Figure 1

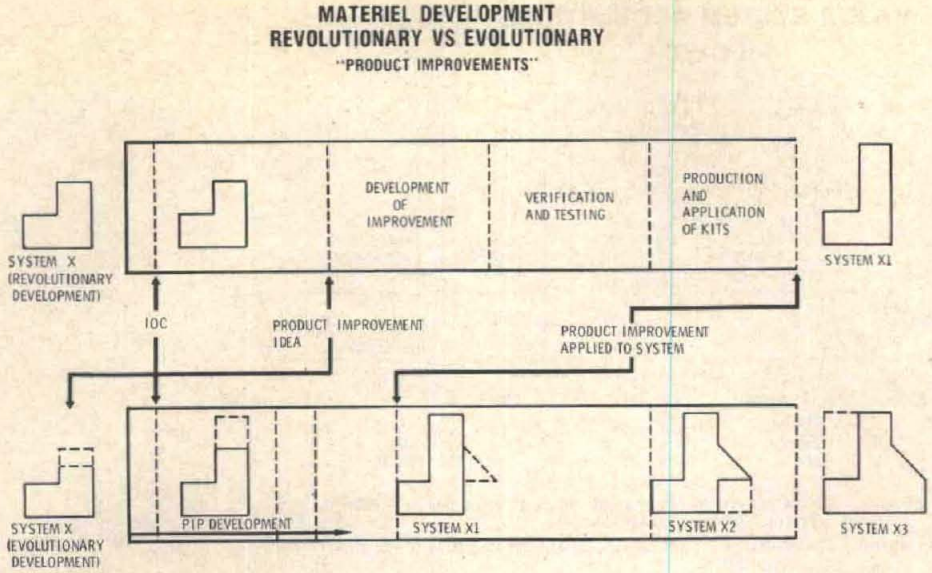

Figure 2

This means that RDT&E appropriations must also continue past the production decision to support product improvement R&D efforts. It also requires that growth provisions be designed into the near term system.

Clearly, these provisions must be as accurate as possible to prevent sunk costs resulting from provisions incompatable with future technology or predicted needs. This requires that the "preplanning" of improvements continue throughout the life cycle of a system and that each planned improvement contains provisions for the next improvement whenever possible.

With these conditions in mind, the P³I Subgroup to the OSD Acquisition Improvement Task Force required the services to develop guidance for the structuring of P³I into major system new starts such that it could also be applied to less than major programs.

The structuring of P³I into Army systems will follow a three phase approach. This approach is applicable to new starts, ongoing programs, and already fielded systems.

Phase I involves the planning and research necessary to determine how a system should evolve in response to advancing technology or projected changes in the need. This effort continues throughout the life cycle of a system.

Phase II entails the incorporation of considerations into the design of the system or acquisiton strategy which will facilitate future improvements to the system. This effort occurs when it's cost effective e.g., during development, production, overhaul or conversion.

Phase III includes the application of product improvements or Engineering Change Proposals which take advantage of Phase I & II efforts. This phase occurs when the need dictates.

Figure 4 illustrates when these phases occur in relation to the life cycle management model.

Already Fielded Systems

The largest share of life cycle cost associated with major systems is operation and maintenance. Uncontrolled cost growth in already fielded systems occurs when the cost to repair or maintain a system or its components exceeds its replacement cost. At this point the item is correctly declared "consumable" and no longer repaired.

We then order replacement parts from a contractor based on the original tech data package, normally at costs much higher than the original acquisition cost. Within the current product improvement program, a system meeting these conditions can be evaluated for standard product improvement.

Once a decision is made to improve the system, P³I considerations can be applied to facilitate future improvements in the same manner as product improvements for ongoing programs.

Reporting

Institutionalization of P³I into the Army acquisition process has generated the need to acquire and analyze evolutionary development information for specific systems. Currently, the Army is required to report the status of P³I implementation through the Joint Logistics Commanders to the Office of the Secretary of Defense on a quarterly basis.

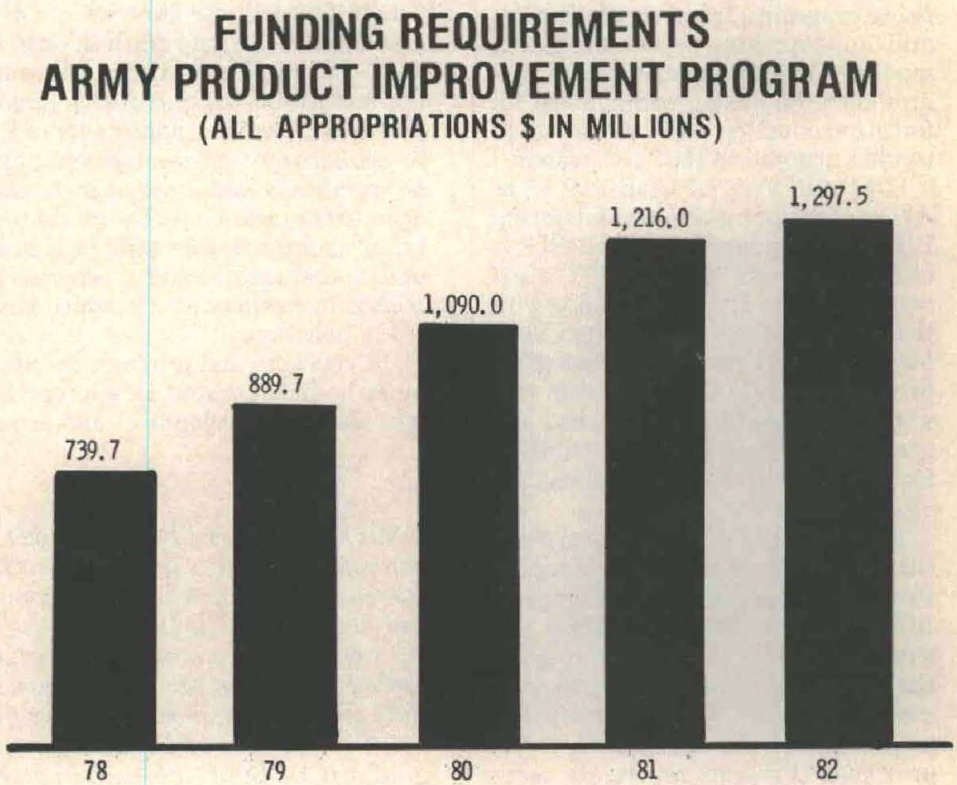

Figure 3

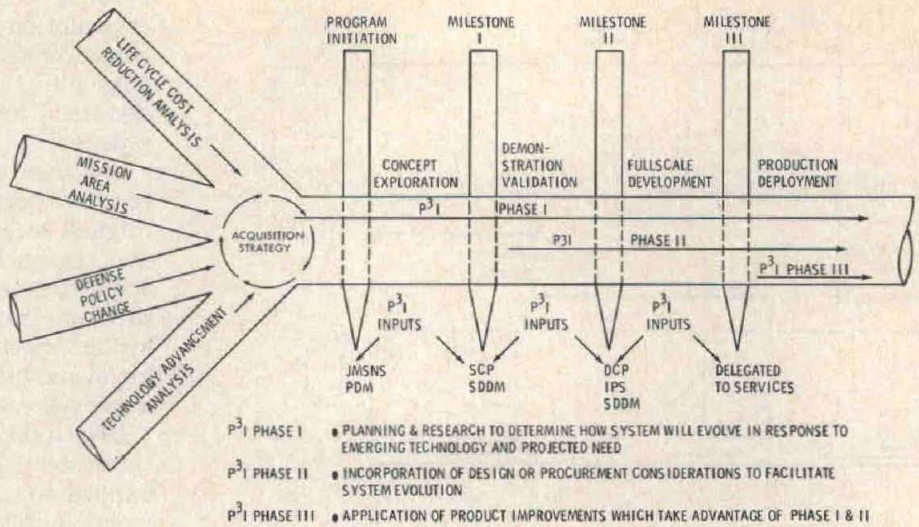

Figure 4

OSD P³I implementation guidance requires that the resources to accomplish P³I be made visible during the PPBS cycle and placed in the FYDP, (POM). Once P³I becomes a part of the acquisition strategy, failure to fund it will be considered a major change in program direction.

OSD has directed that P³I become an integral part of the materiel acquisition process, and that the incorporation of its provisions in new and ongoing programs, to the extent feasible and appropriate, be required. P³I modifications are to be scheduled, programmed, budgeted, and planned for force introduction with the same attention to detail as the basic system.

HQ DARCOM, DRCDE-PIP, is the Army focal point for administering P³I policy guidance. DRCDE-PIP is chartered with overall P³I staff responsibilities and tasked, along with the DARCOM Weapon System Staff Manager (WSSM), with reviewing P³I provisions on individual programs when presented for milestone and program review decisions. Opportunities for further P³I after deployment are also reviewed.

To obtain the needed information, the Army will use the already existing Product Improvement Management Information Report (PRIMIR). The submission of P³I information using the PRIMIR, eliminates the requirement to submit the quarterly P³I input to the Defense Acquisition Improvement Program report. By using the PRIMIR, DARCOM will keep the reporting burden to a minimum, yet achieve the necessary Army program goals, and provide the best possible support to the materiel development community.

In summary, the principles of evolutionary development are not new. Its objective to extend the useful life of systems, with all the attendant advantages in time and cost savings, makes good sense and should be the foundation of acquisition planning for a system's life cycle.

DARCOM, under direction of GEN Donald R. Keith, has taken the lead in development of procedures to insure the institutionalization of this important initiative. The applicability of P³I to weapons system development must be specifically addressed at each management or decision review for the program. Program reviews will include an update and assessment of progress in related technology efforts which have P³I implications.

P³I concepts and program specifics must be incorporated as appropriate into research development and acquisition long range plans, requirement documents, and program management documents. P³I is an area of special interest at the annual DARCOM RDT&E reviews.

DARCOM has established a P³I team within the Product Improvement Branch of the Program Integration Division to assist in structuring P³I to the extent feasible and practical into Army Systems. Initial indications are that the cost effectiveness of the P³I approach is so great, that we can't afford not to consider using it.

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Conferees Cite Importance of Producibility Engineering

Producibility Engineering and Planning (PEP) procedures and perspectives relative to the Army's materiel acquisition process were discussed in detail by government and industry participants during the first U.S. Army Materiel Development and Readiness Command PEP Conference in Greenville, SC.

Attended by more than 120 representatives, principally from industry, but also from HQ DARCOM, DARCOM major subordinate commands, HQ DA, and the Office of the Secretary of Defense, the conference was structured primarily as a tutorial with emphasis on the importance of PEP to the DARCOM community while also sharing PEP "lessons learned" and ideas with industry.

Mr. Frederick J. Michel, director of Manufacturing Technology, HQ DARCOM, called the meeting to order and expressed appreciation for the large response to the conference.

Mr. John D. Blanchard, DARCOM's Principal Assistant Deputy for Research, Development and Acquisition, set the tone for the meeting by emphasizing the importance of PEP and calling for a frank exchange of views by the participants. He prefaced his remarks by stating that DARCOM Deputy Commander for RD&A LTG Robert J. Lunn, who was originally scheduled to present the keynote address, was perhaps DARCOM's greatest supporter of PEP; but regrettably could not be present.

Blanchard also added that Producibility Engineering and Planning is at the top of the list of priorities for DARCOM Commander GEN Donald R. Keith.

Blanchard maintained that a "better way" must be found to think through the Army's production programs beginning very early in the R&D process. He added that there is no functional area now receiving more emphasis than PEP.

"Our (both the Army's and industry's) production management skills have grown rusty but things are improving," said Blanchard. "The PEP thinking," he continued, "must begin when we harden the requirement for a system. Merely designing a system is not enough."

Blanchard repeatedly stated that production readiness must be a high priority goal throughout all stages of R&D and not viewed as a separate process apart from everything else. Producibility must be a consideration even during basic research, and scientists and engineers must learn to "think producibility thoughts" right from the beginning. Said Blanchard: "You can't start the engineering people thinking about PEP too soon. The production risks must also be considered right up front, early in the process."

Blanchard stated that he hoped that the conferees would gain a better understanding of how Producibility Engineering and Planning was to be conducted from an Army management standpoint. The bottom line, emphasized Blanchard, is how we are going to manage PEP!

Queried as to whether PEP should be a separate line item in funding, Blanchard responded: "I am not sure that we need go that far, even though we appear to be moving in that direction. If we get a separate line item for PEP, then we might get too structured. We seem to always go too far and then end up with a whole new community of enthusiasts and proponents; folks who end up too enamored with the administrative processes, and who lose sight of the end result." He closed his remarks by stating that the important thing is to establish PEP policies and procedures, such that they are clearly understood and are workable at the engineering bench and on the factory floor.

Mr. Darold L. Griffin, DARCOM DEA deputy director, followed Mr. Blanchard with a discussion of how PEP fits into the overall acquisition picture, how it will be managed, and how it will be accomplished. He began his remarks by stating that systems must be designed better and they must be transitioned to production better. PEP, he contended, is one of the vehicles we are developing to achieve this.

He indicated that one of the reasons the PEP conference was convened at this point in time was to gain the benefit of the PEP participants knowledge and experience prior to the upcoming Annual RDTE Review.

In order to clarify the current interest in producibility, Griffin provided some background information. During the late 1970s the Army experienced unanticipated high costs where systems were costing three and four times more than anticipated. Additionally, there were inefficient production plants, and there were serious production start-up problems. Consequently, affordability of the Army's modernization program has become a major problem and productivity has been elevated as a significant part of the cure.

HQ DARCOM has been realigned, said Griffin, to provide strong centralized management over the life cycle of each weapon system and to generate a management environment that will embed producibility in the technology products coming from Army labs and in the weapons systems designs from industry.

In addition, subordinate commands have been reorganized and an effort has been made to close ranks among PMs, laboratories, and DARCOM readiness elements. Among the DARCOM realignment tools are matrix management, weapon system staff managers, more modern management information systems, program stabilizers, executability analyses, and long-range planning.

Griffin noted that formal acquisition management training is the long-term approach to be used to institutionalize many of the intended improvements. He stated that it is now possible for an officer to progress from captain to 4-star rank while remaining entirely in the materiel acquisition field. This, he added, should produce some real expertise.

Relative to PEP policy, Griffin said that it must start early in the conceptual phase so as to address production feasibility, and continue through full-scale engineering. Production engineering firmly links the product to the production line.

Funding for Producibility Engineering and Planning will be provided by the RDT&E appropriation, said Griffin. However, the procurement appropriation will pay for a number of PEP related programs, including manufacturing methods and technology, hard tooling and equipment, engineering in support of production, and partial or complete production lines.

The DEA deputy director noted that PEP must be a part of design criteria and must be started early. In addition, an integrated engineering team approach will be used to execute PEP. This team will be comprised of design, production, and quality engineers.

Mr. Griffin then discussed DARCOM's acquisition strategy. He referred to it as the "life cycle business plan" and the baseline for the program management control system. PEP, he said, will be an integral part of the acquisition strategy.

Finally, Griffin offered some proposals for improved producibility. For example, he called on industry to direct some of its independent R&D funds to producibility. Secondly, he suggested application of value engineering to generate process improvements, and he proposed that model production lines be designed for selected weapons systems or commodities. This would embody an idealized plan for layout and equipment.

Griffin closed his remarks by stating that Producibility

Engineering and Planning is vital and it must be included in the Army's acquisition strategy and design criteria. Further, it must be started early in development and, most importantly, PEP must have top management support.

What is industry's perspective on producibility engineering? This question was addressed by Mr. Ward F. Wheaton, executive vice president, Aerospace and Defense, Honeywell, Inc. He noted at the outset that transitioning to production is a very difficult procedure in the life-cycle.

However, he indicated that producibility engineering is very important and has provided some very positive results in a number of programs. Specifically, he said PEP was applied successfully with the Army's Area Denial Artillery Munition Program, the Navy's Antiarmor Cluster Munition Program, and the Air Force GAU 8/A Ammunition Program.

Wheaton then discussed some PEP conclusions and recommendations of the Defense Science Board. Among these conclusions, he said, was that PEP must be interpreted flexibly and PEP funding must be adequate. It was recommended that the Army specifically allocate PEP funds, and achieve better program stability.

Relative to industry, he noted that it was recommended that they execute more efficient transition to production programs, expand independent R&D, and provide a more quality oriented culture.

Wheaton expressed industry concern for defense readiness. He emphasized that "it is better to do fewer programs correctly than to do many programs incorrectly." He stressed the importance of having "good" people and assuring that they are properly trained.

Mr. Harold G. Peacock, chief, Manufacturing Engineering Division, U.S. Army Missile Command, followed Mr. Wheaton with a "Major Subordinate Command Perspective" on PEP. Major elements of PEP at MICOM stress adequate funding, he said.

Peacock explained that the purpose of PEP is to insure smooth transition from R&D to production and to assure system producibility, providing timely and economical production. Some typical early production problems have been design changes, lack of quality control, cost growth, not following production plans, test equipment and procedures, and part shortages.

PEP must be a team effort, insisted Peacock. The MICOM team, he said, consists of functional directorates, contractors, project office managers, production engineers, and the commander.

Finally, Peacock summarized some specific MICOM PEP guidelines. First, he said the scope and level of PEP performance must be approved by functional personnel and special PEP funds must be allocated. Additionally, PEP performance should be reported in cost performance report format.

During a brief luncheon statement, DARCOM Manufacturing Technology Director Mr. Frederick J. Michel stressed that customer needs must be considered when addressing producibility engineering. The bottom line, he said, is that we respond to customer requirements relative to the quality of the end product.

Mr. J.H. King, engineer in charge, Assembly Tool and Processing Engineering, Fisher Body Division, General Motors Corp., opened the afternoon session with a progress report on GM's automated body systems. He explained that quality is the number one priority at GM and that automated systems, or robotics, are helping GM achieve this goal. By 1985, GM will have 5,000 operational robots. Said he: "Quality control through process control is how GM is producing a better product."

Fisher Body, continued King, has been operating under a manufacturing engineering team concept. This concept, which is analogous to PEP, is implemented during the early design stage for a new vehicle, and by using the approach we have eliminated a lot of problems, he said.

Another industry spokesman, Mr. Chris E. Cofer, Textron, Inc., related his firm's experience with the Army's Helicopter Improvement Program. A formal AHIP PEP was established in 1981. Among his recommendations for a good producibility engineering program are the need for company initiatives and support; a knowledgeable producibility team collocated with engineering design people; and manufacturing technology improvements.

Mr. John P. Shanley, vice president, Raytheon, and Patriot program manager, reviewed the Patriot program and how PEP is being applied to it. He cited the importance of informing design engineers about the types of potential production problems they design into a system.

Lessons learned from the Patriot experience, said Shanley, are: PEP is essential; conduct manufacturing technology in parallel with PEP; build prototypes; get the production plant into the engineering development phase; develop second source vendors; and apply producibility engineering properly or it can be dangerous.

Mr. Don Chellis, U.S. Army Aviation R&D Command, followed Shanley with a panorama of PEP activities as related to the Remotely Piloted Vehicle Program. Some of the specific PEP actions which have been requested from the contractor (Lockheed) during the full-scale engineering development phase of the RPV are a producibility analysis, production drawings, an identification of tool and test equipment, and a production facilities plan.

The need for producibility engineering and training was stressed repeatedly by virtually every PEP conference speaker, and was especially emphasized in an address by Mr. Gilbert J. Tallar, an instructor at the U.S. Army Management Engineering Training Activity (AMETA), Rock Island, IL. He spoke specifically on AMETA's training program for management and control of PEP.

He stated at the outset that the course objectives are to provide the DARCOM R&D community with a working knowledge of PEP procedures in preparing proposal documents and to aid in contract management of the contractors planned efforts.

He recommended the course for technical personnel who serve as contract officer representatives of R&D efforts; project personnel who review, monitor and manage the weapon system transitioning efforts from design into production; and procurement personnel who negotiate and administer development contracts.

Some of the topics covered in the PEP course include authority for PEP, PEP in the weapon system life cycle, PEP implementation, contractor efforts, and PM's role in transitioning to production.

Tallar stressed the importance of PEP training by quoting DARCOM Commander GEN Donald R. Keith who said: "There are no activities in weapons system acquisition that demand greater attention than those directed toward assuring effective transition of developed hardware into efficient production."

Tallar explained that the PEP course stresses that PEP is the responsibility of the major subordinate command/project manager, while the contractor is responsible for execution of PEP.

Tallar noted that the standard definition of PEP taught to his students is as follows: Those producibility and production engineering tasks performed which:

- Effect economic and timely producibility and completeness of product design.
- Accomplish detailed planning of all items and resources for production in a timely and economic manner.
- Carry out those actions to try out and prove that the resources specified will perform optimally during production.

In developing producibility criteria, it is important, said Tallar, to strive for simplicity of design, to standardize

materials and components and to design flexibility.

Tallar closed his presentation by identifying three transitioning to production risk categories. External risks are those such as inflation or other unknowns. Production risks can be material and purchased parts and facilities and equipment. Product risks are such things as design stability and producibility performance.

Two Producibility Engineering and Planning courses have been conducted thus far in 1983 and another three are planned. Eight such courses, said Tallar, are programmed for FY 1984. Information on these courses is available by calling Autovon 793-4041.

Abounding exuberance typified a banquet address on producibility by Mr. R.W. Van Sant, vice president of Manufacturing and Engineering Services, Deere and Co. He began by stressing that producibility is crucial to a company's competitiveness, and that his company has been interested in it for a very long time. Some basic priorities at Deere are to develop around a family of components, quality reliability and serviceability, and low cost production.

His firm's producibility program includes emphasis on quality management, value analysis and engineering, and a vehicle test plan. As a result of their producibility plan, there has been a drastic reduction in the number of prototypes required to prove out a design. In addition, production start up occurs only when a 90 percent reliability growth is shown.

One of the key producibility procedures used by Deere Co. is a failure mode and effects analysis. This formal approach identifies potential failure modes prior to assembly and testing of a piece of hardware. Each failure mode is given a failure rating of importance, is classified as to its occurance, and is classified relative to its severity.

Deere's producibility plan, said Van Sant, is administered by their reliability personnel, but in theory every Deere employee assists in its application. Development and implementation of a good producibility plan, he continued, demands tremendous energy and support from the top.

Van Sant added that it takes three to five years to achieve results from a producibility plan and, that based on his company's experience, formal producibility procedures are generally much more successful than informal ones. He closed by emphasizing that when properly applied, PEP definitely enhances transitioning from design to production.

The second day of the PEP conference was opened with a briefing on DOD's perspective relative to producibility engineering. Mr. T.R. Baldwin, staff assistant for Production Management, Office of the Deputy Under Secretary of Defense Research and Engineering (AM), stated that DOD is completely serious about PEP and that transition from development to production is one of the big areas that must be improved.

Baldwin explained that a joint services PEP meeting, in November 1982, in Albuquerque, NM, resulted in a recommendation to have a greater awareness of PEP by both government and industry, and for dedicated funding and an early PEP involvement in the development phase.

Other "action items" from the Albuquerque meeting call for development of an order of magnitude estimates for PEP funding levels; identification of possible contract incentives for PEP performance; and increased government PEP training. The DOD, concluded Baldwin, wants PEP to work and wants it to be contractually authorized.

Mr. R. Dewey, from the U.S. Army's Chemical Systems Laboratory, expanded on the theme of "contracting for PEP" during an address in which he stated the CSL's contracts specify PEP tasks which must be performed by the contractor.

Some of the PEP lessons learned according to Dewey are that contractors generally don't want to do producibility investigations; contractors don't understand the importance of PEP; and contractors don't adequately allocate PEP resources. Future PEP efforts at CSL, said Dewey, call for a greater emphasis on producibility during the proposal evaluation phase, and a greater understanding of what the government expects of the contractors relative to PEP.

Mr. S.J. Lorber — a recognized authority on quality control — and director of Product Assurance and Testing, HQ DARCOM, addressed the subject of "Quality Aspects of PEP." He noted that quality and producibility are inseparable.

Some of today's quality issues, according to Lorber, are hardware problems, command concerns, contractor performance, depot performances, and GAO reports. He said there is a need for a clearer understanding of who is responsible for quality.

Lorber added that today's requirements call for development of a good quality assurance strategy and better cooperation from PMs and contractors. Also, quality concern must be brought into design reviews, he stressed.

Relative to process controls, Lorber stated that the Japanese frequently go beyond what the specifications call for in producing an item. Subsquently, they produce a better product than they might otherwise provide.

The final formal speaker of the PEP conference was Mr. Ed Ford from the U.S. Army Armament R&D Command. He discussed his command's PEP programs and problems. Said he: "It is a generic, ongoing, life-cycle process that must be started early."

ARRADCOM, continued Ford, has both long range and short range perspectives on PEP. These include the fencing in of PEP funds, individual development plans relative to training, and on-site AMETA PEP courses.

One of the key problems of PEP, said Ford, is that there are not enough incentives for people to become production engineers, and this must be addressed. This dilemma, he added, may have its roots in the academic community.

The concluding conference session was devoted to a questions and answers "executive panel" discussion of key conferee concerns. Moderated by Mr. John Blanchard, the panel was composed of Mr. Frederick J. Michel, Mr. Darold L. Griffin, Mr. R.M. Savage, director of Manufacturing, Hughes Helicopter, Mr. H.L. Bachman, vice president for Manufacturing, Hazelton, Corp., Mr. S.J. Lorber, and Mr. T.R. Baldwin.

Subjects addressed during the panel session were: the integration of PEP with design to unit production cost; how OSD is managing PEP; and the application of dollar values to the PEP process.

Since time constraints prohibited the panel from responding to all questions submitted by the conferees during the conference, Mr. Blanchard made the committment to the conferees that DARCOM will clearly articulate the answers (about 50) in the conference proceedings to be published in the near future.

Panel moderator Blanchard emphasized the need for answers to the following questions:

- Where and how is PEP funding going to be addressed?
- What is the proper level of PEP implementation without creating an atmosphere of "bureaucratic strangulation"?
- How can the Army know when sufficient PEP emphasis is being applied, without waiting until the production phase has been reached?

Blanchard closed the conference by stating that he believed the two days of discussions had been highly beneficial for all, and that the Army people had certainly learned a lot. He stated that he would hope that industry too had gained from the exchange and that in any event, the difficult questions posed the industry had to be thoroughly evaluated and clearly answered before DARCOM would conclude its policies and procedures documents.

New Simulator for Army Helicopter Research

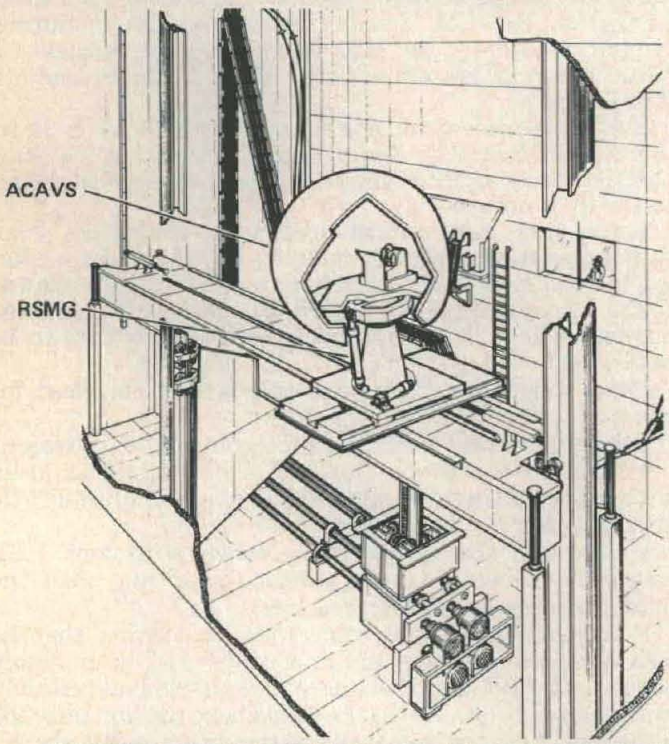
A highly sophisticated simulator program for research on Army helicopters that includes sound, visual and motion systems, is underway at NASA Ames Research Center, Moffett Field, CA. "The program is certain to provide the most realistic flying sensation possible, without leaving the ground," according to COL Arlin (Art) Deel, of the Army Aeromechanics Laboratory, Research and Technology Laboratories (AVRADCOM), also located at Ames.

"With our existing simulator, I've seen pilots emerge from the cockpit exhausted and wringing with sweat, but the new simulator will be twice as realistic," stated Deel who is the manager of the joint Army-NASA program called Rotorcraft Systems Integration Simulator (RSIS).

The $20 million program is funded by the Army Aviation R&D Command and will be used for research into rotorcraft (helicopters) handling qualities and support of all phases of development of new Army aircraft, possibly a family of light helicopters (LHX), Deel stated.

The two part joint Army-NASA simulator program works like this: Franklin Research Center of Philadelphia, designed, built and delivered to Ames a Rotorcraft Simulator Motion Generator, RSMG, that realistically creates the motions experienced in flying. The unit is undergoing acceptance testing at Ames, and will replace an existing motion generator on the vertical motion simulator (VMS), presently in service at Ames.

A new rotorcraft cab and advanced visual system is being built by American Airlines Training Corp., Fort Worth, TX, under a $13.5 million Army contract. Called the Advanced Cab and Visual System (ACAVS), the American Airlines unit will resemble the Black Hawk helicopter, will be one of Ames's six interchangeable cabs, and will also have its own development station. ACAVS will be delivered in 1985, and will be integrated with the new motion system, RSMG, and become operational a year later.



FUTURE VERTICAL MOTION SIMULATOR WITH INTEGRATED ROTORCRAFT SIMULATOR MOTION GENERATOR (RSMG) AND INTERCHANGEABLE ADVANCED CAB AND VISUAL SYSTEM (ACAVS)

Current simulator equipment includes an aircraft cockpit, a pilot control system, a motion simulator, a visual display screen and a central computer. The whole system can simulate instrument flight, night time, low level and flights in fog and turbulence. Mechanical failures along with all sorts of flying conditions could also be simulated, Deel explained.

The simulator cab section, is a make-believe cockpit. It looks like a cockpit, with space for a pilot and co-pilot if a helicopter or larger aircraft is being tested — or single cockpit if a jet fighter-type aircraft is under test. It feels like a cockpit, and some pilots say it even smells like a cockpit. All the aircraft controls are there — depending on the type of aircraft under simulation, even seat belts.

Facing the pilot is a TV screen called a monitor, located where the windshield would be. The monitor reflects the earth and the sky . . . and reacts precisely to what the pilot does with the controls. If the pilot banks the aircraft, the horizon seen on the monitor tilts. If he applies power and climbs, the earth drops away. If he dives, the earth rushes up to meet him.

The simulator has the capability of providing six degrees of freedom — which means that the simulator duplicates up-and-down, forward-and-back, and side-to-side motion as well as three rotational movements (pitch, roll and yaw). It is therefore easy for the pilot to believe he is 10,000 feet up!

When aerospace engineers want to test experimental aircraft under certain conditions, the computer is programmed to provide those conditions . . . which include the realistic flying sensation via the motion simulator, and the appropriate visuals showing up on the screen monitor surrounding the cockpit.

"RSIS will have even greater capability than current simulators at Ames," Deel said. "The advanced visual system will have a wide field of view (140° H × 60° V) which will provide the visual cues necessary to fly close to the ground as most helicopters do. The advanced cab will be reconfigurable in the development station to simulate a variety of helicopters to include the single pilot cockpit proposed for the Army's new family of light helicopters.

RSIS, as is true for all simulators at Ames, will not be used for training. Requirements for training simulators and R&D simulators are vastly different. Training simulators are used to train a better pilot; R&D simulators are used to build a better helicopter," COL Deel concluded.

The preceding article was authored by Mr. Bruce Deam, the public affairs officer for the Army Research and Technology Laboratories, NASA Ames Research Center.

Interview With ARO Director Dr. Robert E. Weigle

Q. A great deal of ARO's effort involves research contracts with the academic, nonprofit, and industrial communities. However, there has been some recent concern in these sectors that the Army may reduce some of this contract research and assume more of the effort on an in-house basis. Would you comment on this?

A. I quite agree that one of ARO's principal functions is to serve as the interface between a large element of the Army science community and that of the universities across the country. While we do support some research efforts in industry and nonprofit organizations, more than 90 percent of our contracts are with the universities. Perhaps of interest also is the ARO responsibility in the DARCOM for the development of the total DARCOM 6.1 research program to assure laboratory requirements and the university efforts are well integrated and address Army science needs.

The concerns that more research will be conducted in-house (at the expense of the contract program) are ill-founded. The Army needs both kinds of capabilities for a balanced program. The research conducted in Army laboratories tends to be more applied and shorter term because of their very strong mission orientations. On the other hand, the universities' research interests tend to be broader, longer range and *lead* technology rather than attempt to solve a specific application problem.

In our recent assessment of the TRADOC critical deficiencies and the operational capability requirements, we identified a number of technology deficiencies that must be overcome if these key Army needs are to be satisfied. Those technology deficiencies can only be met by providing the underlying science through the research programs being conducted in-house and on contract. We simply cannot maintain a laissez-faire attitude and expect the science which we require to magically appear at our doorstep when we need it. In summary, we need to maintain and strengthen our in-house expertise to assure the Army is a "smart buyer" and to make application of the often sophisticated and complex research results which come from the out-of-house, mainly university-conducted, programs.

Q. You served previously as technical director of the Army Armamant R&D Command — considered to be one of the largest R&D organizations of its type. What are your observations relative to the primary differences involved in managing an activity like ARRADCOM and one like ARO?

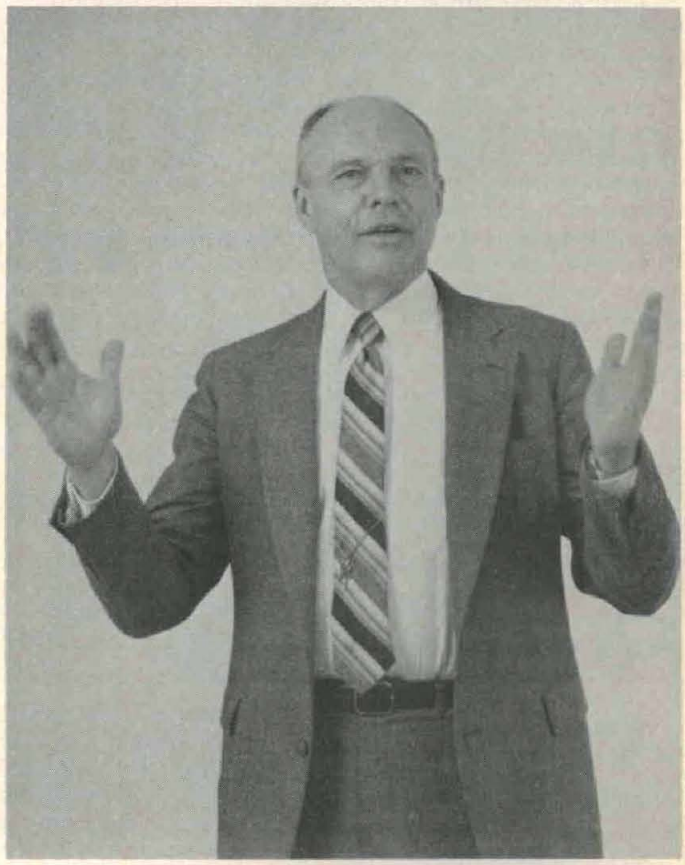
A. Many of the management actions are similar because both activities are part of the Army's research and development structure and therefore the day-to-day conduct of business does not differ significantly. However, because of the broad research responsibilities of ARO, there is an interface with all the DARCOM laboratories. In particular, the actions involving the university scientific community are a major element of the ARO interests, and this was not a significant part of the Armament R&D Command program.

Perhaps the greatest difference lies in the fact that at ARRADCOM the focus is on the development of armament and chemical systems which are schedule-driven and therefore much more time sensitive. Hence, management attention is directed on the nearer term problems. At ARO, my concern has been to assure that the science base we develop addresses the technologies relevant to the longer term operational capabilities desired and therefore the management perspective is not nearly so time constrained.

Q. Rapid and efficient technology transfer to potential users in the Army is obviously a primary concern of ARO. What, specifically, do you think can be done to enhance the technology transfer process?

A. Technology transfer and acceleration of the process is exceedingly difficult because, in general, such actions represent new programs to the laboratories which must be accommodated within their already limited funding resources. To stimulate the transfer process, we place a great deal of emphasis on establishing and maintaining communications between ARO staff scientists, our contractors and potential users in the laboratories. We have a long-established system of scientific liaison and scientific cognizance (unique in the DOD) of DARCOM laboratory scientists with our individual contract research efforts that improves the receptiveness of a research advancement and its application in the laboratory community.

We have also established a Visiting Laboratory Associates Program which brings Army scientists and engineers to ARO for a 6 to 9-month assignment. This provides an opportunity to input laboratory research needs to the ARO program, interact with leading university researchers and acquire a broader knowledge of the total



"While we do support some research efforts in industry and nonprofit organizations, more than 90 percent of our contacts are with the universities."

research program. It should also provide an interactive means for identifying research results ready for transfer to a laboratory program.

However, despite all of these efforts, it often falls to the ARO staff scientist on an individual-to-individual basis to line up the 6.2, 6.3a and MTT support to assure a successful transfer. Probably, in the final analysis, it is the individual-to-individual interactions that make technology transfer work.

Q. ARO reportedly receives hundreds of unsolicited proposals annually. How important are these proposals to the ARO mission?

A. You are quite correct, as we received and evaluated approximately 1,000 unsolicited proposals during the past calendar year. These proposals are the principal means by which the Army taps the scientific capability of the country. And yes, they are extremely important to the accomplishment of the ARO mission, but perhaps more significantly, the research investigations resulting from these proposals are critical to the accomplishment of the overall goals and objectives of the Army.

As you know, ARO scientists have been instrumental in structuring the DARCOM 6.1 program to better reflect our research requirements. With the cooperation of TRADOC and, as a consequence of their Mission Area Analyses, we were able to incorporate their needs into the long-term research that must be undertaken to provide the capabilities identified in the TRADOC Air Land Battle 2000 concept of operations.

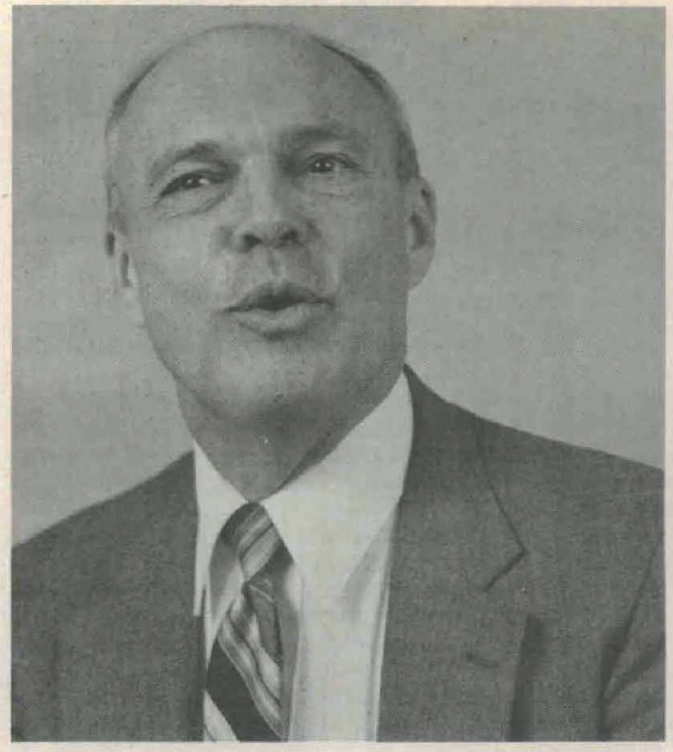
In the planning of the ARO program, these research requirements are being reflected and identified to the scientific community with whom we do business. These requirements are reflected in the unsolicited proposals we receive and provide us the wherewithal to focus the fundamental research program in those areas having the greatest potential of improving our military posture. In summary, unsolicited proposals allow us to cull out the best, most original ideas by the best researchers and integrate their efforts to the Army's advantage.

"We simply cannot maintain a laissez-faire attitude and expect the science which we require to magically appear at our doorstep when we need it."

Q. What research areas do you believe offer the greatest potential for technological breakthroughs during the next decade?

A. I'm undoubtedly the wrong person to ask such a question. I recall very vividly when I was back at the Benet Weapons Laboratory, the announcement of the invention of the LASER was made. My observation at the time was that it was only a laboratory toy and that it would never be useful for military purposes!! Nevertheless, and if you'll bear in mind my previous forecasting experience, I do believe one of the most significant breakthroughs will occur in our capabilities for data processing.

From an Army viewpoint, one of our most difficult problems is that we have too much data and not enough information. However, in the area of computer science and technology, many opportunities are being developed through advances in software and hardware. In fact, much of the Army-supported research in ultra-small electronics



that is part of the Joint Services Electronics Program will contribute to these advances. Related to this, ARO has been given a special responsibility for developing the DARCOM Artificial Intelligence Research Program. I believe it will be from this particular area of computer science that we will ultimately see the most revolutionary changes occur in the way we treat, assess and process data. The so-called "expert systems" we have today, such as powerful aids in medical diagnostics, are but forerunners to the expanded capabilities which will be derived from artificial intelligence research.

Q. Do you believe the Army is getting its "money's worth" in research contracts with academia, etc? Could you explain how?

A. The answer is an unequivocal "Yes!" There have been a number of hindsight-type of studies which show how basic research in academia has paid off for the Army. Just one achievement, the discovery of Fast Fourier Transforms, has paid back much more than the total funding resources expended by ARO since its founding, and it still continues to provide pay-off. Another example is the invention of the LASER which was also supported by this office. Research is generally recognized as the information-gathering phase of the R&D process and therefore is an extremely efficient investment from a return-on-investment perspective.

Where we are not so successful or take too long in the systems development cycle is often times symptomatic of a lack of information and may well have been avoided with an adequate research base. With respect to our university research contracts, it is worth noting that we are now supporting nearly 50 graduate fellowships for work in the areas of the Army technology thrusts and the Army-supported centers of excellence in rotary-wing technology. We currently have more than 800 active contracts which provide support for the equivalent of nearly 850 undergraduate and graduate students. Certainly, this investment in the training of scientists and engineers has considerable significance and benefit to the national interests.

"There have been a number of hindsight-type studies which show how basic research in academia has paid off for the Army."

Another little known area in which we are getting our money's worth is that of the Youth Science Program which is aimed at encouraging our young people to take up science and engineering careers. This year we have sponsored 43 regional Junior Science and Humanities Symposia culminating at the National JSHS hosted by the U.S. Army Military Academy at West Point, NY. Over 7000 junior and senior high school students have participated in this uniquely Army-sponsored program which had its origins in the Office of Ordnance Research (now ARO) and which will celebrate its silver anniversary this year.

We also provide Army support for over 270 science and engineering fairs across the country involving nearly one million students and culminating in the International Science and Engineering Fair held this year in Albuquerque, NM. We initiated two ongoing programs in the 1980/1981 time frame to provide opportunities and encouragement to the minorities/disadvantaged high school students. These are the Research and Engineering Apprentices and the Uninitiated Introduction to Engineering programs in which several hundred high school students have participated and from which a high percentage have entered college and undertaken a science/engineering curriculum. I believe these programs have had outstanding success and represent an investment in our "people assets" from which the long-term potential and real benefits are incalculable.

Q. Is the Army Research Office involved with product improvement proposals or preplanned product improvement efforts?

A. ARO is involved only in isolated instances where individual ARO scientists have made personal contributions to ongoing programs. The manufacturing research program, which is still in its infancy, may contribute to these efforts in the sense of addressing ways and means to accommodate insertion of new technology devices in military products without major disruption of production lines and facilities.

Q. Does ARO have any involvement with the High Technology Light Division?

A. Not at this point in time. Since the High Technology Light Division has the goal of demonstrating a fly-away capability by FY86, it is not practical to expect research to influence their fielded systems. Any equipment to be provided in that time frame must have the technology available now and no research is required. If the High Technology Test Bed program adopts longer term objectives, then ARO may well become a more active partner in those activities.

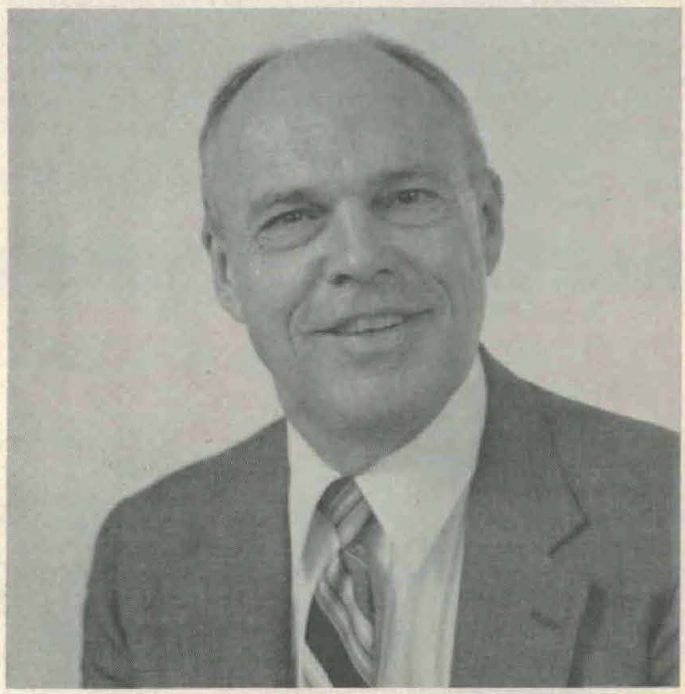
Q. Are there other Service counterparts to ARO? If so, how does ARO interact with them.

A. The ARO is essentially the Army counterpart of the Air Force Office of Scientific Research and the Office of Naval Research. Aside from minor differences in their function, these organizations are entirely parallel and, in fact, are collectively known as the OXRs where "X" stands for Army, Navy and Air Force. The interactions are frequent and extend from the director through the staff level and occur through meetings, workshops and one-on-one visits.

In a number of instances we have jointly sponsored workshops and conferences having common interest. There is a strong interaction in the Joint Services Electronics Program, various committees of the National Materials Advisory Board and through the tri-service panels established by the Joint Directors of Laboratories to address key technological areas.

Q. What recent research areas have proven most fruitful, and can you give examples of systems that have been developed as a result of your efforts?

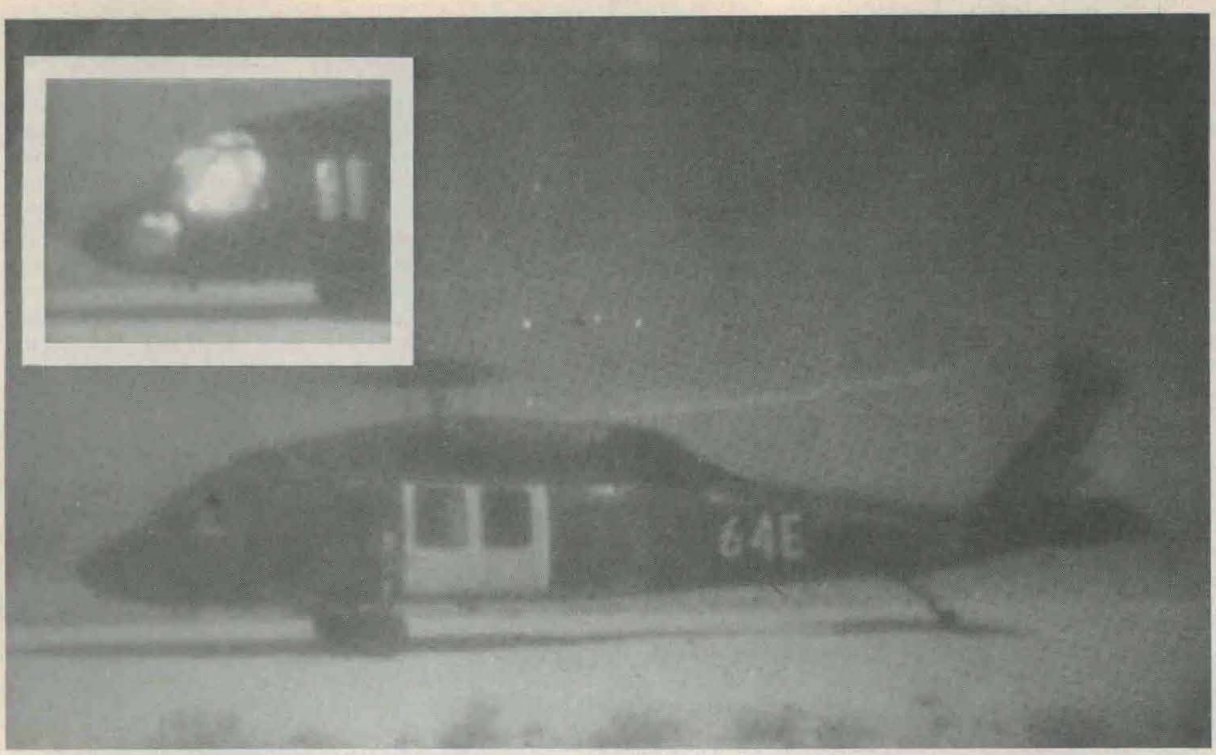
A. I mentioned earlier the LASER invention support, and its use in many systems is well known. Every system that demands performance of signal processing makes use of the Fast Fourier Transform.



ARO supported development of the saturable dye Q-switch which permitted development of the lightweight hand-held AN-GVS-5 range finder because it eliminated the weight and power supply associated with the rotating prism. ARO supported the development of several now widely-used, computer-aided design programs for integrated circuits which the industry itself saw no need to do.

The incorporation of electronic chip technology into military systems would have occurred much later in time had it not been for this advancement. Work on hot deformation of metals has led to better projectile, body-forming processes and ARO-sponsored research led to development of the corrodescope that now makes possible a nondestructive evaluation of the structural integrity of high performance kinetic energy penetrators.

Recently developed aerodynamic stall analysis techniques have been utilized in the helicopter rotor design for the reblading of the UH-1 helicopter. Typically, ARO research accomplishments are incorporated into the general technological infra-structure of systems with little fanfare and little publicity. But, I assure you they are there and they are important to system performance. Quality research is being carried out in the university community and in the DARCOM laboratories. Its continuance is absolutely essential to the fielding of Army equipment that will advantageously employ tomorrow's technology.



Comparison of external signature of UH-60 aircraft using standard red lighting (inset) and modified blue-green lighting as seen through an image intensifier night vision device.

Red Cockpit Lighting Requirement Fades Away

By Dick Franseen

Advantages of red lighting for aircraft cockpit instruments have long been debated and subjected to testing. Red has been used predominantly in military aircraft for over 40 years because it is known medically that the peripheral retina sensitivity of the eye is least affected by red light. This allows a pilot some advantage in resolving objects outside the cockpit — at least on a very dark night.

The Night Hawk unaided eye night mission for helicopters, however, cannot be performed at the levels of darkness that are sufficiently low (starlight and overcast starlight) to justify red lighting on this basis.

Improved resolution of instruments has also been advanced as an advantage of red instrument lighting. Studies are not in universal agreement on this subject but it can be concluded that no significant difference in reading acuity can be attributed to color.

The Air Force adopted a blue-filtered white instrument lighting specification during the 1960's for several reasons including the need to read color maps, occasional instances of "red light blindness," the need to introduce electro-optical systems to take over much of the outside visual detection requirement, and eye fatique related to long term exposure to red lights.

In addition, pilots prefer the Air Force blue-filtered white instrument lighting. The Army, however, operating closer to the ground, preferred to stay with red lighting to preserve dark adaptation.

When the AN/PVS-5 night vision goggles were adopted by the Army for helicopter night flying in the mid 1970's the issue of incompatible cockpit lighting came into focus. FM 1-51, "Rotary Wing Flight", 16 April 1979, describes the use of night vision goggles and the adverse effect of aircraft lighting on goggle performance since the lighting systems were not designed for the use of goggles. Initial suggested efforts to improve this situation were to paint the cockpit interior flat black, improve rheostats to allow greater light dimming range, install a three position switch for day-night-night vision goggle transition, taping of lights to restrict illumination, and other changes contained in training circulars.

Gauges were rotated so that the normal operating positions were at 9 o'clock. This allowed rapid identification of a problem without refocusing the goggle from outside to inside the aircraft. Remember, the closed-in facemask of the AN/PVS-5 forces the aircrew to refocus the objective lens to accurately read an instrument. This function was primarily assigned to the co-pilot for safety.

Map reading is particularly difficult using the goggles because colors cannot be easily distinguished, except for differences in reflectance, and detail is generally too small for rapid resolution.

Development of the AN/AVS-6, aviator's night vision imaging system, ANVIS, was intended to solve most of the major problems associated with use of the AN/PVS-5 for aviation. The open facemask of the ANVIS allows full peripheral vision and direct reading of instruments. Weight and balance are improved to eliminate face and neck fatique on long flights.

The third generation image intensifier tubes in ANVIS allow nap-of-the-earth (NOE) operations under all night illumination conditions except those affected by fog or severe weather. By contrast, the AN/PVS-5 NOE provides uncomfortable performance at no-moon starlight (groundspeed must be sharply reduced) and NOE performance in overcast starlight is unacceptably dangerous.

In 1981 the aviation community became acutely aware of the fact that red lighting in the cockpit would severely reduce the effectiveness of the ANVIS — glare and reflections created within the cockpit make outside viewing virtually impossible. There was great concern that ANVIS would go into production before appropriate aircraft lighting changes could be made, thereby preventing the fielding of the urgently desired ANVIS.

In addition, it was during this period that the problem of red lighting external signature that can be easily detected by threat night detection devices was revisited. The armored vehicle community was already taking steps to reduce their red light signature by changing the red dome light filter to a blue filter.

The Aviation Development Test Activity (AVNDTA), Fort Rucker, AL, modified the secondary lighting system of one UH-1H, beginning in the fall of 1980, and tested for both NVG and ANVIS compatibility. This modification was entitled Improved Lighting System for Army Aircraft (ILSAA) corresponding to the name of the AVRADCOM working group which had been in existance for over four years for the purpose of developing goggle compatible crew station lighting.

Blue filters (CS-4-96)(Corning Glass Works) were utilized in map, flood and post lights, and on the RPM warning, master caution and fire detector lights. Use of the 5mm thickness CS-4-96 filter provided ANVIS compatibility because very little incandescent bulb radiation of wavelengths longer than 600 nonometers can pass this filter. The ANVIS has almost all of its sensitivity in the orange, red and near-infrared 600 to 900 nanometer band.

Compatibility with the AN/PVS-5 NVG resulted from the very large reduction in radiated tungsten bulb energy through the CS-4-96 as compared to red filters which pass all of the infrared radiation. This blue filter also provided the solution to the strong red lighting signature to image intensifier devices which was documented in the AVNDTA August 1981 test report.

During the same summer 1980 to spring 1981 period, ERADCOM's Night Vision and Electro-Optics Laboratory (NV&EOL) had successfully modified a UH-1H at Davison Airfield, Fort Belvoir. This effort was part of the engineering development program for ANVIS in preparation for the summer-fall 1981 DT II and OT II.

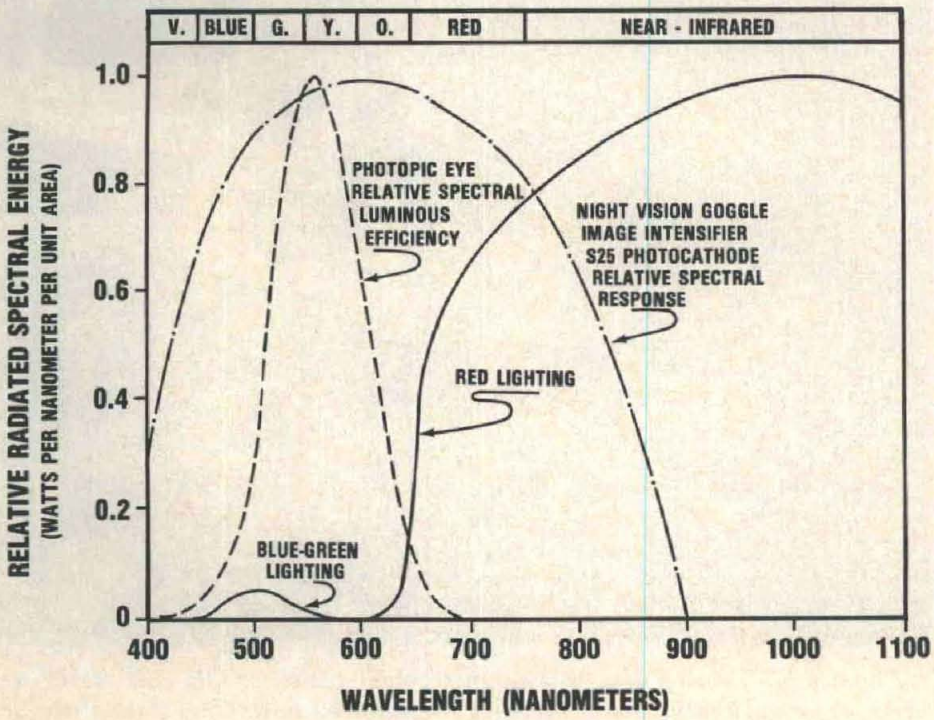
Several types of filters were tested leading to the choice of the BG-18 (Schott Optical Glass Inc.) because it offered a sharp transmission cutoff at 600 nanometers with a more convenient 3 millimeters thickness, and it was thought to be more environmentally stable than the CS-4-96.

NV&EOL then carried out a rapid cockpit lighting modification activity to support ANVIS DT II and OT II at Forts Rucker, Stuart and Campbell. The list of cockpit modifications by NV&EOL is impressive: six UH-60A's, ten UH-1H's, six UH-1M's, sixteen CH-47C's, three OH-6's, six OH-58A's, one OH-58C, and six AH-1S's (MOD and ECAS). In addition filter glass kits were prepared for Marine CH-46's at Yuma and for Air Force C-130 aircraft.

A tremendous momentum had now been generated for cockpit lighting modifications for goggle compatibility. AVRADCOM and TSARCOM initiated product improvement programs for the UH-1, CH-47, OH-58 and AH-1. An 18 Sept 81 message from Headquarters DA stated the urgency for night vision goggle compatible cockpits and the need to accelerate the execution schedule for these four product improvements.

The term "quick fix lighting" was changed to "Night Fix" for the final approval briefing to BG Parker, director of Army Aviation, ODCSOPS, on 9 October 1981. Night Fix addressed 2609 aircraft stationed in Europe, Korea, the RDF, the 9th Infantry Division, and Fort Rucker: 290 AH-15's, 800 OH-58A's, 1277 UH-1H's, 76 UH-1V's, and 166 CH-47C's at a estimated total program cost under $5M.

Night Fix was approved as Phase I



The blue-green lighting and red lighting energy spectrums compared on the left have the same *apparent brightness to the eye. That is, they react equally with the spectral luminous efficiency of the photopic eye. However, to a night vision goggle with an S25 photocathode (2nd generation), as shown above, the red lighting will appear* 30 times *brighter than the blue-green lighting. Blue-green lighting can provide sufficient cockpit instrument illumination for good direct eye reading without overpowering outside viewing with goggles. Red lighting, due to its strong near-infrared interaction with the goggle S25 photocathode, requires extreme instrument dimming to allow outside viewing. Direct eye reading of instruments is then impossible and the goggles must be refocused inside the cockpit.*

toward the goal of total night vision goggle compatibility for all Army aircraft. The lighting was described as "blue-green" and the term has stuck to the present time. As far as red lighting was concerned, it was simply the nuissance that had caused the night vision goggle compatibility problem, and everyone wanted to get rid of it as soon as possible. Well, almost everyone.

The Night Fix, Phase I, program required initial design and testing of lighting modification kits at the Corpus Christi Army Depot. The first problem encounted was the finding that BG-18 filter glass is a lead phosphate base glass that hydrolyzes in a high humidity atmosphere and decomposes. This was the problem found earlier with the CS-4-96 filter glass.

NV&EOL became the focus of attention in the winter of 1981-82 to somehow find a quick solution to the problem of what filter glass to use for Night Fix. Every possible solution was considered. Fortunately, TACOM had just completed environmental qualification of Schott's BG-7 filter glass for replacement in tank dome lights to reduce external signature.

BG-7 is a zinc based crown glass that proved to be environmentally stable. However, NV&EOL tests indicated that BG-7 photopic (eye response) transmission was too low for the smaller bulbs used in aircraft cockpits. Schott provided several sample lots of BG-7 chemical variations with higher photopic transmission. To aviod confusion, the TACOM filter glass was called BG-7A and the NV&EOL glass was called BG-7B.

First the photopic transmission was raised and then the infrared transmission was lowered. Finally the optimum formula for BG-7B was derived and NV&EOL provided a procurement specification to TSARCOM. The Night Fix program was then able to accelerate back to its scheduled completion date goal.

However, Night Fix addressed only four helicopter types. There remained the CH-47D, OH-58C, UH-60, CH-54, AH-1S(FM), and the AH-64. How will cockpit lighting modifications be provided in these cockpits? One exception to this problem is the OH-58D advanced helicopter improvement program (AHIP) which began engineering development in September 1981.

Night vision goggle compatibility was written into the AHIP cockpit lighting requirement from the start. The entirely new AHIP cockpit design allowed the freedom necessary to attack this problem head on with all the resources available in the avionics industry. Green electroluminescent panels and bezels were utilized for most instruments and switches.

The largest light sources in the AHIP cockpit are the two eight-inch multifunction cathode ray tube displays which utilize filtered P43 phosphor screens. The P43 phosphor, with a narrow radiation spike around 550 nanometers, is almost a perfect match for the peak eye photopic sensitivity at 555 nanometers.

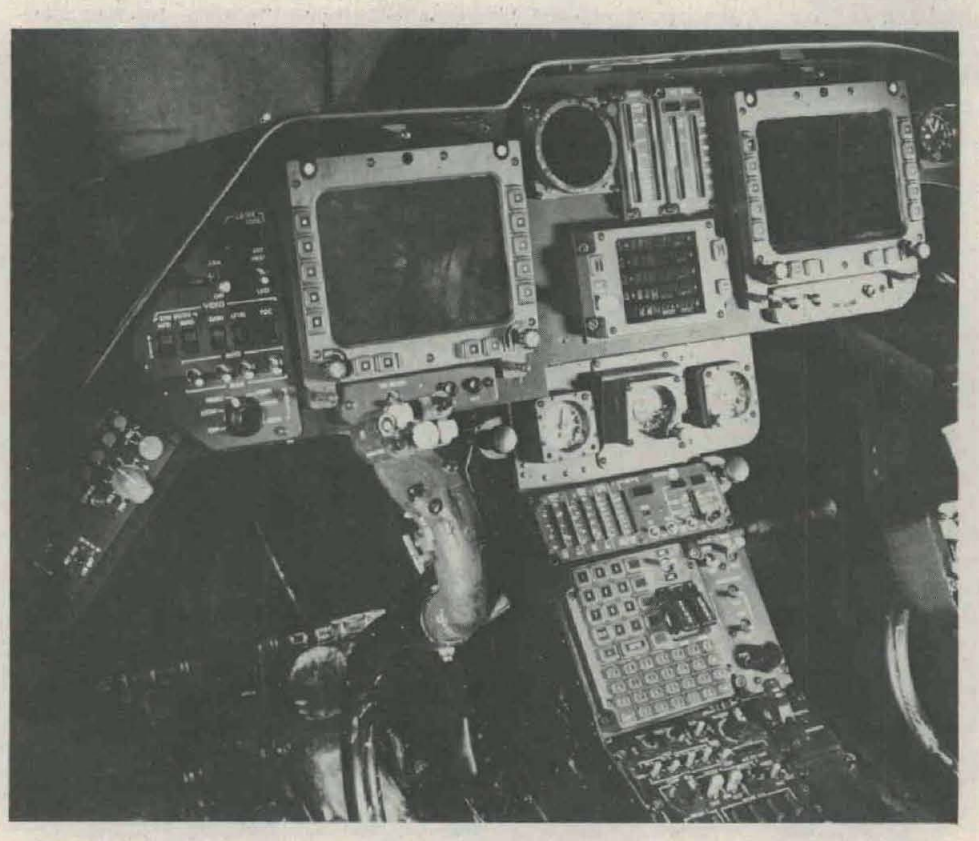
The most difficult design parameter for these displays is maintenance of all graytones in the FLIR (forward looking infrared) image when maximum brightness is reduced to a level suitable for overcast starlight pilotage with ANVIS goggles. The same display must also be readable in full sunlight! To reduce reflections from instruments on the front and side windscreens, the AHIP instrument glareshield can slide outward to provide greater instrument coverage at night.

Micro-louver plastic film in bezels guides light only to the face of instruments to minimize glare in the cockpit. Of course, all interior surfaces are painted flat black for low reflection. Rheostats provide balanced dimming control for all panel and instrument lights. The only red lights in this cockpit are located in the map lights as optional filters. The AHIP cockpit represents the state-of-the-art in lighting design for the Army.

The original question as to the mission need for red lighting has been only recently answered by the Office of the Surgeon General in spite of several earlier attempts by others.

In a Human Engineering Laboratory (HEL) report dated January 1976, entitled "A Comparision of Red and White Cockpit Lighting Under Quasi-Operational Conditions," the following is quoted from the abstract: "The overall results indicate that when the ambient light level is sufficiently high to allow unaided nap-of-the-earth (NOE) flight, the color of the cockpit lighting is not a significant factor in external visual acuity. There is no significant difference between legibility levels for the two lighting conditions nor was there a difference on the peripheral visual performance."

The lighting referred to in this report was red and white integrally wedge-lighted instruments. The assumption is that for a Night Hawk mission total darkness cannot be utilized, therfore complete dark adaption



Engineering development cockpit instrument panel for OH-58D AHIP unveiled at formal lighting mock-up review at Bell Helicopter. This state-of-the-art avionics system utilizes blue-green lighting exclusively.

is unnecessary. Nevertheless, this report could not be accepted as a final official answer on red lighting in spite of the fact that almost every test pilot experienced with red and green lighting would agree with these findings. With cockpit modification actions pressing for the CH-47D and UH-60, an official definitive answer on red lighting was urgently needed.

In mid 1982, AVNDTA performed a static (non-flight) comparison test of blue-green versus red cockpit lighting using flood and post lighting. For their derived optimal instrument brightness level of 0.05 footlamberts, red did not demonstrate an advantage over blue-green for dark adaptation, nor was there a significant difference in readability of instruments. Additionally, there was no difference in external acuity exept for external ambient illumination less than starlight (below 0.00025 footcandles).

When instrument brightness levels were less than optimal, resolution of instruments was found to be generally slow and inaccurate, but red lighting was found to be "not as bad" as blue-green lighting. These findings are contained in the AVNDTA final report dated October 1982. The report included a TECOM message recommending continued use of red lighting in a dual lighting system, more testing replications, and external signature tests.

Dual lighting, as it exists after a Night Fix kit is installed, has primary system red internal lighting in instruments and panels, and blue-green flood and post lighting from the secondary lighting system. The primary lighting system is inherently superior to the secondary system in terms of efficiency, i.e., total radiated lumens necessary to provide legibility of instrument dials and labels.

If the primary lighting system is blue-green and the secondary lighting system is red, then any possible advantage of using this secondary red lighting instead of the more efficient blue-green primary system would be lost.

It is technically unrealistic to attempt to provide a true dual color primary lighting system in any new aircraft or modification of existing aircraft. Also, it is impractical not to convert the primary lighting system to a goggle compatitible system in existing aircraft, if sufficient funding is made available, because goggles are primarily utilized for night operations, not the unaided eye.

The question then is — what are the advantages to the unaided eye of secondary red lighting as compared to primary blue-green lighting? This question may now be overtaken by events and never answered. One opinion is that red lighting offers a far bigger advantage to threat anti-air than it could ever offer to the friendly aircrewman.

In late 1982, DARCOM was still stymied by the lack of a definite HQDA decision on red lighting that would allow formulation of a Phase II modification program for the UH-60, CH-47D, AH-1S (FM) and AH-64. In order to make this decision, HQDA required a position from the Office of the Surgeon General (OSG). Therefore, at the end of 1982, the Aeromedical Research Laboratory (AMRL) at Fort Rucker performed in-flight testing of red versus blue-green cockpit lighting to determine if optional red lighting is necessary to preserve dark adaption for unaided nighttime flying.

AMRL found that blue-green cockpit lighting (secondary lighting system) degrades visual sensitivity slightly (compared to red), but that the difference is sufficiently small that "there does not appear to be a valid physiological requirement for dual cockpit lighting systems in future Army aircraft." This quote is from the AMRL letter of 7 Jan 83 to the OSG. Their primary caveat is that more testing would be required if lighting intensities greater than 0.1 footlambert are utilized (which is unlikely for a Night Hawk mission). The OSG approved the AMRL report.

The long awaited decision from the Director of Army Aviation, ODCSOPS, came in a message on 14 Feb 83. This message recognized the tactical operational considerations (signature of red lighting) and the findings in the approved AMRL report. It stated that "within current funding constraints, DARCOM should proceed with approved blue-green cockpit lighting modifications.

"In addition, the findings of this study should be considered when designing future cockpit lighting and avionics equipment." The light has finally turned green for aviation cockpit lighting. The requirement for red lighting is lifted.

The next step will be development of new specifications and revisions to existing specifications and standards for cockpit lighting to address night vision goggles compatibility. Since all services are now fully involved in the use of the NVG and ANVIS for pilotage, the Joint Logistics Commanders, on 30 Mar 83, approved formation of a Joint DARCOM/NMC/AFLC/AFSC Commanders' Ad Hoc Group for Aviation Lighting to accomplish this task.

Lighting experts from these commands will carefully design these specifications so as to address the requirement for goggle compatibility without dictating the technical approach. Therefore, filtered incandescent, electro luminescent, CRT displays and other lighting devices will all be encompassed. The choice of lighting will be determined by the individual situation. Conversion cost is the major consideration for existing aircraft modifications.

MR. RICHARD E. FRANSEEN is a weapons system manager in the Aviation Systems Division, Development, Engineering and Acquisition Directorate, HQ DARCOM. He is primarily responsible for night vision and electro-optical systems and visionics for airborne applications. He holds a BS degree in mechanical engineering from Rice University.

WRAIR Probes Novel Treatments for Battlefield Shock

Battlefield injuries frequently result in a collapse of the circulatory system due to a sudden loss of blood. Although current treatment of this "hemorrahagic shock" state involves the rapid administration of intravenous fluids, such therapy is extremely difficult in the battlefield.

Not only does intravenous fluid replacement require a skilled medical technician, but problems of storage and availability of these fluids may result in treatment delays that could be fatal. In addition, other shock states resulting from such causes as wound infections, burns or spinal cord injury do not respond well to intravenous fluids and existing drugs.

Discovery of a drug which would control shock on the battlefield with minimal demands for technical skills and without the problems of storage and availability would be of enormous medical value. Dr. John Holaday and colleagues at the Division of Neuropsychiatry, Walter Reed Army Institute of Research (WRAIR), have shown that opiate blockers ("antagonists") may possess these qualities.

Although opiate drugs such as opium and morphine have been used for centuries, it has been discovered within the last eight years that the body contains its own opiates. This "endogenous opiate system", which includes the popularly known "endorphins", consists of chemical messengers and receptors within the body and is responsible for a number of physiological and behavioral effects including euphoria, pain relief, and cardiovascular effects such as the reduction of blood pressure.

Investigators at WRAIR hypothesized that endogenous opiates, activated when a patient goes into shock, would act like high doses of morphine to reduce blood pressure. In essence, the body may release so much of its own opiates that a "self-overdose" occurs.

The opiate antagonist naloxone (which opposes the effects of endogenous opiates) reversed the circulatory effects and improved survival in a variety of experimental models of shock. This finding not only confirmed their hypothesis, but provided the link between the body's mechanisms for pain and shock.

The researchers' initial demonstrations that circulatory shock resulting from bacterial infection responded to the therapeutic effects of naloxone prompted subsequent research to establish that endogenous opiate systems were involved in other forms of circulatory shock as well. In 1979, they reported that rats subjected to an acute hemorrhage or spinal cord severance experienced shock which was also rapidly reversed by naloxone.

More recently, the researchers have studied a model of spinal cord injury and once again found a beneficial effect of naloxone. Naloxone not only improved blood pressure and spinal cord blood supply, but also significantly reduced the paralysis resulting from severe spinal trauma.

Endogenous opiates alleviate pain and cause shock; therefore, it was of concern that blockade of the endogenous opiates with naloxone would result in the intensification of pain following severe injury, even while improving recovery. Not only would the endogenous opiate-derived pain-relief be reversed, but subsequent attempts to treat pain with opiates such as morphine would be opposed by the prior injection of naloxone.

This team of scientists at WRAIR has taken two different approaches to overcome the potential pain-enhancing effects of naloxone. Their research into alternative treatments was first rewarded with the finding that thyrotropin-releasing hormone (TRH), a substance used by the brain to control thyroid gland function, reversed shock without intensifying pain.

It was further shown that TRH was even more effective than the opiate antagonist naloxone in preventing paralysis in experimental spinal cord injury. Although TRH has many properties which oppose opiate actions, this "natural" drug appears to exert its therapeutic effects through systems which are distinct from those acted upon by naloxone.

Further research into the molecular mechanisms of opiate action has yielded a new series of drugs that may provide a more basic answer to the complex opiate effect. These new drugs are referred to as "selective" antagonists.

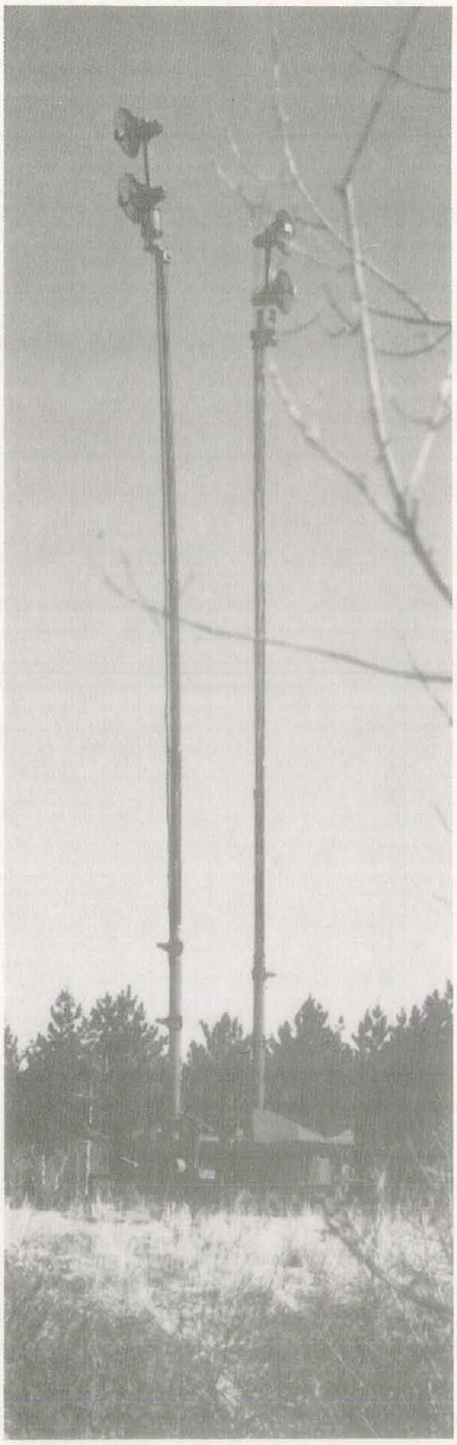
Although selective antagonists resemble opiates in structure, they have a built-in ability to choose between the different molecular opiate mechanisms which bring pain-relief and blood-pressure depression. This ability enables them to act at only one site, i.e. to reduce the detrimental effects of circulatory shock, while allowing for the relief of pain by endogenous opiates and/or morphine.

Collective research efforts from the WRAIR have provided fundamental information on the cause of circulatory shock as well as novel therapeutic approaches to the management of battlefield casualties. Specifically, naloxone (Narcan), used during the past decade to reverse the effects of overdose by opiate abusers, also stablizes shock and prevents paralysis following spinal trauma.

Indeed, preliminary clinical trials have yielded encouraging evidence that naloxone has therapeutic benefit in humans suffering from various forms of circulatory shock. Thorough studies are currently underway to verify the potential clinical utility of naloxone and TRH as well.

Selective antagonists are still highly experimental, but they have already proven to be sensititive tools for exploring the molecular mechanism of opiate action and in the future may even provide the key to development of non-addictive pain-killers. Investigators at WRAIR anticipate that the use of these novel treatments for the control of shock will improve the management of military casualties while ensuring minimal discomfort to the wounded soldier.

The preceding article was authored by Dr. John W. Holaday and Lauren E. Black, Neuropharmacology Branch, Department of Medical Neurosciences, Division of Neurosciences, Walter Reed Army Institute of Research, Washington, DC.



PATRIOT Antenna Mast Group during integration testing.

The PATRIOT Antenna Mast Group

By CPT James E. Moffett

A new era in Army air defense history will begin with deployment of the first PATRIOT Air Defense System Units. Having its beginning in the 1960's, Phased Array Tracking to Intercept of Target (PATRIOT), utilizes a phased-array radar to acquire, track and ultimately engage hostile air threats.

PATRIOT system area coverage is accomplished in an "interlocking fashion" of the fire unit target engagement areas. The nerve center for each fire unit is the Engagement Control Station (ECS). Each ECS is under the operational control of the Information Coordination Central at battalion headquarters. In order for all fire units of the battalion to remain abreast of the "total air defense picture", they must be interconnected via a data voice communications link.

The PATRIOT Antenna Mast Group (AMG) interconnects and extends ultra high frequency voice and data communications to distant fire units and adjacent PATRIOT battalions. Composed of two quick-erecting mast systems, parabolic reflectors, and highpower amplifiers, an AMG is collocated with each PATRIOT manned shelter.

Demanding Requirements

Requirements most demanding for any mobile antenna system are emplacement time and height. The problem most often encountered by tactical units utilizing multi-channel communications has been emplacement and erection of the antenna system. Heretofore, the erection time of at least 30 minutes and, in some cases over an hour, have been commonplace for standard inventory antenna.

An additional shortcoming has been height. Standard Army tactical antenna systems have been limited to heights of 35-50 feet, requiring cumbersome transport and installation methods. In many cases, the limited height did not clear terrain obstacles, necessitating additional relays strategically placed to avoid the obstacles.

Problems of emplacement time and height have been lessened with development of the PATRIOT Antenna Mast Group. The AMG is not the panacea for the Army's communication problems, but it holds potential to significantly improve, if not eliminate, emplacement time and height concerns.

The AMG does not utilize a guying system. This is perhaps the greatest contributor to the reduction in emplacement time. During the emplacement of guyed antennae, operators are required to man each guy for mast stability. This is not the case for the AMG.

Another plus for the PATRIOT antenna is its maximum height of 91 feet. This is a remarkable improvement over standard Army antennae. Although this additional height capability exists, it probably will not be needed at all times. In fact, the antennae should only be elevated to the minimum height that the operational scenario requires.

The AMG transports the antennae and amplifiers for UHF communications equipment in a collocated shelter. The PATRIOT system utilizes standard Army Tactical Communications System (ATACS) equipment. This ensures communiations compatibility and interoperabiity with adjacent PATRIOT battalions and the Air Defense Group AN/TSQ-73 control facility.

In particular, this equipment consists of an AN/GRC-103 radio, TD-1065 data buffer, TD-660 multiplexer, security equipment, and a newly-developed tunable filter to suppress out-of-band noise produced by the "103" radio.

Also located in each shelter is an antenna mast monitor panel and antenna contol units. The monitor panel monitors operation of each UHF amplifier and deflections of each mast. Indications of amplifier malfunctions are shown via a summary fault light from built-in test equipment located on the AMG. This panel is essential in providing the AMG operational interface with the collocated manned shelter. The antenna control unit allows remote operation of each antenna in azimuth only, antenna elevation is adjusted manually.

To reduce amplifier cable losses, the amplifiers are mounted atop each mast. Mounting the amplifiers in this way permits the use of flexible radio frequency cable that can be stowed at the base of the mast.

The antennae, amplifiers, tunable filters, antenna control unit, and antenna mast monitor panel were developed by the Raytheon Co., the PATRIOT prime contractor.

The AMG Backbone

The major component of the AMG is a GTE/Sylvania Corp. quick-erecting Mast Group, Hydraulic-Pneumatic OA-9054(V)4/G. The Mast Group utilizes hydraulics to raise both masts to vertical and pneumatics to extend the masts.

Mast Group components were adapted for PATRIOT communications equipment and mounted on the M-811 5-ton vehicle. They were originally developed by the U.S. Army Signals Warfare Laboratory in support of the quick erecting antenna mast (QEAM) requirement for SIGINT/EW tactical systems.

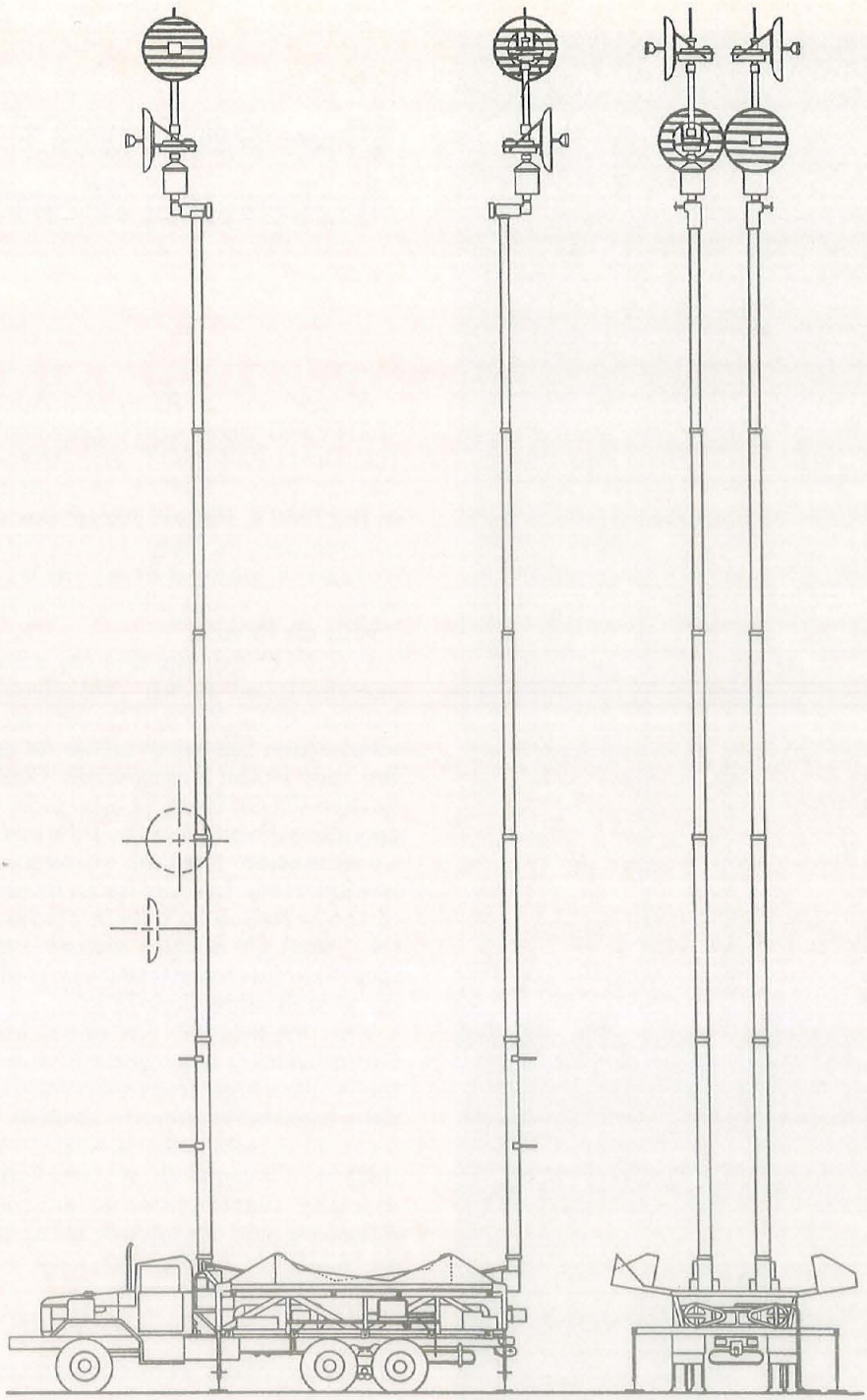
The Mast Group has two 72-foot telescoping masts. Extruded from tempered aluminum alloy, the mast extends by pneumatic pressure using an air compartment formed with leather seals at the base of each mast section. Each seal is reinforced by a copper-berrilium seal expander. During over four years of operation, the seals have performed well. The seals were also tested at the Eglin AFB low temperature chamber while the mast was covered with ¾ inches of ice. No adverse effects were noted.

Mast group reliability is enhanced through the use of multiple power sources. The Mast Group functions with 50-400HZ power or 24-28 volts DC. DC power from the vehicle may be used during the initial phases of system emplacement. When AC power becomes available, DC power may be discontinued or allowed to continue as a supplement.

During road march, the antennae are protected by shrouds, which have a ground clearance of 142 inches elevated and approximately 80 inches when lowered. The shrouds also serve as maintenance platforms for the amplifiers and antennae.

The AMG is designed for a crew of three radio relay operators (31M20) to emplace and make operational in less than 14 minutes. This is well within the prescribed time for activation of communications between PATRIOT fire units.

Road march of the AMG is slightly



A side and rear view of the PATRIOT Antenna Mast Group.

longer due to the time required to lace the rf cables into the storage bins and manually raise the protective shrouds.

After the M811 vehicle has been positioned, the 11 intervehicular cables are connected between the AMG and ECS/ICC/CRG. The crew then unclamps, rotates and deploys the antenna masts. The twin-mast system may be deployed with both masts or only one mast, depending upon the site communication plan. The AMG, like all other PATRIOT equipment, can be emplaced on terrain slopes of 10 degrees or less.

Safety Considerations

A series of automatic switches and interlocks have been designed into the PATRIOT Antenna Mast Group.

- A "O" Degree Limit Switch prevents the mast from being extended when in the horizontal or stowed position.
- A "15" Degree Limit Switch stops the mast automatically when it is being lowered within 15 dgrees of horizontal, for a check that personnel or other obstructions are not underneath the mast.
- A "100" Degree Limit Switch prevents the mast from being raised beyond the 100 degree vertical position. The mast attains this position when the vehicle is emplaced on a 10 degree downslope.
- A Hydraulic Cylinder Interlock Switch allows mast extension only when the hydraulic cylinder lock bar is in place. The lock bar also prevents the mast from falling if the hydraulics fall.
- A Mast Pressure Switch prevents the mast from being lowered to a horizontal position when it is pressurized.
- A Vertical Interlock Switch prevents the mast from being extended until it is within five degrees of vertical. Premature mast extension could damage the mast seals and tubular sections.

Consideration is now being given additional interlocks affecting rf radiation and antenna rotation. Another system improvement will be the production cut-in with improved masts, thus permitting increased performance.

The M-811 vehicle is also scheduled for replacement with an improved version, the M-942, in late FY 83.

Following extensive subsystem testing at GTE/Sylvania, Raytheon, and the National Bureau of Standards, the AMG is ready to support PATRIOT follow-on evaluation at White Sands Missile Range, NM, scheduled through mid '83. As testing begins for the AMG, data will be collected to determine its responsiveness to environmental conditions and other pertinent parameters of the PATRIOT system.

With AMG transitioning from development to an operational role, its future appears bright. It can be truly stated the PATRIOT AMG is a cost effective antenna system, providing a significant improvement in maximum attainable height, less visual signature and greater commonality with other Army antenna systems.

CPT JAMES E. MOFFETT is the R&D coordinator responsible for PATRIOT prototype Antenna Mast Group development and acquisition. He is assigned to the Hardware Engineering Division, PATRIOT Project Office, Huntsville, AL. He holds a BS degree in science education from Jackson State University and is pursuing an MS degree from Florida Institute of Technology.

The author wishes to thank Mr. Saul Beaumont, Raytheon Co., and Mr. Judd Stiff, GTE/Sylvania, for providing valuable assistance in preparing this article.

New British Army Military Attache Assigned

Brigadier Stephen R.A. Stopford has been assigned as the new Military Attache and Head, British Army Staff, British Embassy, Washington, DC. He replaces Briagdier Alan Wheatcroft, who is returning to the United Kingdom.

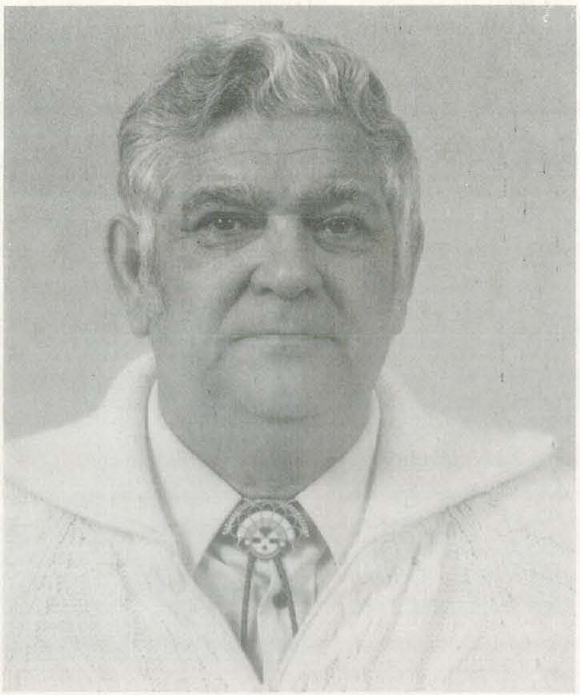
Stopford was commissioned into the Royal Scots Greys in 1955. He served as a Centurion Tank Troop Leader in the UK and Germany for several years before attending a signals course after which he was appointed Regimental Signals Officer. He attended the Tank Technology Course at Bovington and was then sent to the Fighting Vehicles Research and Development Establishment (FVRDE) in 1962 where he worked primarily on Chieftain which was undergoing acceptance and user trails. He then attended the 19th Technical Staff Course at the Royal Military College of Science Shrivenham from 1965 to 1967, specializing in electronics and instrumentation.

He was then assigned to regimental duty for two years as Armoured Squadron Leader with the British Army of the Rhine. After this tour he was sent to the Ministry of Defense in 1968 as a staff officer in Operational Requirements Directorate, mainly responsible for overseeing the entry into service of the Swingfire anti-tank guided missile system. Stopford returned to regimental duty as Second-in-Command in 1970 just before his regiment was amalgamated with the Third Carabiniers to form the Royal Scots Dragoon Guards. He then commanded their Independant Armoured Car Squadron in the UK and Cyprus.

On promotion to Lieutenant Colonel in 1972, Stopford served on the Central Staff of the Ministry of Defence where his main resposibilities were scrutinizing operational requirements for guided weapons and communications systems. During this period he became a graduate member of the Institute of Electronic and Radio Engineers.

He commanded his regiment in Germany from 1975-1977, during which he took his Regiment Battle Group to Canada for training. On relinquishing command he was promoted to Colonel and was appointed Project Manager of the MBT 80 programme and later became Systems Manager when a Major General was put in overall charge.

Stopford moved to the Directorate of Operational Requirements as Colonel GS(OR)1/10 in 1980 where he was responsible for coordination of the work on the Directorate and was also in charge of operational requirements for counter-terrorist equipment. He was promoted to Brigadier in early May 1983.



George J. Makuta

RD&A Associate Editor Retires

GEORGE J. MAKUTA, associate editor of this publication (formerly the *Army R&D Newsmagazine*) almost since its inception, retired recently following more than 22 years of service with the magazine and 30 years of dedicated and uninterrupted Federal Government Service. Widely respected throughout the Army's printing, publications, and research and development communities, Mr. Makuta was repeatedly credited for his unsurpassed acumen in designing and laying out the artistic and mauscript format of the *Army RDA Magazine*. "Unquestionably first rate" and "exceptionally outstanding" were the terms routinely applied to his work. In addition to his layout expertise, Mr. Makuta consistently earned the praise of superiors and coworkers for his writing and editing skills which elevated the magazine to its high position of respect.

Prior to joining the Department of the Army in 1951, "George" — as he was known to his coworkers — was employed for six years as a writer-editor with the Department of the Navy's Bureau of Yards and Docks in Washington, DC. A veteran of WWII, he served honorably in the U.S. Navy's Submarine Service aboard the *USS Billfish* (SS286).

Mr. Makuta graduated from Pennsylvania State University with a bachelor's degree in journalism in 1951 and was employed in private industry prior to joining government service. His professionalism, dedication, and keen artistic sense will be missed by the magazine.

New Battle Management Center Aids Fire Unit Data Transmission

The Army is reportedly considering a new Manual Air Battle Management Operations Center (ABMOC) which will facilitate information transmitted to fire units. Performance tests on the ABMOC have been conducted at the U.S. Army's Human Engineering Laboratory (HEL), Aberdeen Proving Ground, MD.

Performance tests of the newly designed center have advanced the Army's expertise and knowledge on short-range air defense (SHORAD) command and control, according to Dr. Jon Fallesen, an engineering psychologist at HEL. The study focused on how information from sensors (radar) is passed down to weapon systems.

Conducted at HEL by soldiers from Fort Bliss, TX, the performance tests determined the effectiveness of the ABMOC system to track incoming aircraft in a simulated Western European combat scenario. Testing was accomplished inside an expandable van, which measures 204-by-164 inches wide and stands 74-inches high.

Inside the van, a crew composed of four plotters recorded radar information, and a radio telephone operator and an assistant retransmitted the information over a division air defense early warning net.

A grid system marked on an upright plexiglass plotting board is a main feature of the ABMOC system. Different colors are used on the grid boards to indicate the status of approaching aircraft. White indicates that the aircraft is friendly; yellow indicates that aircraft's status is unknown; and red indicates that it is a hostile aircraft.

After the information is relayed to the plotters, the radio telephone operator relays it to the fire units. Because fire units are familiar with their own map and grid locations, using the grid system gives them a better idea of the aircraft's approaching azimuth. It also alerts the units to prepare to engage aircraft within their area.

"The primary benefit of the grid system is that it provides a shorthand notation system for locating the position of aircraft targets. Fire units can quickly sort out which aircraft they should be concerned with and which to disregard," Fallesen explained.

Before the standardized SHORAD grid system was developed, commanders deployed teams to the nearest high-to-medium altitude air defense unit. The units were a good source of early warning because they obtained quick and reliable information through assorted radar and automatic data links.

Once deployed, the team leader viewed a radar scope and radioed information to the SHORAD tactical operations center. The battalion, upon receipt of the information, transmitted the alert information to its fire units.

However, the system had a major drawback. New crewmembers not familiar with their new organization's system often became confused. The next step was standardization of the wide variety of early warning systems.

The manual SHORAD control system (MSCS) with its four phases of implementation was developed. The four phases include basic MSCS; improved MSCS; enhanced MSCS; and, the ultimate objective, SHORAD command and control (SHORAD C^2) system.

Although basic MSCS greatly enhanced SHORAD's early warning capability, communications equipment and personnel shortages reduced its efficiency. In spite of new AM radios being added at the division, battalion, battery, and platoon levels under improved MSCS, the system has certain inefficiencies. Under both basic and improved MSCS, early warning is relayed from the high-to-medium unit source through the SHORAD tactical operations center and the forward area alerting radar to the fire units.

However, enhanced MSCS will make improvements in early warning procedures by adding personnel and equipment, according to Fallesen. He said that these improvements will allow the SHORAD battalion to conduct manual air battle management. The system will also serve as a model for the automated C^2 system of the future.

"Under enhanced MSCS, all early warning information will be centralized at the air battle management operations center (ABMOC). Personnel at ABMOC will relay early warning information to retransmission elements, where it will be automatically relayed to the fire units. It will also transmit air space management information to the division air management element and the Army FCC," Fallesen said.

Portable Helicopter Shelter Provides Versatility

The military has always had a lot of interest in tents, and that interest is still as strong as ever. But while the military is concerned about providing tents for their soldiers, they are also concerned about designing shelters for other purposes.

One such shelter is in the design phase and is just about ready for final testing at the U.S. Army Natick Research and Development Laboratories (NLABS), Natick, MA. This shelter is actually a unique portable helicopter enclosure for use in forward areas by the rapid deployment Army. It provides covered work space for all phases of helicopter inspection, maintenance, and repair in areas where such activities have not traditionally been feasible while providing soldiers protection from all environmental conditions.

The shelter has been dubbed the Transportable Helicopter Enclosure (THE) as it's especially designed to fulfill the Army's requirement for a large, highly mobile enclosure with unrestricted work space. Utility, attack, and scout helicopters are capable of being serviced within the completely open area of the large quonset-hut shaped shelter since the internal measurements are 84 feet long, 26 feet wide, and 20 feet high.

The versatility of the new enclosure can be attributed, in part, to its aircraft hangar shape and its construction of opaque, lightweight urethane air-pressure modules and skin.

Unlike conventional tents which are supported by poles of some sort, the Army's helicopter shelter is supported by air which is pumped into large arch-shaped beams by a blower. The air beams, or pressure modules, are actually incorporated into the skin so, when inflated, the entire inside of the shelter is free of miscellaneous supporting devices.

During transportation, the sectionalized shelter and all other necessary erection materials are easily packaged in six large cotton duck bags. Upon location and marking of a suitable erection site, the bags are positioned at 12 foot intervals to allow for expedient unpacking. Each section is then taken from its individual cache and laced or "becketed" to its adjoining section making one long deflated unit.

Upon completion of these preliminary steps, the five air modules are connected to the air hose of a 10 Kw generator. Once these connections have been made, the generator and air blower are started by a simple push of a button.

Air then begins to fill the pressure modules as the erection crew assist the inflation process by keeping the air beams and air manifold in proper location to ensure that air flows easily into the modules without restrictions. The entire inflation process takes approximately 20 minutes or less.

Sixteen external guy ropes, eight on each side, are secured to the ground upon inflation of the shelter to provide stability during periods of high winds. The fully inflated and secured Transportable Helicopter Enclosure can then be equipped with internal lights and climate control systems to provide heat or cooling if necessary.

In addition, the enclosure itself is light-tight and can thus be operational under blackout conditions, allowing personnel to work during such times. The successful development of this system will reportedly provide the Army with a new capability to perform critical maintenance functions under world-wide climatic extremes.

The unit is designed to be erected quickly. With eight workers, erection time is just two hours, a relatively short time for putting up a portable aircraft shelter. Tear down time is similarly less than two hours.

Thus far, the Transportable Helicopter Enclosure has been through Developmet Test I at Fort Rucker, AL and Operational Test I at Fort Campbell, KY. Following each test, and Independent Evaluation Report is written by the testing command.

Based upon the testing at Fort Rucker, the U.S. Army Test and Evaluation Command in Aberdeen Proving Ground, MD, has reported in part: "From a development point of view, the THE has a high degree of military potential and is considered ready to enter the full-scale-development phase."

An Independent Evaluation Report is being prepared by the Transportation School at Fort Eustis, VA, and while the report is not complete, preliminary findings indicate the tests at Fort Campbell have been considered successful.

The Transportable Helicopter Enclosure affords helicopter mechanic crews located in remote areas, temporary areas, or poor environments far greater versatility in performing their mission of helicopter maintenance. The enclosure is presently entering the final stages of development and is expected to be fielded by June 1987.

Natick's S&T Prioritization System

By Jerry Whitaker

A common problem confronting many organizations is that of living within constraints of a tight budget. As in private industry, the government too is faced with this dilemma, and the annual allocation of dollars to various programs is characterized by fierce competition as agencies clamor for funds to carry out their functions.

This procedure has been standard practice throughout the government, and the selection of R&D projects at the U.S. Army Natick Research and Development Laboratories (NLABS), Natick, MA, has not been exempt from this process.

Competition for funds at Natick can be quite intense since it is not uncommon for more than 100 projects to be in progress (or under consideration) simultaneously in such areas as food and food service systems, textiles, clothing, body armor, footwear, organic materials, fungicides, containers and field support equipment, and air delivery equipment.

In the past, each proposed project was placed on a priority list for funding with its position determined by a number of factors, the most important being a judgement on how the item would sustain or protect the individual soldier in the field. It was characteristic of this process that the selection decision could potentially be swayed by how well a project officer or laboratory director could present his case.

As part of the Federal Government's Resource Self-Help/Affordability Planning Effort (RESHAPE) program, which was devised as a means of making the most efficient use of internal resources, COL James S. Hayes, Natick commander, appointed Mr. Richard P. Richardson as the special assistant for Planning & Program Evaluation. Richardson's prime responsibility was to develop a program to improve the project selection process and to apply it in developing a recommended science and technology program for fiscal year 1983.

The broad objective of Richardson was to review technology base efforts in order to allocate resources to high priority programs that most improve capabilities of the service member to accomplish his or her mission. Further, Richardson developed a single NLABS project priority listing to facilitate decisions that simultaneously affect several of the labs.

Richardson established a program called the Science and Technology Evaluation and Prioritization System (STEPS) which, although multifaceted, has proved itself extremely simple in design and thoroughly effective in remedying accepted yet outdated practices.

Essentially, there are three principal elements of STEPS: the candidate projects themselves, a nine member Program Review Team, and an evaluation methodology. While these elements can be broken down into smaller components, STEPS is perhaps easier understood when dealing with these three elements.

The process works as follows: Prior to the start of a fiscal year, the individual laboratories identify the R&D projects they believe should be conducted, and each project is summarized on a tightly designed, one-page work unit data sheet. This sheet has been designed to capsulize a project, highlighting all essential information while eliminating all non-essential data.

Once complete, the data sheet is forwarded to the Program Review Team which is comprised of a senior representative from each laboratory plus several "neutral" members. Each member then assesses the merits of the proposed work summarized on each data sheet using a predetermined evaluation methodology.

The seven evaluation criteria used for rating the projects via the data sheets are clearly defined, and each criterion is weighted to reflect its relative importance for prioritization purposes. For example, the evaluation favors most heavily the candidate work that is combat-critical in nature and that has been identified as a specific need.

The individual scoring procedure is a relatively simple task. Each Program Review Team member independently scrutinizes the data sheet for a particular work unit. After a thorough assessment of the sheet, each member decides upon one of the defined scoring points for each of the seven evaluation criteria. The actual total score for each work unit is arrived at by multiplying the criterion weight by the point score selected for that criterion, followed by summing the scores for all criteria.

Following the assessment and rating by the Program Review Team members, their nine scores are averaged together to determine a mean total score. In addition, the standard deviation is computed and the low to high range of the nine scores is noted. Resulting from this procedure is a list of projects in a priority order. A variety of printouts is provided which presents all work units in priority order.

Lastly, is the technical director's review which is an integral step in the program. In addition to reviewing the priorities from the review team evaluation, the effort at this point also includes assessing the work unit dollar and man-year requirements, start and complete dates, possible transitions to other funding categories, and various other detailed considerations.

Funding lines are drawn based on budget guidance, and the composition of each funded tech project and tech area is examined for content and balance. A few new work units may be introduced to fill preceived gaps in the proposed program, and the results of the tech director's review are then provided to the laboratories and to the Joint Technical Staff of the DOD Food Program.

A few final revisions are made, primarily to address issues in the DOD Food R&D Program, and then command level approval concludes the process.

STEPS has so far yielded a number of benefits not realized with the previous methods used for determining project selection. First, it is well understood internally and well accepted, and second, it has served quite beneficially as a decision support system for top management.

Results are presented to management in varied formats to meet a variety of uses. Combining all of NLABS proposed work in appropriate R&D categories into one listing is very helpful in reaching decisions on resource allocations between internal organizations and in assisting the commander to carry out his responsibilities under single program funding and single program element funding.

Although the Science and Technology Evaluation and Prioritization System has been developed specifically for the U.S. Army Natick R&D Laboratories, other high tech organizations within the military and the private sectors could benefit from its application.

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Commercial Trucks Slated as Partial Jeep Replacements

The Army is reportedly buying some 53,000 Cheverolet utility and cargo trucks to replace jeeps.

According to test directors at Aberdeen Proving Ground's Materiel Testing Direcorate (MTD), who are testing some of the new commerical utility cargo vehicles (CUCV), the CUCV will complement the High Mobility Multi-purpose Wheeled Vehicle. The HMMWV is also a replacement for the Army jeep.

The two vehicles are designed to do the same thing and are somewhat similar. However, the CUCV is primarily a rear-support vehicle while the HMMWV is a tactical vehicle. The CUCVs are also less expensive, with a price tag of one-half to one-third that of HMMWV.

The Army currently has multi-purpose utility trucks but the CUCVs have some new features.

Produced by the General Motors Corp., the CUCVs all have a 6.2 liter diesel engine, three-speed automatic transmission, power steering and brakes, and four-wheel drive capability. While it is basically designed for primary and secondary roads, it can be used for off-road terrain with its four-wheel drive capability.

There are five different versions of the CUCV:

• The M1009 utility vehicle which is a commercial version of the Chevy Blazer. It's designed to carry four troops and gear.

• The M1008 cargo vehicle can haul up to eight troops in back. It is a 1¼-ton pickup with a removable cover for either summer or winter seasons. It can also tow a M101 trailer for an additional payload of 1,500 pounds.

• The M1010 ambulance version can haul up to four litter patients or eight seated patients.

• The M1028 shelter carrier carries a removable S250-type shelter which is used for communication systems.

• The M1031 vehicle is a chassis-type vehicle with a capability for being equipped with special bodies that will be developed for the vehicle in the future.

M1010 ambulance version of the commercial utility cargo vehicle.

The M1009 utility vehicle.

Seven of the trucks are currently at the Proving Ground undergoing first article testing, which began in late February.

"All seven of the vehicles have been undergoing performance testing," according to Mr. Paul Babcock, one of the CUCV test directors. "Testing included cold room testing at temperatures of −50 degrees fahrenheit, electromagnetic interference testing, acceleration testing, braking tests, gradeability, cooling, rail impact (transportability), noise tests, and human factors evaluations."

Babcock added that four of the vehicles are also undergoing endurance testing, operating 2,500 miles each over a variety of test courses at APG.

When our testing is completed, the trucks will be returned to GM Corp.," he said. "Any problems we've found with the trucks will be corrected at that time. We will then receive more trucks for comparison testing sometime in August." The 53,000 utility and cargo trucks are expected to be delivered to the Army over the next three years.

Aviation Will Become Separate Army Branch

Secretary of the Army John O. Marsh has approved the establishment of aviation as a separate branch of the Army. Additionally, Marsh announced that Army Chief of Staff GEN E. C. Meyer has approved the centralization of proponency, or responsibility, for aviation matters at the Army's Aviation Center, Fort Rucker AL.

Meyer had earlier approved the two actions in concept as a result of a thorough study of the Army's aviation requirements now and in the future. That study was conducted by the Army's Training and Doctrine Command at Fort Monroe, VA.

In approving the centralization of aviation proponency. Meyer noted that "voids in aviation training and training development, piecemeal development of aviation doctrine and force structure, and the education and training requirements generated by equipment advances" mandated single responsibility for aviation matters.

New battle doctrine for Army aviation has broadened its role as a combat maneuver element. That doctrinal development and personnel management considerations, according to Meyer, made information of a separate aviation branch necessary.

Meyer has directed the Army Staff to give futher study to the Training and Doctrine Command's Aviation Implementation Plan. That study will include personnel management, aviation training, aviation logistic, budget, and branch composition issues.

The Army's Aviation Officer, BG E. D. Parker, commented that "Secretary Marsh's decision will not change the fundamental nature of Army aviation and its mission; nor does it affect the close air support mission of the Air Force." Parker also noted that the combined effect of the two decisions will be "the full integration of Army aviation into the combined arms team."

BG P. H. Mason Retires

BG P.H. Mason, director of Combat Support Systems, ODCSRDA, retired effective 31 May. He will be replaced by BG D.S. Pihl, formerly deputy director of Weapon Systems, ODCSRDA. Pihl will be replaced by BG J.C. Cercy who has been deputy director of that agency's Combat Support Systems Directorate. BG R.H. Lee will succeed Cercy.

New Digital Unit Permits Secure Communication

A tactical situation, whether it is training or the real thing, requires good communication between the various Armed Forces and to allow field radio users access to the telephone system, radio wire integration is used. Consequently, special equipment providing this integration recently completed developmental and operational testing at the U.S. Army Electronic Proving Ground, Fort Huachuca, AZ.

Called the Secure Digital Net Radio Interface Unit (SDNRIU), the equipment permits a secure means of communication. Working with digital circuit switches used by the Army, Air Force and Marines for field telephones, it will replace all radio wire integration systems currently being used. It will also work for any single channel radio.

Another advantage of the new equipment is that it uses a wider selection of phones, and is not restricted to use of any one type. As well as better security, the SDNRIU will also provide a better quality link using digital communication versus analog.

Analog communication is like using a commercial telephone because it picks up a voice transmission through a microphone and turns it into an electrical signal. The pitch and volume of the signal remains the same but is amplified. It is then sent the desired distance through repeators boosting it at various strengths.

Digital communication takes a sample of the signal voltage level and codes it into a specific number, such as 001 or 002. Each repeater then boosts the signal enough for that number instead of boosting too much or not enough. Knowing the strength of the signal can then eliminate the possibility of background noise or a signal too weak.

Lasser Departs as Army Research Director

Departure of Dr. Marvin E. Lasser as Director of Army Research, was announced in May. Dr. Lasser, who had served in that position since 20 May 1974, has become a private consultant.

From 1966 until 1977, Dr. Lasser had served as Chief Scientist of the U.S. Army and from 1970-77 as Executive Director of the Army Scientific Advisory Panel (now the Army Science Board). Prior to joining government service, he was associated with the Philco Corp., and had held teaching and research associate positions at Syracuse University. In addition, he has served as a consultant with the National Aeronautics and Space Administration and the former Army Electronics Command.

COL Kenneth A. Evans is assigned as Acting Director of Army Research until a successor for Dr. Lasser is named.

Hollis Addresses Army Smoke Symposium

More than 250 military, industrial, and academic representatives, including 31 delegates from 7 allied nations, heard Under Secretary of the Army for Operations Research Walter Hollis describe the importance and many challenges facing the Army's smoke program and emphasize the need for obscurants in battlefield environments in his keynote address at the 7th Smoke Symposium.

Sponsored by the Army's Office of the Project Manager for Smoke/Obscurants (PM Smoke), the 3-day meeting, held at the Harry Diamond Laboratories in Adelphi, MD, provided information on smoke, obscurants and electro-optical systems to user-members of the smoke/obscurants community.

More than 45 technical papers were presented, highlighting the performance of electro-optical systems in smoke/obscurants, instrumentation, training and doctrine, testing, and the use of smoke/obscurants in tactical scenarios.

Ten major military commands, eight military-user organizations, personnel from the tri-services, as well as delegates from the United Kingdom, the Federal Republic of Germany, France, Canada, Norway, Israel, and the Netherlands were represented.

Participants from Aberdeen Proving Ground, MD, included personnel from the Army's Chemical Systems Laboratory, the Ballistic Research Laboratory, both research activities of the Army Armament Research and Development Command (ARRADCOM), the Test and Evaluation Command, and the Army Materiel Systems Analysis Activity.

ABCA Today...

TEAL Conference Emphasizes 'Coalition Warfare 2000'

Spring brought TEAL to the United States Military Academy, West Point, NY, but it was not a duck, as one would first guess. TEAL, as many readers may know, is the nickname for the American, British, Canadian and Australian (ABCA) Quadripartite Standardization discussion.

The ABCA Program, which predates NATO, began shortly after World War II, 1947 to be exact. It existed as a loose agreement between the United States, United Kingdom and Canada to standardize equipment and doctrine; then in 1954, a formal standardization concept agreement was executed. In 1964, Australia joined the program to round it out to the ABCA as we know it today. New Zealand became an official observer in 1965.

TEAL began separately in 1955 as a British proposal to permit the Vice Chiefs of Staff of the participating countries to meet and agree on broad national guidelines. The first actual meeting occurred in 1957 when the British hosted a "Tripartite Conference on Tactics-1957". Subsequently, the conferences have become totally integrated with the ABCA Program as the body which provides the policy and guidance to the Program. (A detailed history and program description is contained in the Jan-Feb 1982 issue of *Army RD&A Magazine.*)

The discussions, occurring approximately every 18 months, are attended by the ABCA Vice Chiefs of Staff or their representatives. This year the U.S. had the honor of hosting the conference. The United States Military Academy, because of its excellent facilities and U.S. military history, was chosen as the site for the 1983 discussions.

LTG Robert J. Lunn, deputy commander for Research, Development and Acquisition, HQ, DARCOM, was the overall conference chairman, with DARCOM Commander GEN Donald R. Keith heading the United States delegation. The BCA countries were represented by LTG Sir Thomas Morony, United Kingdom; MG Patrick J. Mitchell, Canada; and MG Lawrence G. O'Donnell, Australia; and their delegations. New Zealand, an associate member, was represented by Brigadier Alfred C. Hamilton.

The conference agenda, structured on the theme "Coalition Warfare 2000", was carefully organized by ABCA day-to-day manager — the Washington Standardization Officers (WSO), to provide maximum opportunity for open discussion leading to the development of guidance for the future direction of the program.

TEAL XXIII, held in Canada, October 1981, determined that the ABCA Program was expending significant effort duplicating NATO, therefore, it was directed that a refocus of the ABCA Program toward the lower end of the conflict spectrum should be investigated.

A TEAL study was initiated to take a comprehensive look at warfare in the middle and at the lower end of the conflict spectrum. The resulting report, entitled "Study on Lower Intensity Conflict", was one of the conference highlights. The study examined in depth the ABCA's role in all types of operations, from peacekeeping through classical conventional (non-nuclear) warfare.

This fine work was accomplished by the Quadripartite Working Group — Combat Developments (QWG/CD), which is one of the 20 key working elements of the ABCA Program. QWG/CD prepared and coordinated an extremely fine study which is destined to be the keystone for future ABCA effort for years to come.

Based on this study and the ABCA associated work, TEAL XXIV recommended that future ABCA effort should be concentrated on the lower end of the conflict spectrum, leaving NATO to address standardization work at the high end of the spectrum.

Significant TEAL agenda time was devoted to allowing each country to present a theme related subject of their choice for discussion. The subjects were selected to facilitate an open exchange of views between the principals on contemporary Army activities. After each presentation, time was alloted for a question and answer period, which proved to be quite spirited.

The U.S. presentation was on the Army/Division 86 Study. In keeping with the theme of the conference and the shifting emphasis by ABCA toward lower intensity conflict, the U.S. presentation described in some detail the first U.S. Army post-Vietnam force modernization effort.

The excellent U.S. briefing, provided by the Combined Arms Center, described the study and presented a clear explanation of the U.S. Army's concept based methodology. Special emphasis was placed on airborne, airmobile and light infantry divisions, which would most likely be involved in lower intensity and ABCA coalition conflict situations. Significant study based changes in force structure and the ways that new equipment capabilities were maximized were discussed.

The Canadian presentation covered their activities in the rapidly changing area of training development. The presentation recounted the importance of training development. Canada's training policy, organization, and evaluation standards were described. The involvement by industry in the training process was also addressed. This very timely and interesting briefing described current Canadian projects, identified research requirements, developmental trends and concluded with a discussion of simulator deficiencies.

The Australian presentation addressed the subject of Operations in Remote Areas. These are the types of environments likely to be encountered by an ABCA coalition force in a low-intensity conflict situation. The briefing provided an in-depth look at the unique logistical problems faced by a military force operating in a harsh, undeveloped area such as the Australian wilderness (Outback). The requirement for self-contained logistics was heavily stressed.

In addition to the Combat Developments QWG presentation, QWG/Aviation, QWG/Surface to Surface Artillery, QWG/Logistics and QWG/Health Services Support also made presentations to TEAL XXIV. Each report discussed current status, future plans and provided the TEAL leadership the opportunity to question and comment directly on QWG activities.

Since the activities of the QWGs are really the heart of ABCA activities, we will continue to keep the reader abreast of current ABCA events and accomplishments by highlighting the work of one the QWG's in future *Army RD&A Magazines* under a new department titled "ABCA Today."

TEAL XXIV was considered by all to have been highly successful, accomplishing all its goals. The high level, relatively unconstrained, discussions succeeded in solidifying positive agreed direction to the ABCA Program for the immediate future.

The next TEAL conference, TEAL XXV, will be held at the Royal Military College, Canberra, Australia in November 1984. The theme of this next session will be Deployment and Maintenance of ABCA Forces for Conventional Warfare in Low and Medium Level Conflict up to the Year 2000.

From The Field...

ARRADCOM

Anti-tank Gator Mine contract. The U.S. Army Armament Research and Development Command, Dover, NJ, recently awarded a $6.5 million contract to Aerojet Ordnance Co., Downey, CA, for production of 3.900 Blu 92/B anti-personnel mines.

The overall Gator Mine System is managed by the Air Force at Eglin Air Force Base, FL, and is a tri-service development program. The Air Force furnishes the dispenser; the Army is responsible for development of the mines, as well as loading, assembling and packaging the CBU 89/B dispensers for the Gator mines, and the Navy provides the Kit Modification Unit that goes inside the CBU 89/B dispenser and arms the mines. (PAO Rel.)

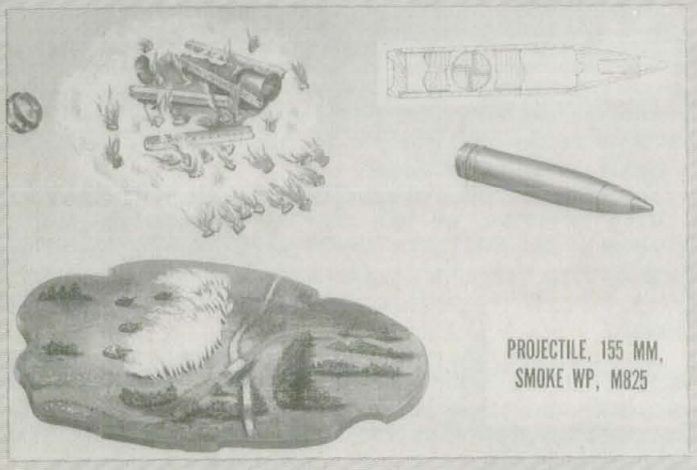
Obscuring smoke munition. A new obscuring smoke munition developed at the Army's Chemical Systems Laboratory (CSL) has reportedly been approved for production and eventual placement into the Army's inventory of munitions.

Designated the M825, the 155mm smoke round produces a dense white smoke cloud three times as effective as any of its predecessors and creates a low-lying smoke screen that lasts between 4 and 10 minutes depending on weather conditions.

The smoke round was developed by a CSL research and development team for the Office of the Project Manager for Smoke/Obscurants, the management activity that funded the development project and has resposibility for the life cycle M825 development.

Mr. Jim McKivrigan, the project engineer, said much more was gained than just meeting the Army's type classification standards. "State-of-the-art obscurant munition technology was advanced during the work on the M825," he said, "and important research data was acquired."

The new smoke round can be fired several miles from target, making it especially useful as a forward visual screening and obscuring agent." (PAO Rel.)



Improved 81mm mortar. The improved 81mm mortar, one of the weapons systems to undergo a joint developmental plan between the United States and another country, is nearing completion of its developmental testing at Aberdeen Proving Ground, MD.

Both countries are testing the Improved Mortar System, which is intended to save scheduling time and duplication of effort, according to the experts at the Materiel Testing Directorate (MTD).

MTD personnel involved with the test have traveled to the United Kingdom to monitor a portion of their test program, explained Mr. George Shandle, chief for the Tank Weapons and Mortar Systems Section. Representatives from the United Kingdom have also come to the U.S.

MTD received the weapon and ammunition in late 1978 for testing and currently the improved 81mm mortar is nearing completion of its Development Test II phase at APG. The testing program involves firing and environmental testing.

"We've tested its capability in the ground-mounted mode," Shandle said. "The whole program is comprised of safety and performance to see if the system meets requirements for safety and performance characteristics."

MTD has been responsible for testing the mortar weapon and the high explosive (HE) round. Companion rounds, such as the illuminating and smoke rounds which comprise the whole system, are being tested at Yuma and Dugway Proving Grounds. Those rounds are being developed by the U.S.

The I-81mm mortar is made up of a combination of selected components from the United Kingdom's and United States' mortars, Shandle said, describing the weapon. Its baseplate, M64 sight unit, fire control equipment, and multi-option fuze on the HE round are from the U.S. The UK provides the cannon, bipod mount, and the HE rounds minus the fuze.

The advantage of the improved 81mm is that it has an extended range capability, according to Shandle. It has greater range while retaining high precision. The maximum range of the present U.S. 81mm mortar is approximately 4,800 meters and the maximum range of the improved mortar is approximately 5,600 meters. It has a high rate of fire, too; its sustained rate is 12 to 15 rounds a minute. It is also lightweight and transportable and weighs about six pounds less than the present 81mm mortar.

"Perhaps the best feature of the I-81mm is the multi-option fuze on th HE round," Shandle said. "The M734 multi-option fuze is from the U.S. 60mm lightweight company mortar system. It gives four modes of functioning. First there's the proximity function which allows for a detonation 3 to 13 feet off the ground.

The near-surface burst function allows for a detonation zero to 5 feet off the ground. The impact function allows for a detonation upon impact, and the delay function allows for a 0.05-second delay before detonation."

The HE rounds and the weapon are the lead items of the mortar system. There are also other items concurrently developed and tested for the system, and there are plans for future testing of an XM879 training round, which is another part of the whole system. (PAO Rel.)

ERADCOM

Transportable jeep-mounted jammers. The U.S. Army Electronics Research and Development Command (ERADCOM) has awarded a $6.1 million contract to American Electronic Laboratories, Inc., of Landsdale, PA, to produce transportable jeep-mounted jammers (Applique' Jammer).

The jammers will be used to train radio communications

operators in a tactical electronic countermeasure environment. The Applique' Jammer evolved from the Forward Applique Jammer (AN/VLQ-4) prototype, developed jointly by the Electronic Warfare Laboratory and the Technical Support Activity at Fort Monmouth, NJ. Both are elements of ERADCOM.

Under the terms of this first production contract — won after competitive negotiations — the firm will deliver 227 jammers by January 1986. (PAO Rel.)

MERADCOM

Military Amphibious Reconnaissance System. The Army, the Navy and the Marine Corps are participating in a joint project to develop a new military reconnaissance boat, known as the Military Amphibious Reconnaissance System (MARS).

The boat is an inflatable craft that can carry a squad of seven men and their equipment. It can be pushed out of the hatch of a nuclear submarine or air dropped from a C-130 cargo plane or a helicopter. In operation, it can be inflated in less than a minute and completely assembled by its crew in less than half an hour.

What makes this craft unique, though, is its outboard motor. The 35-horsepower engine is completely submersible. A special valve allows the operator to drain water from the fuel system and restart the motor if it is dropped over the side of the boat or if the craft is deployed underwater. It is believed to be the only engine of its kind with this capability. The motor has a solid state ignition and a range of 20 miles at its top speed of 25 miles-per-hour.

The MARS research and development effort was sponsored by the Army's Mobility Equipment Research and Development Command, which also supervised the tests conducted by the Navy, and by the Marine Corps, who shared in funding the project. Thus far, 73 of these craft have been procured for the Marine Corps. The Navy plans to let a contract to buy them for the Army this year. (PAO Rel.)

Inflatable military reconnaissance boat with 35-horsepower outboard motor.

Simulated chemical warfare agents. The U.S. Army Mobility Equipment Research and Development Command (MERADCOM) is teaming with Johns Hopkins University to develop simulated chemical warfare agents which can be used to test the effectiveness of the membranes used in the Army's reverse osmosis water purification units.

To develop the simulated agents, researchers will study organic phosphates to determine which could be used as substitutes for live agents. Candidate substances will then be tested for stability under various conditions. A test will then be developed to detect minute quantities of these substances in water.

Next, water contaminated with the simulants will be run through a reverse osmosis unit to determine the most promising candidates. These data will be compared with results obtained using real agents. Finally, the results will be used to develop standardized test procedures for use of the simulated agents. Work on this project is expected to be completed in early 1984. (PAO Rel.)

TSARCOM

Airboat procurement. An Army program to replace World War II vintage landing craft with modern airboats has been transferred to the Troop Support and Aviation Materiel Readiness Command (TSARCOM) in St. Louis, MO. TSARCOM accepted responsibility for the program from its developer, the Army Mobility Equipment Research and Development Command at Fort Belvoir, VA.

Bell Aerospace Textron is the prime contractor for the $166 million program, building the watercraft at its Buffalo, NY, plant.

Seven of the airboats have been built and assigned to the 331st Transportation Company at Fort Story, VA, where they would be on call for use by the Rapid Deployment Force. TSARCOM is now negotiating an additional procurement of five of the craft to bring the company to its desired strength.

The airboats are faster and more versatile than their predecessors, with each capable of carrying a 30-ton load from a troop or cargo ship to a beach landing at speeds up to 60 mph, as well as transversing reefs, underwater obstacles and land barriers on a cushion of air. The practical effect of the latter is to make 70 percent of the world's beaches accessible to U.S. troops in the event of war, versus 17 percent attainable using traditional watercraft.

In deployment overseas, airboats could be tied down on the decks of cargo ships and then lowered by the ships' cranes to the water for the final run to the beachhead.

The Army has designated the airboat "LACV-30," for the Lighter, Air Cushion Vehicle, 30-ton capacity. A "lighter" in this case is the common nautical term for a boat that transfers cargo from ship to shore. (PAO Rel.)

Corps of Engineers

Voice Recognition System. Setup of the Voice Recognition System for field testing at Fort Devens, MA, was made earlier this year. The system, developed by the U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL, is designed for use in quality control/quality assurance inspections. It allows an inspector to verbally record inspection data on a hand-held cassette recorder.

When a tape is placed into the system, printed reports are rapidly produced in the format desired. Thus, the inspector no longer has to fill in checklists during the inspection, is relieved from writing by hand the required reports, and, therefore, is freed to do more actual inspection.

The Fort Devens system is for contractual compliance for maintenance contracts. This report system requires an initial report containing failures as well as satisfactory items. A copy of the report will be kept by the inspector and one will go to the contractor. The contractor then has 12 hours to correct and sign off on the deficiencies and return the copy so that the areas flagged as failures can be reinspected.

Based on the percent of failures and noncompliance to correct them, deductions are made to contractor payments. Field testing will begin as soon as necessary computer and programming modifications are completed. (PAO Rel.)

Awards...

Natick Presents Annual Incentive Awards

Civilian and military achievements in research, engineering, administrative leadership, and installation support were recognized recently during annual incentive awards ceremonies at the U.S. Army Natick Research and Development Laboratories, Natick, MA.

Natick R&D Labs Commander COL James S. Hayes prefaced the incentive award ceremony with presentation of the 1982 Rohland A. Isker Award, sponsored by the R&D Associates for Military Food and Packaging Systems, Inc. The award recognizes outstanding contributions to national preparedness in the fields of food and containers.

Recipients of the Isker Award, who also received a Technical Director's Silver Pin for Engineering, are *Mr. Paul Short,* Operations Research Systems Analysis Office; *Mr. John Kovar,* Aero-Mechanical Engineering Laboratory; and *Mr. Santo Gravina* and *Mr. Dominic Bumbaca,* both of the Food Engineering Laboratory. This 4-man team was cited for designing and developing a Mobile Food Service System prototype for the Air Force Ground Launched Cruise Missile System.

A second Technical Director's Silver Pin for Engineering was awarded to *Dr. Kwoh Hu* and *Mr. Warren Roberts,* Food Engineering Laboratory, for developing individual ration heaters and water heating and cooling devices for use by combat field troops.

The Technical Director's Gold Pin for Engineering, another team award, went to *Messrs. Bruce Bonaceto, George Chakoian, Ralph Vernet,* and *Stephen Deberadinis,* all from Aero-Mechanical Engineering Laboratory. They were cited for development of the Airdrop Controlled Exit System which enables multiple platform loads to be dropped from a single aircraft and land side by side on a drop zone, instead of a widely dispersed pattern.

Dr. David Remy, Individual Protection Laboratory, was the recipient of the Technical Director's Silver Pin Award for Research for his effort leading to a novel and more practical route to the systhesis of isoindole. The military is interested in the ability of these highly colored compounds to interact in clothing systems to affect camouflage.

The Director's Gold Pin for Research, as well as the Inventor of the Year Award, were presented to *Mr. Armando Delasanta* and *Mr. Gil Dias,* both of the Individual Protection Laboratory, for their invention and development of a novel protective laminate clothing material system which provides improved protection to the soldier in a chemical environment.

The Commander's Silver and Gold Pins for Leadership in Administration went to *Ms. Mary W. Barnum,* Engineering Programs Management Office and *Mr. Richard Richardson,* Office of the Technical Director, respectively. Barnum was cited for exceptional administrative leadership in the transitioning of the Readiness Outfit, Toxicological, Microclimate Controlled System to the Readiness Command. Processes, methods and policies she developed will reportedly benefit future programs.

Outstanding leadership in developing and administering the Fiscal Year '83 Science and Technology Program Review for Natick Labs earned the Gold Pin for Mr. Richardson. His comprehensive review plan, project evaluation technique methodology, and supervision earned praise of several Department of Army, DARCOM, and DOD review teams.

The Commander's Gold Pin Award for Installation Support, presented yearly to a Wage Grade and General Schedule employee for significant devotion to duty or mission accomplishment, was presented to *Ms. Ruthann M. Roth,* Science and Advanced Technology Laboratory and *Mr. William Freer,* chief, Visual Aids and Photo Section, Directorate for Services and Facilities, respectively.

Wage Grade employee Roth was selected for her extraordinary culinary abilities and professional attitude, and Freer earned his Gold Pin for exceptional performance and leadership in supporting the audio visual and exhibit requirements of the laboratories.

Co-winners of the Commander's Military Award for Research, Development, Test and Evaluation were *CPT Stephen R. Missler,* formerly of the Science and Advanced Technology Laboratory and *MAJ Edward L. Taylor,* formerly assigned to the Individual Protection Laboratory.

CPT Missler was honored for development of an analytical procedure for separating and identifying harmful oxides of cholesterol which provides comprehensive guidance for food manufacturers in drying cholesterol rich products such as eggs. He also designed a more sensitive and efficient system for measuring penetrability of protective films and fabrics by harmful chemical agents.

NLABS Executive Officer *MAJ Edward L. Taylor,* former R&D coordinator and program manager, Individual Protection Laboratory, was cited for his outstanding management and technical contributions to the combat boot development and high test bed programs which led to increased protection to the combat soldier from battlefield threats and environments.

Kruse Receives Outstanding Civilian Service Medal

Dr. Paul W. Kruse (center, accompanied by his wife) accepts Outstanding Civilian Service Award from ASA (RDA) Dr. J. R. Sculley.

In a ceremony at the Pentagon, Assistant Secretary of the Army (RD&A), Dr. Jay R. Sculley, presented the Outstanding Civilian Service Medal to former Army Science Board member, Dr. Paul W. Kruse, Jr.

The accompanying citation noted Kruse's exceptionally significant contributions as a member of the Army Scientific Advisory Panel and the Army Science Board from June 1965 through July 1982. Cited specifically were his extensive technical expertise and leadership in electro-optics, night vision, target identification, and command and control.

The award recognized Kruse's important contributions in "clearly and realistically identifying significant opportunities and constraints in the application of optics technology to modern weapons and sensors." These exceptional contributions, it was noted, were critical during a period of rapid development and fielding of improved IR and laser systems, "constituting a virtual revolution in battlefield target identification, location, night fighting, and weapon homing."

Dr. Kruse was known as a very valued contributor in a wide variety of Army Scientific Advisory Panel and Army Science Board activities.

In presenting the citation and medal during the ceremony on 23 May 1983, Secretary Sculley remarked that Kruse had "set the standards for membership and service to the Army Science Board," and that "we have a better Army because of his efforts."

Kruse, after serving with the Army 1946-47, enrolled at Notre Dame, graduating in 1951 with a BS in physics. He then continued his education there, winning his masters and doctorate degree in physics. He is now a Principal Research Fellow with the Honeywell Corporate Technology Center, Bloomington, MN.

Welch Gets Meritorious Service Medal

Dr. Thomas J. Welch

Dr. Thomas J. Welch, a physical science administrator, at the U.S. Army Chemical Systems Laboratory, Aberdeen Proving Ground, MD, has been awarded the Army's Meritorious Civilian Service Medal for his accomplishments as CSL's associate for technology.

The Meritorious Civilian Service Medal is the second highest honor granted by the Secretary of the Army for outstanding accomplishments. Dr. Welch was cited for conceiving, planning and implementing an improved technology base for the Army's current chemical warfare and chemical biological defense programs.

A career civil servant since 1956, he came to CSL in 1975 from the Army Ordnance and Chemical Center and School at APG where he was assigned as a supervisory physicist in the Chemical Directorate.

He has a bachelor of science degree in physics from St. Bonaventure University, Olean, NY, and a master's degree in the same discipline from John Carroll University, Clevend, OH. In 1974, Auburn University awarded him a doctorate in physics. He graduated from the Army War College, Carlisle, PA, in 1978.

Welch is a member of the American Physical Society, the American Association of Physics Teachers and has been honored by election to Sigma XI, the Research Society of America.

DARCOM Names Berg 'Engineer of the Year'

Dr. Norman J. Berg, an employee at the U.S. Army Electronics R&D Command's Harry Diamond Laboratories, has been selected by the U.S. Army Materiel Development and Readiness Command as 'Engineer of the Year'.

A specialist in acousto-optical signal processing techniques, Berg was chosen for the honor from among the 13,400 engineers who work in the 166 military installations and separate DARCOM agencies nationwide. His research has reportedly led to new concepts for real-time processing of large volume data for radar and communications.

Berg's previous honors include an Army R&D Achievement Award in 1981, Army Science Conference awards for outstanding papers in 1978 and 1980, and being named HDL's Inventor-of-the-Year in 1979.

He holds three degrees in electrical engineering, including a doctorate from the University of Maryland earned in 1975, and has published more than 60 technical papers and coauthored a book on acousto-optics.

Additionally, he is the Army's representative on the Tri-Service Advisory Group on Optical Signal Processing, a member of the Institute of Electrical and Electronic Engineers Ferromagnetic Working Group, and an ordained rabbi.

Wright, Breaux Elected as BRL Fellows

Dr. Thomas W. Wright, a mechanical engineer, and Harold J. Breaux, a mathematician, have been elected Fellows at the Army's Ballistic Research Laboratory (BRL).

The BRL Fellowship, composed of scientific and engineering (S&E) personnel, now has 26 members. It was established in 1972 by Dr. R. J. Eichelberger, BRL's director, to recognize outstanding S&E accomplishments.

Wright, assigned to BRL's Terminal Ballistics Division, has been employed at BRL for 16 years. Cornell University awarded him both a BS degree and a masters degree in chemical engineering and a doctorate in mechanical engineering.

Breaux, assigned to BRL's Systems Engineering and Concept Analysis Division, has worked at BRL for 21 years, including an 18-month span of military service. He was awarded a BS degree in physics from Louisiana State University and a master of applied science from the University of Delaware.

In 1978, Breaux was honored with an Army R&D Development Achievement Award for research he had conducted in modeling high energy laser effects and propagation.

ADPA Presents Weisz With Simon Award

Dr. John D. Weisz, director of the U.S. Army Human Engineering Laboratory, was recently presently with the American Defense Preparedness Association's Simon Award. He was recognized as a dynamic and skillful leader and as one of the most responsive, imaginative and productive human engineering experts in the Free World.

The Simon Award, which is named in honor of MG Leslie E. Simon, (USA Ret.) a founder of the Ballistics Research Laboratory and a former chief of R&D in the Office of the Chief of Ordnance, consists of a $1,000 cash award and is presented in recognition of technical excellence in weapons systems R&D.

Dr. Weisz was cited specifically for his keen technical ability, excellent knowledge, and high degree of resourcefulness which resulted in significant human factors improvements in the design of Army weapon systems.

Additionally, Dr. Weisz was recognized for human engineering contributions in the areas of robotics, blast/overpressure, field artillery systems integration, individual weapons, clothing and chemical protective equipment, aircraft cockpit lighting, rearm/refuel procedures, military operations in urban terrain, and logistical readiness initiatives.

Henry Receives Crozier Prize

Dr. Mary C. Henry, a pharmacologist and toxicologist at the U.S. Army Medical Bioengineering Research and Development Laboratory, has been presented with the American Defense Preparedness Association's Crozier Prize.

The award was given to Dr. Henry in recognition of her work in developing a major research program to insure that the materials used in smoke and obsurants do not adversely affect the health of troops in the field or civilian personnel engaged in its manufacture and disposal.

Dr. Henry's specific contributions in the smoke and obscurants health effects research program reportedly played a vital role in the development and expansion of a model program of medical research designed to integrate health hazard assessment research with materiel research and development. She initiated numerous toxicology research projects and consistently provided extensive report reviews to insure state-of-the-art toxicology.

Dr. Henry's vital input into the smokes and obscurants program is expected to facilitate expanded and more timely participation of medical R&D in all forms of smoke/obscurants material development, the effects of which will be quickly evident in the development and fielding of less hazardous systems and promulgation of optimal training use guidelines.

The Crozier Prize consists of a $1,000 cash award in recognition of outstanding achievement by an individual in scientific research related to weapons progress in the United States. It was established in honor of the late MG William Crozier, chief of Ordnance of the U.S. Army from 1901 to 1918, whose leadership in technical progress had lasting effect on armament development.

Career Programs . . .

Menne Chosen for Senior Executive Service

Mr. Donald F. Menne, a mechanical engineer and physical science administrator at the Army's Ballistic Research Laboratory (BRL), Aberdeen Proving Ground, MD, has been selected as member of the Federal Senior Executive Service (SES).

Donald F. Menne

SES, established in July 1979 by the Civil Service Reform Act, is the personnel system for men and women who administer the top level programs of the Federal Government.

Menne is chief of BRL's Terminal Ballistics Division. A veteran Army researcher with 23 years of Federal service, he heads up a team of scientists and engineers that study projectile-target interactions during the incalcuably small period of time that a projectile is in flight towards its target.

Menne was awarded a bachelor of science degree in mechanical engineering by Bradley University and studied at the University of Delaware. He also participated as a fellow in the Practicing Engineer Advanced Study Program of the Center for Advanced Engineering Practice at the Massachusetts Institute of Technology.

Menne received the Technical Director's Award from the Army Armament Research and Development Command (ARRADCOM), BRL's parent command, in 1979 for his contributions to the design, development and evaluation of the Army's M1 Tank. He was also awarded the Army's Meritorious Civilian Service Award in 1978 and was the 1977 recipient of BRL's Robert H. Kent Award.

CSL Picks Annunziato for Executive Training

Mr. Pete Annunziato is the 47th civilian employee to participate in the U.S. Army Armament R&D Command's Chemical Systems Laboratory's (CSL) technical executive training program.

A chemical engineer assigned to the CB Detection and Alarms Division, he has started six months of specialized training that will assign him to the Office of the Commanding General of CSL and to the Office of the Deputy Chief of Staff for Research, Development and Acquisition in Washington, DC.

The technical executive training program was established in 1971. It is designed to give participants practical experience in the essentials of staff work relating to managerial decisions.

Annunziato began his Federal service career in 1971 as a chemical engineering technician at the Bureau of Mines and then as a chemist for the National Institute for Occupational Safety and Health (NIOSH), both in Morgantown, WV.

In November 1974, he transferred to the Army chemical center at Edgewood, MD, and began working on a program to improve the Army's M9 chemical detector paper. Annunziato became the project officer for the M9 program in August 1980.

He was awarded a bachelor of science degree in chemical engineering from the University of Dayton, OH, in 1970 and later received a master's degree in engineering administration from George Washington University in Washington, DC.

Personnel . . .

Gilleece Named Acquisition Management Deputy

Mary Ann Gilleece

Under Secretary of Defense for Research and Engineering Dr. Richard D. DeLauer has announced the appointment of Mary Ann Gilleece as Deputy Under Secretary of Defense for Acquisition Management.

Gilleece will serve as the principal advisor to the Under Secretary of Defense for Research and Engineering in all matters concerning management

and policy for the Department of Defense acquisition process. Her area of responsibility includes policy development to insure availability of overall production support, including a cost effective industrial base and enhancement of industrial productivity.

Gilleece is responsible for making procurement system improvements in accordance with Executive Order 12352 of March 17, 1982 on Federal procurement reforms and is the DOD member of the Office of Management and Budget Executive Committee on Procurement Reform.

Prior to her appointment, Gilleece served as counsel to the U.S. House of Representatives, Committee on Armed Services. In that position she was responsible for committee functions relating to Federal contracting legislation and government procurement methods.

She graduated from the University of Connecticut in 1962, and attended Suffolk University Law School in Boston where she received a Juris Doctor degree in 1972. In 1982, she received a master's degree in government procurement law from the George Washington University. She is a member of the Massachusetts Bar and the American Bar Association public contracts section.

Bunyard Takes Over Missile Command

MG Jerry M. Bunyard

MG Jerry Max Bunyard, project manager of the PATRIOT Air Defense Missile System since November 1980, has been selected to assume new duties as commander of the U.S. Army Missile Command, Redstone Arsenal, AL.

A veteran of more than 28 years of active military service, MG Bunyard holds a BS degree in animal husbandry from Oklahama State University, an an MS degree in international relations from George Washington University. His military schooling includes the National War College, Army Command and General Staff College, the Field Artillery School Advanced Course, and the Infantry School Basic Course.

From July 1979 to November 1980, MG Bunyard was deputy director, Defense Test and Evaluation, Office of the Deputy Under Secretary of Defense for Research and Engineering. He served prior to this as project manager, Tactical Fire Direction System/Field Artillery Tactical Data Systems, Army Communications R&D Command, Fort Monmouth, NJ.

Other key assignments have included commander, Yuma Proving Ground, AZ; assistant to the scientific advisor, and later chief, Technical Support Division, U.S. Army Operational Test and Evaluation Agency, Fort Belvoir, VA; and operations research analyst and coordinator of Army Programs Presentations, Materiel Programs Directorate, Office, Assistant Vice Chief of Staff, Department of the Army.

MG Bunyard is a recipient of the Defense Superior Service Medal, Legion of Merit, Distinguished Flying Cross with Oak Leaf Cluster (OLC), Bronze Star Medal with two OLC, Meritorious Service Medal with two OLC, Air Medals with "V" Device, Joint Service Commendation Medal, and the Army Commendation Medal.

DARCOM Names Kicklighter Chief of Staff

MG Claud M. Kicklighter has been chosen as the new chief of staff, HQ U.S. Army Materiel Development and Readiness Command, following duty since 1981 as director, Security Assistance, and commander, U.S. Army Security Assistance Center, DARCOM.

MG C. M. Kicklighter

Graduated with a BA degree in biology from Mercer University, MG Kicklighter has an MS degree in business administration from George Washington University, and has completed requirements of the Industrial College of the Armed Forces, Army Command and General Staff College, and the Field Artillery School Basic and Advanced Courses.

During 1977-79, he served assignments as assistant division commander, 24th Infantry Division, and commander, Division Artillery, 24th Infantry Division, Fort Stewart, GA. He was a logistics management staff officer, Office, Defense Representative — Iran, Tehran, Iran in 1975-76.

Other career tours have included member, Security Assistance Branch, Resource Management Division, Logistics Directorate, J-4, Organization of the Joint Chiefs of Staff; and commander, 1st Battalion, 21st Artillery, 4th Infantry Division (Mechanized), Fort Carson, CO.

MG Kicklighter is a recipient of the Defense Superior Service Medal, Legion of Merit with three Oak Leaf Clusters, Bronze Star Medal, Meritorious Service Medal with OLC, Air Medals, Joint Service Commendation Medal, and the Army Commendation Medal with four OLC.

Vuono Chosen as TRADOC Deputy Commander

MG Carl E. Vuono

MG Carl E. Vuono, commander, 8th Infantry Division (mechanized), U.S. Army Europe since 1981, has been selected to assume new duties as deputy commander, U.S. Army Training and Doctrine Command and commander, U.S. Army Combined Arms Center, Fort Leavenworth, KS.

Graduated from the U.S. Military Academy, MG Vuono holds an MS degree in public administration from Shippensburg State College and has completed requirements of the Army War College, Marine Corps Command and Staff College, and the Artil-

lery School Basic and Advanced Courses.

During 1979-81, he was assigned as deputy chief of staff for Combat Developments, U.S. Army Training and Doctrine Command. Prior to this he served as assistant division commander, 1st Infantry Division (mechanized), Fort Riley, KS.

Other key assignments have included executive to the Chief of Staff, Department of the Army, Washington, DC; commander, Division Artillery, 82d Airborne Division, Fort Bragg, NC; and chief, Budget Division, Plans, Programs, and Budget Directorate, Office Deputy Chief of Staff for Personnel, DA, Washington, DC.

A veteran of more than 25 years of active military service, MG Vuono is a recipient of the Legion of Merit, Bronze Star Medal with "V" Device and five Oak Leaf Clusters, Meritorious Service Medal, Air Medals, and the Army Commendation Medal with four Oak Leaf Clusters.

Heiberg Becomes BMD Project Manager

MG Elvin R. Heiberg

MG Elvin R. Heiberg, former deputy chief of engineers, Office, Chief of Engineers, Washington, DC, has succeeded MG Grayson D. Tate, Jr. as project manager of the U.S. Army Ballistic Missile Defense Program.

MG Heiberg will direct the activities of two major field elements in Huntsville, AL — the BMD Advanced Technology Center and the BMD Systems Command — and the management of Kwajalein Missile Range in the Marshall Islands group of the Central Pacific.

A 1953 graduate of the U.S. Military Academy, he holds three master's degrees, including one in civil engineering from the Massachusetts Institute of Technology. He has also completed requirements of the Industrial College of the Armed Forces.

Prior to his assignment with the Corps of Engineers, MG Heiberg served as director of Civil Works in the Office of the Chief of Engineers. Other major staff assignments have included deputy chief of staff (Engineer), U.S. Army Europe; military assistant and later executive to the Secretary of the Army; and service in the Office of the assistant Vice Chief of Staff of the Army and in the Executive Office of the President of the United States.

He has also served tours as division engineer, Ohio River Division, Army Corps of Engineers; district engineer, New Orleans District; commander, 4th Engineer Battalion, 4th Infantry Division, Vietnam; and at the engineer company level in two infantry divisions in Europe and Korea.

An active member in the American Society of Civil Engineers and the Society of American Military Engineers, MG Heiberg is a recipient of the Silver Star, Legion of Merit (three awards), and the Distinguished Flying Cross.

Harnagel Commands Electronic Proving Ground

Following a tour as director of Combat Developments, Fort Gordon, GA, COL William R. Harnagel has assumed new duties as commander of the U.S. Army Electronic Proving Ground, Fort Huachuca, AZ.

COL W. R. Harnagel

COL Harnagel holds an undergraduate degree from the U.S. Military Academy at West Point and a Master of Science degree from the University of Arizona. Additionally, he attended the Command and General Staff College at Fort Leavenworth, KS and the Army War College at Carlisle Barracks, PA.

During 1977-78 COL Harnagel served as chief, Communications-Electronics Operations Division, Defense Communications Agency-Pacific. Prior to that assignment, he was commander, Signal Battalion, 25th Infantry Division, HI. He has also been an instructor in the Department of Mathematics at West Point.

COL Harnagel's decorations include the Bronze Star Medal with one Oak Leaf Cluster, the Meritorious Service Medal with two Oak Leaf Clusters, the Air Medal, and the Army Commendation Medal with one Oak Leaf Cluster.

In Memoriam

The RD&A Magazine regrets passing to the many friends of Dr. Richard L. Haley, DARCOM Assistant Deputy for Science and Technology, the sad news of the death of his wife, Margaret J. (Peggy), in an automobile accident June 14, 1983. The accident occurred on the George Washington Memorial Parkway near Mt. Vernon, VA, when Mrs. Haley's car was reportedly struck at high speed by another whose occupant was allegedly driving under the influence of alcohol.

Peggy Haley will be sorely missed by her many friends in the RDA community.

Interment was in Arlington National Cemetery.

To The Future Then . . .

With this issue my services as editor of this magazine will end. It has been almost 6 years — all of it most enjoyable. My successor, LTC David G. Kirkpatrick, will unquestionably do a fine job, even raise further, the high respect and fine tradition with which the *Army RDA Magazine* is held.

As a member of the Army's materiel acquisition community for some 23 years, I have seen marked changes in emphasis and ways of conducting the business. One of the most dramatic has been that of moving from a Congressional climate of rarely being criticized-even being offered money over and above what was being requested, to one of intense Congressional review and control. In the late 1950's and early 1960's U.S. defense science, prodded by the embarrassment of Sputnik and the flaunting of huge Soviet missiles and masses of ground might around Berlin, Cuba, Hungary and Czechoslovakia, walked on almost sacred ground. No longer.

Perhaps the second most dramatic change has been the realization that successor new systems cannot be developed in isolation. We have learned the vital need for early attention to ILS and for future force modernization planning, to say nothing of studying future affordability budgets.

But there has been one constant driving the development and acquisition process throughout this entire period — a constant that forces a sort of Catch-22 syndrome. The only real military threat to the U.S. today and in the forseeable future is one that is synonomous with potentially overwhelming Soviet numbers — manpower and materiel.

New materiel capable of offsetting these Soviet preponderances was sought, and is still being sought. Technology pushed its naturally time-constrained boundaries, eagerly abetted by both the Army and industry, and risks and costs began to rise dramatically. Then came the guns and butter days of Vietnam and the attendant curse of double digit inflation. The term cost overrun became one of everyday use. The sacred ground of R&D's promised technological wonders of the future was replaced by the intense creed of cost control.

No longer were Congressional committees leaning forward in wide-eyed interest at the films and slides of the wonders promised by new systems in development or for which funds were being sought. Rather, the tone became one of deep questioning — of the need, the risks, and above all the overruns and the probable total system costs.

Unfortunately, we seem to have come up with no better solution for cost control than that of ever widening and deepening program review — no matter the guise. The result has been over the 20-odd years, a formidable growth of layering — the oft-referred to micro-management process. It has grown at an insidious rate, and given a continuation of peacetime conditions, there seems little hope for a lessening of this repetitive review process.

Given a democratic society, where loyal opposition is an accepted — even desirable facet, and given a continuation of the need for new materiel that offsets Soviet numerical and technical advantages, there seems to be a never ending continuation of this Catch-22 syndrome. The constant complaint this editor has heard over the past 5 years in the halls of the Army Staff — at all levels, action officers, division chiefs, and general officers, is the total inability to plan ahead, to think ahead. Rather, the system forces them to react — react to demands for data, mostly fiscal data, that changes weekly, and to attend reviews. I found the word *frustration* used with increasing frequency.

Amazingly, the system works. To this old grayhead there seems to be a parallel to the situation that existed in the German war machine of WWII — despite the incredible bureaucratic duplication at the top, the dedication and skill of the lower echelons seemed to be able to do a remarkable job.

There is then a bright light ahead for us. This editor has seen over the years a very deliberate effort by the Army to learn from its experiences, to teach and train its acquistion people how to better run their business. And it has been my very honest observation that the caliber of people who have chosen this field are truly at the high end of the bell curve. One evidence of this can be seen in the high number of RDA officers who have risen to general officer rank. Good people then, even working within the frustrating immutables of the system, can and will find a way to do the job better.

To ensure a continuing flow of such high quality people into the program, both military and civilian, has been a high priority program of GEN Donald R. Keith, now DARCOM commander. When accepting the editorship in 1977, I was given a mandate by the outgoing DCSRDA, LTG Howard Cooksey, and incoming DCSRDA LTG Keith, to make better use of the magazine to enhance the awareness and attractiveness of the materiel acquisition career field — for both military and civilians.

Accordingly, the magazine underwent a number of changes. The title was changed to better reflect the realigned Army functional structuring of research, development, and *acquisition*. Type style and size were changed to increase ease of readability. A new cover format was designed featuring eye appeal and simplicity, yet always recognizable as the *Army RDA Magazine*. Further, in keeping with the mandate, every active officer who carries a materiel acquisition speciality indicator, to include those who carry the additional skill identifier of the project manager program, receives an individual copy of the magazine. This was later expanded to include all reserve officers with RDA mobilization designations. And recently, all DARCOM designated reserve officers are on the mailing list.

We have tried to keep foremost in mind the needs of the material acquisition careerist *in the field* — military and civilians. We began adjusting our topic content more toward management rather than hardware progress or review articles. We have tried to answer the questions: What is senior management's acquisition philosophy? What changes in key regulations and policy are in the offing or taking place? What's going on in the headshed? etc.

Not long ago a recent returnee to the materiel acquisition community, after an absence of several assignments, remarked to us that had it not been for his receiving his personal copy of the *Army RDA Magazine* he would have been unable to keep abreast of what was going on in the RDA community. His recent return to a senior level headquarters RDA assignment was considerably facilitated, he said, through the knowledge gained from the magazine. If this can be said of others, then the magazine is making progress in fulfilling its real mission. Under my successor, and the very able staff he will inherit, I feel totally confident that the magazine will far exceed those successes achieved to date.

To all of you in the RDA community then, I thank you for your support and wish great personal and materiel success.

L. VanLoan Naisawald, Editor

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