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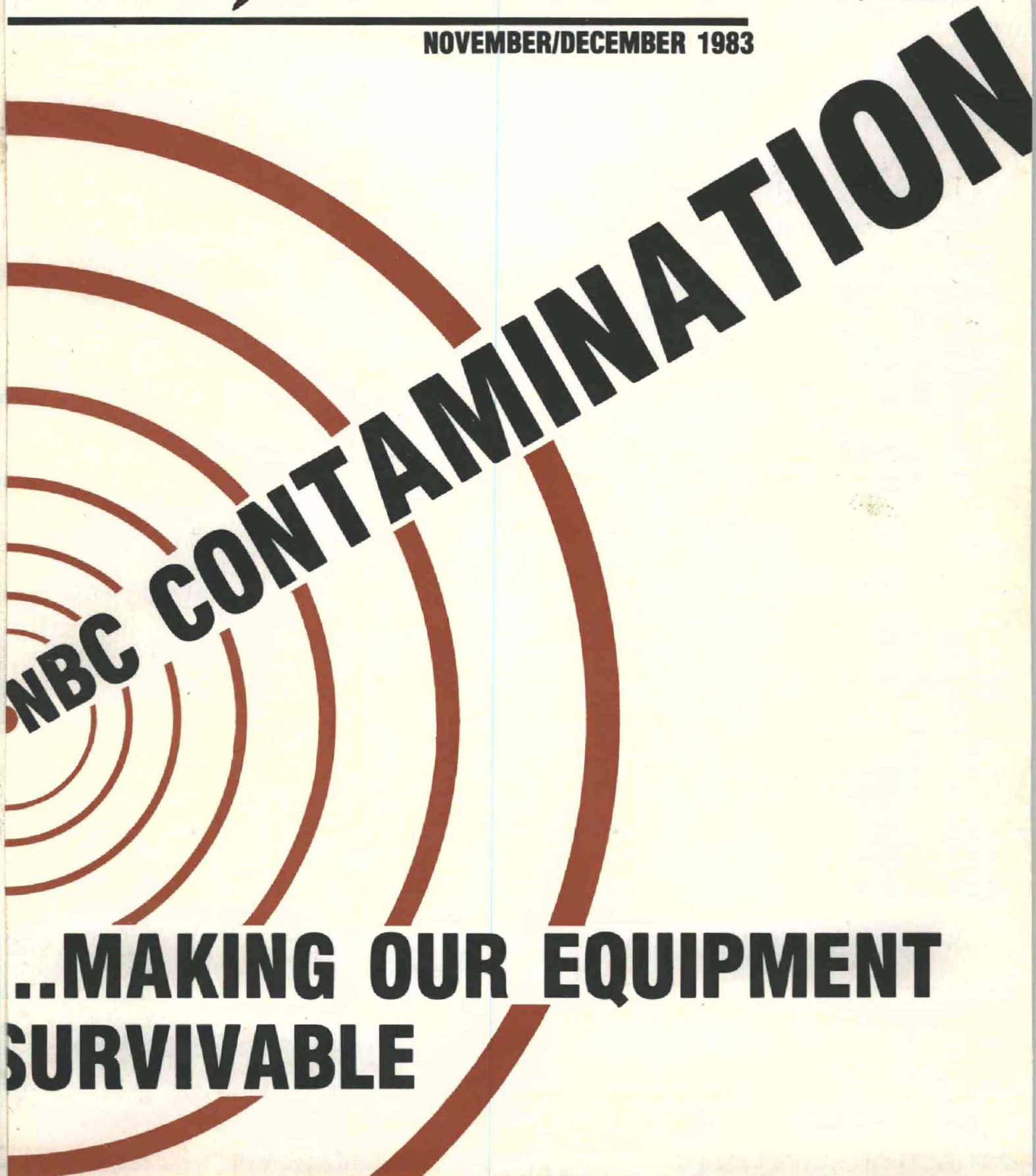

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ABOUT THE COVER:

This month's cover story addresses the Army's efforts to insure that its materiel and equipment can survive nuclear, biological and chemical contamination on future battlefields. Decontaminability, hardness, and compatibility — three characteristics considered essential for NBC survivability — are examined. Cover designed by Christine Deavers, HQ, DARCOM Graphics Branch.

FEATURES

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

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NBC Contamination Survivability for Army Materiel

By LTC Armand M. Pelletier

Criteria for equipment to survive small arms fire, fragmentation munitions, off-road shock, and rough handling have been a part of U.S. Army requirements documents since the American Revolution. However, in the late 60s and early 70s the Army recognized the need for a formal program to ensure that its equipment was built to survive the initial effects of nuclear weapons, and the nuclear survivability program was eventually formalized by Army regulation.

With the resurgence of interest in the chemical threat in the late 70s, the Army has been adding a new dimension to the survivability challenge. The new dimension is NBC contamination survivability.

The program had its genesis at a meeting of the Quadripartite (Australia, Great Britain, Canada, and the United States) Working Group on NBC Defense in October 1979. Participants at that meeting recommended formulation of a concept paper on "biological and chemical survivability criteria for military equipment." The U.S. accepted the task and added nuclear contamination survivability during the development of the concept paper. After several cycles of coordination and rewrites, the concept paper was approved by the Quadripartite countries on 12 May 1981.

The value of the concept paper is that there is now an agreement that, for any system to be considered survivable on an NBC contaminated battlefield, it must have at least three essential characteristics: decontaminability, hardness, and compatibility.

Decontaminability is the ability of a system to be rapidly decontaminated to reduce the hazard to personnel operating, maintaining, and resupplying it. Hardness is the ability of a system to withstand the damaging effects of NBC contamination and any decontamination agents and procedures required to remove it. Compatibility is the ability of a system to be operated, maintained, and resupplied by personnel wearing the full NBC protective ensemble.

Once there was an agreed definition of what constituted NBC contamination survivability, the next step was to develop the standards or criteria to which the next generation of equipment could be built so that it would be survivable.

The task of developing the criteria fell to the U.S. Army Nuclear and Chemical Agency (USANCA), a field operating agency of the Office, Deputy Chief of Staff for Operations and Plans, located at Fort Belvoir, VA. With contractor support, USANCA set up a team that spent the next six months developing quantitative criteria to go with the definitions. The study was guided by a Study Advisory Group that approved the major steps of the study and was invaluable in securing the input of a cross-section of Army thinking.

It was concluded that decontaminability criteria should specify that the system be able to be decontaminated from a given level of initial contamination, to a specified level, which we termed the negligible risk level, when a complete battlefield decontamination effort is applied.

"Complete" decontamination was defined as "that amount of effort which reduces the NBC contamination hazard to a level that allows soldiers to operate the equipment in *standard combat clothing* with no more than a *negligible* risk of mild incapacitation."

Our next step was to define "negligible risk." We decided to accept five percent mild incapacitation as our definition of negligible risk for chemical agents. We accepted five percent not only because we thought it was a reasonable number, but it is also the level used by several NATO countries. We also accepted a five precent chance of casualties from biological agents.

The negligible risk level for nuclear radiation had previously been defined by others as 2.5 percent incidence of vomiting. We accepted this definition since we saw no necessity to use the same percentage number for all three contaminants.

The next area we considered was the hardness criteria for decontamination agents and procedures. We thought that hardness criteria should specify a maximum level of degradation of reliability, availability, and maintainability (RAM) that a system would be allowed to suffer over a specified period of time (like 30 days) after undergoing a complete battlefield decontamination procedure.

To be complete, we added a hardness criterion for exposure to chemical agents as well. This standard should specify a similar maximum level of degradation of RAM standards that a system would be allowed to suffer over a period of time (like 30 days) after being contaminated with a maximum credible battlefield level of chemical agent.

Finally, we looked at compatibility criteria and concluded that it should specify the maximum degradation, in combat task performance, allowable as a result of having to operate a piece of equipment while in the full NBC maximum protective ensemble.

Having established where we wanted to go, we then developed a methodology for deriving these

quantitative criteria. The methodology for developing the compatibility criteria consisted of selecting a number of systems or pieces of equipment that represented a cross section of categories of Army equipment. These are shown below:

Category	Example
Aircraft	
Helicopters	UH-60A Black Hawk
Fixed Wing	OV1 Mohawk
Combat Vehicles	M1 Tank
Tactical Support Vehicles	HMMWV
Communications Equipment	AN/TRC-152
Crew-served Weapons	
Infantry	TOW Launcher
Fire Support	M109A1
Air Defense	Roland
Individual Weapons	M16 Rifle
Battalion Aid Station	Stretcher
Refuel Point	POL Bladder
Ammunition Supply Point	2.75 Inch Rocket

Next, we developed a mission profile for each piece of equipment to give ourselves a framework of representative activities under which the piece of equipment would have to "survive" and operate in an NBC contaminated environment. The following is a stylized mission profile, although the actual profiles developed for the individual pieces of equipment are much more detailed:

- assume NBC environment during conventional combat task.
- adopt maximum level of protection.
- continue combat tasks.
- perform emergency or partial decontamination as necessary.
- perform first echelon maintenance tasks.
- continue combat tasks.
- decontaminate completely.
- continue combat tasks in standard combat clothing.

We then conducted an extensive literature search to find out all we could about the degree of degradation which our soldiers can expect to suffer while performing the mission profile tasks. Our research revealed that, depending on the task and the ambient temperature, degradations from zero to 100 percent within a very few minutes have been reported. Test reports indicated several types of degradation.

Psychological degradation generally results from isolation experience when encapsulated in the ensemble.

Physiological degradations are usually divided into elements such as follows:

- fine motor skills, degraded by the protective gloves.
- gross motor skills, degraded by the bulky suit and booties.
- visual acuity skills, degraded by the mask.
- hearing acuity, degraded by the hood.
- stamina, degraded by the weight of the suit and heat load.

These results are not new. However, the study team became convinced that the available test data generally included not only the actual degradation, but also the degradation which results from using troops who have not been fully trained or acclimated to function in the NBC ensemble.

Using this information, the study team proposed the following compatibility criterion. The design of materiel developed to perform mission-essential functions shall take into consideration the combination of equipment and anticipated NBC protection. The combination of equipment and NBC protection shall permit performance of mission-essential operations, communications, maintenance, resupply, and decontamination tasks by trained and acclimatized troops over a typical 12-hour mission profile in a contaminated environment:

- In meteorological conditions of areas of intended use.
- With no more than negligible risk (five percent) of heat stress casualties, if applicable.
- With no degradation of crew performance of mission-essential tasks greater than five percent below levels specified for these tasks when accomplished in a non-NBC environment.

The period of 12 hours was chosen because the study team believes it is an ample period of time to ensure that the combination of man and machine can perform mission-essential and life-support functions.

Although only five percent degradation is very stringent, we believe that a high standard is necessary and achievable with redesign of the protective ensemble and design of new equipment with this standard in mind from the start. Of course, cost and operational effectiveness analyses will be required for each new system to determine the cost effectiveness of achieving the standard.

The methodology for developing the decontaminability standard consisted of collecting all available data on human response from exposure to low level doses of nuclear radiation and threat biological and chemical agents. Approximately 200 documents from sources which included many NATO countries and several Warsaw Pact countries, including the Soviet Union, were reviewed. Based on the analysis of those documents, we drew these conclusions:

- Very little human test data are available. The bulk of the literature consists of qualitative information and animal test data.
- Most available human test data for chemical and radiological agents are for acute exposures (high dose rates). There are essentially no human test data for long-term chemical exposures. The longest exposures reported are 6 to 8 hours.
- Available data are insufficient to confidently calculate parameters for quantitative response models. However, ranges of dosages for which responses occurred in humans can be gleaned from the data.

Decontaminability criteria were subsequently proposed by the study team and worded so they will not have to be changed if future data indicate that a change in the negligible risk values is warranted.

The criteria stress that exterior and habitable interior surfaces of materiel developed to perform mission-essential functions shall be designed so that NBC contamination remaining on, or reaerosolized from, the surface following decontamination shall not result in more than a negligible risk to unprotected personnel working inside, on, or one meter from the item.

The following conditions will be specified for testing the equipment during RDT&E:

- level of initial contamination.
- time the contamination is to remain on the item.
- decontamination procedures to be used.
- decontamination time to be allowed.
- level to be decontaminated to.
- level of protection and location of operating personnel.
- exposure conditions.

The other decontaminability standard is for neutron induced activity. The criterion states that materiel developed to perform mission-essential functions shall be designed so that, when exposed to a neutron fluence from a nuclear detonation that results in a total dose of 2,600 cGy

(rad) to the crew of the equipment, the neutron induced activity in the item will result in no more than a negligible risk to unprotected personnel arriving at H+2 and remaining inside, on, or at 1 meter from the item for 12 hours. If all of the other criteria were met and this one was not, we would not have an NBC contamination survivable item according to our definition. Once radiation activity is induced in an item it cannot be decontaminated, therefore, consideration must be given to the materials used in making the item.

The neutron fluence associated with 2,600 rad was chosen because 2,600 cGy (rad) is the level of immediate transient incapacitation (ITI) and our calculations show that for most nuclear yields of interest, the radius of moderate damage to vehicles is smaller than the ITI radius. This suggests that even though the crews would eventually die, the equipment would still be operable by a replacement crew. However, the item would only be useful to the replacement crew if it posed no more than a negligible risks hence the standard.

The methodology for developing the hardness standard consisted of gathering existing data on the vulnerability of material to chemical agents and decontaminating solutions. These data indicated that many materials are not compatible with present decontamination agents and some are incompatible with the chemical agents as well. The Army Chemical R&D Center at Aberdeen Proving Ground, MD, has initiated an effort which will result in a handbook listing materials and the extent of their compatibility with these compounds.

The degree of hardness to which a piece of equipment should be designed is a matter of trade-off between item criticality, cost of hardening, and available technology. After examining each category of equipment with these trade-offs in mind, the study team concluded that the following is both necessary and achievable: Materiel developed to perform mission-essential functions shall be hardened to ensure that a degradation over a 30-day period of no more than five percent in selected, quantifiable, essential characteristics is caused by five exposures to NBC contaminants, decontaminants, and decontaminating procedures encountered in the field.

The Ballistic Research Laboratory (BRL), Aberdeen Proving Ground, is now conducting a study to determine the sensitivity of combat capability of selected combat units to variations in these criteria. Using their AURA (Army Unit Resiliancy Analysis) computer code, they are trying to determine the change in the unit's capacity to perform a given mission as a function of variations in the criteria. For example, if the compatibility or hardness criteria were no less than 10 or 20 percent degradation instead of 5 percent, what would be the effect on the mission performance of the unit? Regardless of what number is eventually used in the standard, this effort should give us a methodology for evaluating the cost/benefit ratios for any given system.

In addition, we will soon begin a study to determine the NBC contamination survivability of systems under development based on these criteria. This study should give us a better feel for the applicability of these standards to fielded equipment as well as an insight into what needs to be done to make non-survivable systems survivable.

Concurrent with the development of the concept paper, steps were being taken to formalize the requirement to produce equipment that would be NBC contamination survivable. AR 1000-1 *Basic Policies for Systems Acquisition* was published in May 1981, and requires that NBC protection be designed into each system, item, or component which is expected to be exposed to an NBC environment. It requires that cost effectiveness of NBC protection be considered along with tactical considerations. It also requires that the system's design consider the ability of operators to effectively employ the system while wearing protective clothing.

In September 1981, TRADOC published TRADOC Reg 71-14 *Procedures for Implementing Nuclear and NBC Contamination Survivability in the Development and Acquisition Process.* This regulation specifies that all requirements documents must address NBC contamination survivability.

The Department of the Army is also now in the final stages of coordinating AR 70-XX, *NBC Contamination Survivability for Army Materiel.* This will formally establish the NBC Contamination Survivability Program throughout the Army. The program will be patterned after the Nuclear Survivability Program (organized under AR 70-60) and will provide for a General Officer review board to adjudicate requests for waivers from the NBC contamination survivability criteria. A draft Quadripartite Standardization Agreement (QSTAG 747) is now being developed by the Quadripartite Working Group on NBC Defense. The QSTAG is the vehicle which will be used to obtain quadripartite nation approval of the criteria.

All of these efforts should culminate in a program which will insure that our forces are equipped with materiel and equipment which will survive if the enemy chooses to use NBC weapons against us in the next war.

LTC ARMAND M. PELLETIER is the division chemical officer in the 25th Infantry Division, Schofield Barracks, HI. He served formerly as the chemical effects officer with the U.S. Army Nuclear and Chemical Agency. He holds an MS degree in systems management from Flordia Institute of Technology and an MS degree in physics from the Naval Postgraduate School.

The Environmental Technical Information System

Engineers and scientists at the U.S. Army's Construction Engineering Research Laboratory (CERL), Champaign, IL, have been doing some important work in recent years in the area of computerized information storage and retrieval. Perhaps one of the best examples of their efforts is the Environmental Technical Information System (ETIS).

Developed by CERL about 10 years ago in response to increasing national emphasis on environmental issues, ETIS is a computerized information retrieval system which provides several extremely useful aids to the Army and other government agencies in preparing environmental impact statements.

Background

During the 70s, growing concern for the environment, as exemplified by the National Environmental Policy Act, resulted in new requirements for Federal agencies, including the Army, to prepare environmental impact statements. These statements explored both preferred and alternative ways to achieve a specific mission and provided public documentation of the analysis. Since the requirement was unprecedented and little institutional knowledge or expertise was available to deal with this major undertaking, the Army faced a real challenge. ETIS was a response to this challenge.

The ETIS Concept

The ETIS concept is characterized by:

- Use of a large, centralized data base and a family of application programs.
- Implementation on a mini computer (initially a PDP 11/50, now a VAX 11/780).
- Communication through standard telephone lines.
- Reliance on low cost terminals in the field.

According to Mr. Ron Webster, team leader of the CERL's Environmental Modeling and Simulation Team, the mini computer software approach (UNIX and C-language) was adopted for a number of reasons.

The UNIX operating system encourages the design of modular "software tools" which is popular in many developmental organizations today because of the flexibility it affords. Written in C-language, UNIX was the most appropriate choice during the initial stages of the system's development and subsequent experience has shown the advantages of the high degree of portability which the C-language provides. C-language is a high-level programming language designed to increase the efficiency of computer operations. The language can support a wide range of data bases and provides the programmer with the capability to build system software quickly and easily. The system allows the creation of a singular interface with each user and makes it easy to manage the data.

System Description

The basic ETIS consists of three subsystems: the Economic Impact Forecast System, the Environmental Impact Computer System, and the Computer-Aided Environmental Legislative Data System.

According to Ron Webster, the Economic Impact Forecast System (EIFS) was and is the most popular of the systems. It allows the user to specify a geographic region for analysis by merely inputting the names of constituent counties (eliminating numeric codes to designate counties, for example). Once the region is specified, data are aggregated automatically and can be either displayed (printed) or used as inputs to a family of economic models supported by the subsystems.

These models cover construction projects, operations and maintenance activities, base realignments and other functional areas of Army activity. The user merely specifies the project-specific information in response to user prompts from the computer (such as dollar volume of projects, number of civilian and military personnel and their salaries, etc.).

The system calculates regional constants, multipliers, and other factors pertinent to the area; provides estimates of change in such variables as total business volume, population, income, and employment; and provides statistical analysis to ascertain the "significance" of these changes.

The second subsystem, the Environmental Impact Computer System,

provides a systematic means to identify potential environmental impacts as a result of Army programs or activities. A large matrix was designed and created which relates approximately 900 Army activities (along one axis) to approximately 700 environmental attributes or characteristics (along the other axis). This matrix identifies potentially almost 600,000 intersections, or environmental problems. The user, providing the system with answers pertaining to either the project site or project design, retrieves only those elements of the matrix which contain intersections (or problems) remaining for the analyst to consider.

The Computer-Aided Environmental Legislative Data System provides prompt access to abstracts of pertinent State and Federal environmental regulations for use in environmental impact analyses and enviromental quality management activities. The system uses keywords to call up those regulations which might be of interest to the user — e.g., Virginia regulations which are concerned with both explosives and noise control.

One similarity of these three subsystems is that they are easy and inexpensive to use. The current cost to use the system is $90 per hour. This includes about $40 for data update, $30 for communication, and $20 for the computer time.

The ETIS Philosophy

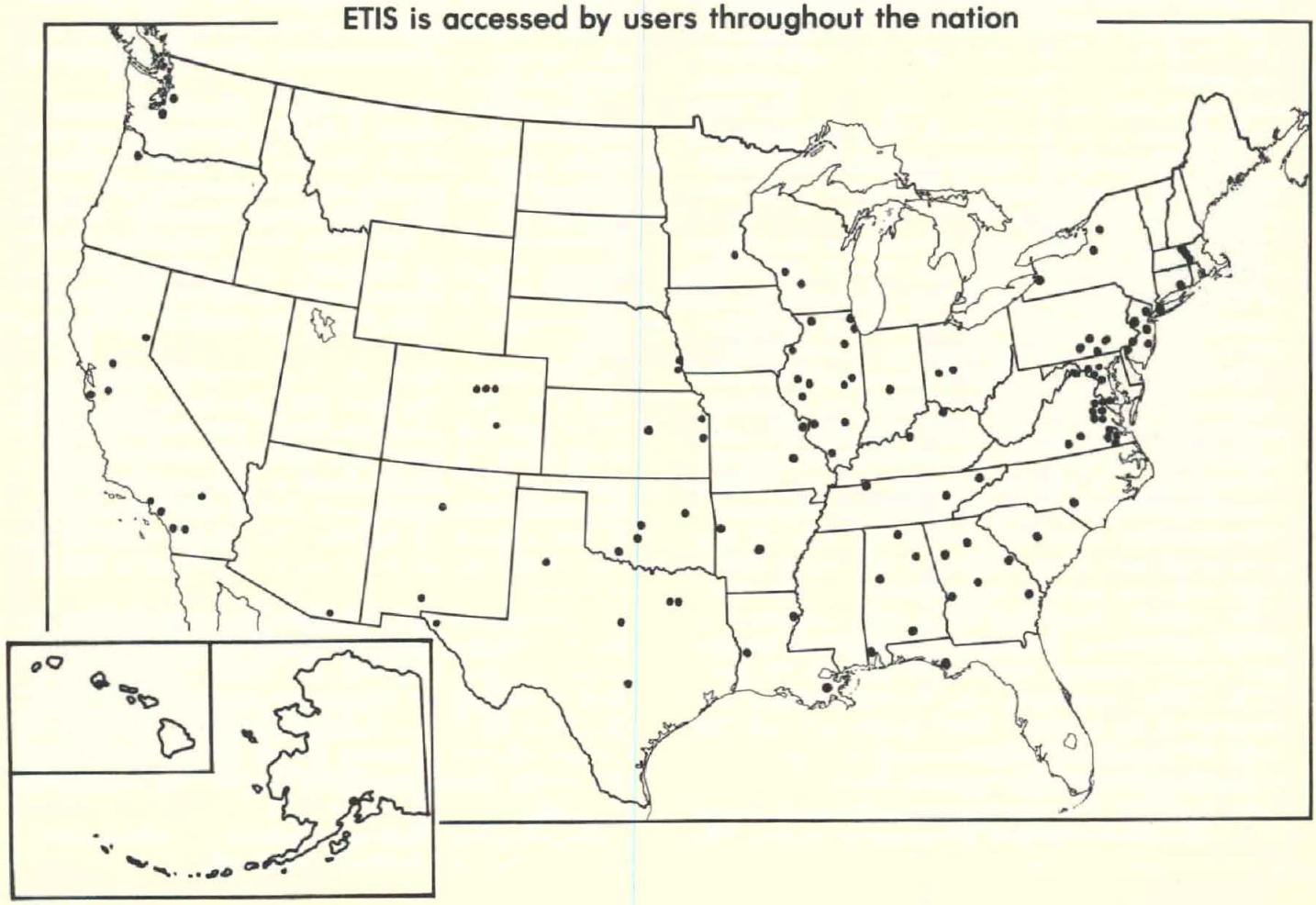
Perhaps more important than the system itself is the approach used to develop and continually improve it. From the beginning, the developers of ETIS have followed a prototyping methodology of quickly developing software and modifying it through an iterative process based on user response. This method contrasts with the more traditional structured software development approach which calls for a strict determination of functional requirements, thorough systems analysis and detailed documentation, prior to the construction and testing of the software.

Advantages and disadvantages of these different approaches are a source of frequent debate. However, there is little question that the prototyping approach used in developing ETIS has resulted in a flexible system which is responsive to rapidly growing environmental concerns and, likewise, to the user's changing needs.

Evidence of this responsiveness can be found among the more than 20 additions and enhancements to the three basic subsystems discussed above which are in various stages of development and are available to the user.

In addition to enhancements and modifications of the basic systems, the Environmental Division at CERL has applied the ETIS concept and philosophy to areas unrelated to the environment. In one application, for a Deputy Chief of Staff for Personnel study of personnel problems, CERL made it possible to easily reorganize cumbersome personnel data into a usable form. Another application involves an ongoing investigation of how to computerize a system which will automate the monthly reports to DA on the status of the Army's major development programs. *(Additional information on ETIS availability and management aspects appears in a related article on page 6 of this issue.)*

ETIS is accessed by users throughout the nation



Cooperative Effort Expands ETIS Availability

The U.S. Army Construction Engineering Research Laboratory (CERL) and the University of Illinois at Urbana-Champaign have joined forces to ensure that the CERL-developed Environmental Technical Information System (ETIS) is available for general public use.

The university's Bureau of Urban and Regional Planning has established an ETIS Support Center on campus to manage the daily operation of ETIS. Personnel at the support center assist individuals in using the system, provide technical guidance, and offer training classes for potential users. Additional university personnel update the ETIS data files and maintain the system hardware.

ETIS, as explained in a related article on page 4 of this issue, was initially developed by CERL to aid Army planners in preparing environmental impact statements. The computerized information retrieval system contains information on current environmental regulations, programs for assessing economic impacts and potential environmental consequences of activities, and other aids for environmental planners.

Army use of ETIS quickly attracted the attention of individuals from other Federal and State agencies and the private sector. Interest in the system presented some problems for CERL according to Mr. John Fittipaldi, one of the developers of ETIS. "Handling the volume of nonmilitary requests for use of ETIS was outside the research mission of the lab, and we began to look for help," he said.

CERL looked outside the government to find an organization to manage ETIS and make it available to users nationwide. A scope of work was prepared and competitive procurement was undertaken. The University of Illinois at Urbana-Champaign was selected.

Placing the ETIS Support Center at a university has increased the effectiveness of this information exhange program according to university employee Ms. Lynn Engelman, the project manager of the center. She says, "the university is a logical medium through which to transfer government technology to the private sector." The university, she adds, has many contacts in both government and private sectors, understands each of their needs, and serves as a good liaison between them.

The joint effort approach works to the advantage of CERL, the bureau, and the ETIS user. With the support center assisting the user community in using ETIS, CERL researchers are free to continue their research of the system. CERL researchers are still available through the support center to answer more technical questions on the system's design.

By managing the support center, Engelman points out, "the bureau is able to fulfill its mission of providing support to the planning community." Another benefit of managing the system, she adds, is that university personnel can broaden their own research experience by increasing their awareness of environmental concerns and gaining expertise in computerized information systems.

The biggest winner of this combined effort is of course the ETIS user. The support center operates ETIS at a competitive rate, and also maintains a panel of experts on call from their Institute of Environmental Studies and other university departments. Members of this panel answer questions on environmental consequences of an activity or will assist in interpreting ETIS output. In addition to specialists in a variety of environmental areas, the panel also includes specialists on economics, sociology, and land use planning.

The support center staff communicates over the phone or through the computer and users of the system are very pleased with the assistance provided by the support center.

Users are also eligible for the center's training courses. The center runs two to three workshops a year, said Engelman, and each workshop can orient up to 25 users to the system. CERL personnel assist in the training sessions by demonstrating ETIS programs still being developed.

The support center is staffed by Engelman, two part-time graduate students, and a third student who works during busy periods. At the university's Library Research Center, another four research associates work fulltime to update data bases, primarily in the Computer-Aided Environmental Legislative Data System. Engelman estimates the center recieves an average of 25 to 35 requests for assistance each month. Users connected into ETIS over 11,000 times during FY82.

CERL was affiliated with the University of Illinois in 1968, and this close relationship made the transfer of ETIS from CERL to the university very easy according to Fittipaldi. He points out, "the willingness of the contractors to ask questions and to work closely with us during the transition was a critical factor in the success of this contract." Engelman's familiarity with ETIS also helped greatly since she was formerly a CERL employee.

Additional ETIS information may be obtained from Mr. Ron Webster, U.S. Army Construction Engineering Research Laboratory, P.O. Box 4005, Champaign, IL 61820, commercial telephone (217)373-7230, FTS Telephone 958-7230 or Lynn Engelman, ETIS Support Center, 909 West Nevada Street, Urbana, IL 61801, commercial telephone (217)333-1369, FTS Telephone 957-1369.

The preceding article was authored by CERL Public Affairs Officer Mr. Jeffrey J. Walaszek.

RAM Evaluations for Army Systems

By Ronald L. Simmons

Reliability, availability and maintainability (RAM) are critical factors for every Army materiel system and for materiel in development they are essential elements of performance measured at each program milestone. Relative to fielded systems, RAM criteria determine operating and support costs and troop acceptance.

Determination of RAM values achieved during development tests, projection of RAM values expected during the next development phase, and estimation of RAM values for system concepts and fielded items are the responsibilities of the RAM Division of the U.S. Army Materiel Systems Analysis Activity (AMSAA), Aberdeen Proving Ground, MD.

AMSAA's role in reliability evaluation is rooted in the Ammunition Surveillance and Stockpile Reliability Programs which evolved in Aberdeen's Ballistic Research Laboratory (BRL) prior to World War II. Because its expertise in reliability and statistics was considered valuable to other materiel programs in addition to ammunition, the Surveillance and Reliability Group was tasked by Headquarters Army Materiel Command (now DARCOM) to do comprehensive reliability analyses for a variety of other materiel systems, such as TACFIRE, the M16A1 Rifle, trucks, etc. This led to transfer of the Surveillance and Reliability Group from BRL to AMSAA, as the RAM Division, in 1969 and its formal assumption of responsiblities for Army materiel RAM evaluations.

During the early 1970's, the RAM Division was tasked by AMC Headquarters to design development tests and do RAM evaluations for several materiel systems being developed by the Army and to review some development test plans to see if test quantities could be reduced without decreasing the power of the tests.

As a result of the RAM Division's early assignments, several of the concepts which are now formalized in the RAM community were initiated. Failure definition and scoring criteria, the concepts of mission and system reliabilities, the quantitative basis for reliability requirements and the concept of reliability growth evolved, although not necessarily without debate.

The role which the RAM Division played in these tasks, AMSAA's systems analysis capability, and the Army's desire to emphasize the evaluation portion of test and evaluation resulted in the last major expansion of the RAM Division.

In 1975, as a result of Army Materiel Acquisition Review Committee recommendations, AMSAA received responsibilities for the design and independent evaluation of the development tests of major, designated non-major, and other selected systems. Responsibilities were subsequently added for similar evaluations of product improvements to those systems. These assignments now constitute one of AMSAA's major efforts and create many interfaces between AMSAA, the project offices, the DARCOM major subordinate commands, the Operational Test and Evaluation Agency (OTEA), TRADOC and industry.

It is primarily through these interfaces that AMSAA executes its role as the DARCOM center for RAM methodology. However, continuing dialogue is maintained with leading universities both directly and through the Army Research Office and with our NATO counterparts.

Earlier test and evaluation assignments conducted by AMSAA have now become formalized for developmental systems and the agencies involved have become an "informal RAM community" which guides the process.

The RAM process is governed by AR 702-3, *Army Materiel Reliability, Availability and Maintainability (RAM).* Its application is aided by the joint TRADOC/DARCOM Pamphlet 70-11, *RAM Rationale Annex Handbook.* The process is executed by the core members of the informal RAM community — DARCOM's Product Assurance and Test Directorate, TRADOC's Army Logistics Center, AMSAA's RAM Division, OTEA, and personnel from the development commands and project offices.

It is significant to note that the *RAM Rationale Annex Handbook* is an annex to the Required Operational Capability (ROC) which insures that the rationale for the ROC/RAM values, and the values themselves, are defined early in each development program and are integral parts of the system requirements.

For the major development programs, this process provides, formally, the data base for RAM analyses. It has also introduced a wide community of users and developers to concepts which had been applied earlier only in special cases. Methodology for the analyses remains the responsibility of the independent evaluator. In recent years, major disagreements relative to mathematical models and the interpretation of the data have decreased sharply as the RAM community has evolved.

Scoring of test incidents for chargeability is accomplished in a formal scoring conference through a detailed review of the test incidents and the engineering analyses provided by the contractor, the project office, the tester and anyone who might provide useful information.

The review attempts to determine whether the incident was a chargeable failure or a "no test," i.e., an incident resulting from the test itself, and if chargeable, whether it was a hardware failure, a failure attributed to the operators, or a failure due to improper

procedures given in the equipment manuals.

Scoring is accomplished by a vote of four parties — the materiel developer, the combat developer, the independent development test evaluator and the independent operational test evaluator. Systems which are reviewed at DA or higher level involve the DARCOM Project Office, TRADOC, AMSAA and OTEA.

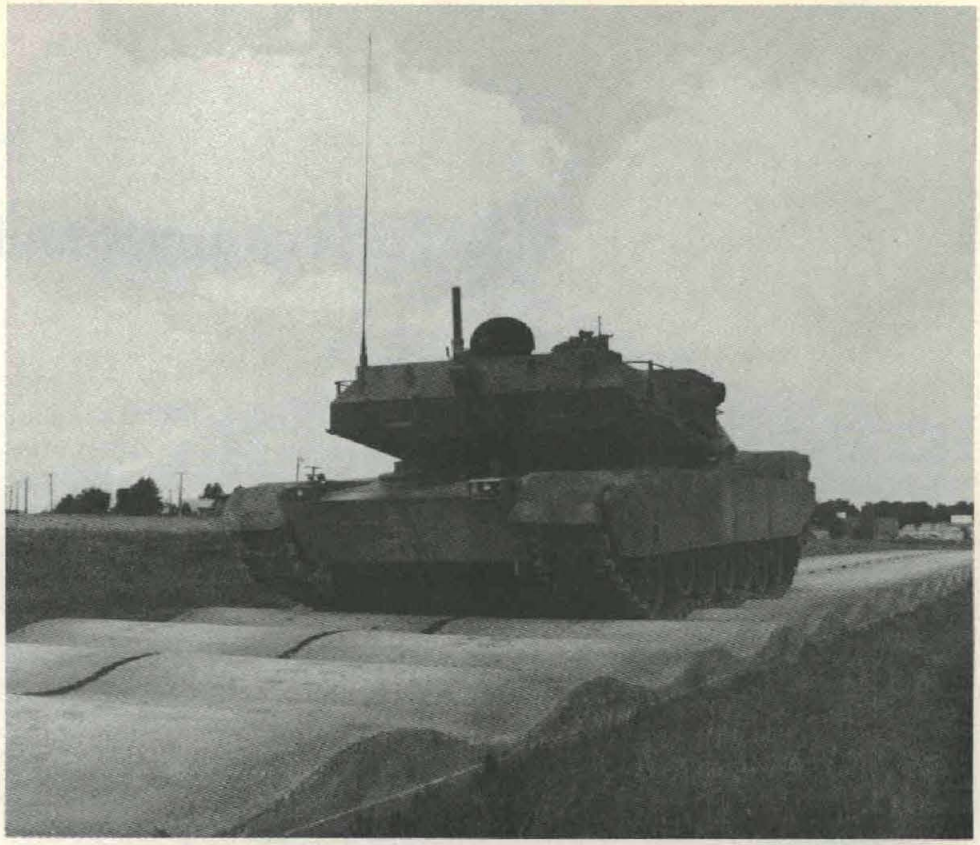
The scoring conference is an exciting forum because program decisions are in the balance. They have worked well and the voting process has become, in the great majority of cases, a vehicle to determine consensus after weighing all available evidence. It has virtually eliminated disagreements among participants and enhanced the credibility of Army evaluations.

If there have been disagreements and, if they are significant, the independent evaluators are free to present their scoring along with the conference scoring. However, in a recent test of a major system, there were only eight disagreements out of 800 test incidences. Hence, the credibility of the process.

It is the Army's goal to arrive at a single reliability value to be reported at the decision review. It is a goal that is unlikely to be met because it is rare that the reliability measured during the development tests and the corresponding operational test represent comparable test items or test conditions.

It must be remembered that the purpose of the development tests is to determine the failure modes across a spectrum of test conditions and to incorporate the fixes. Thus, the configuration of the test equipment may change as the tests progress. It is more likely that the test configuration in an operational test is fixed and that it is used for a short period of intense use in a single environment.

The challenge to AMSAA has been to determine the reliability of the materiel configuration at the end of the test and significant advancement has been made in doing so. Previously, when a fix was made, the failures which had occured in that component were purged from the data base. The result of this was an inflated reliability value — fixes are not 100 percent effective, sometimes the fixes cause new failure modes, and probably not all of the potential failure modes of



M1 tank traverses the washboard portion of the Munson test area. Such trials identify the failure modes in the test-fix-test cycle necessary for realization of reliability growth.

that component had been discovered prior to the institution of the fix.

Efforts to develop more precise reliability estimates have resulted in the widespread adoption and use of reliability growth tracking as the preferred method for assessing end of test reliability.

AMSAA's reliability growth analyses recognized the utility of planned reliability growth curves as management tools. This helped insure that adequate test times were provided for in the development programs and helped track the growth that had occurred. It also helped to estimate the present reliability, and project a reliability at some future time.

It was found that for many items the failure rate after t units of testing, r(t), can be represented by the equation $r(t)=\lambda B t^{b-1}$ where λ and B are parameters which determine the scale and the shape of the curve. This is now known as the AMSAA reliability growth model. It is fully developed in *MIL Handbook 189 Reliability Growth Management.*

A further refinement is currently under development. Based on some case histories of systems developed for the Army, we are developing a data base for determining the change in failure rate resulting from incorporated fixes. Combining these data with the reliability growth tracking techniques has proved to represent test results quite faithfully for systems such as the Black Hawk Helicopter.

Initial attempts to use this combination in the development programs for PLRS (Position Location Reporting System) and M9 ACE (Armored Combat Earthmover) have been favorably received by both the contractors and the project offices. Consequently, we are convinced of the utility of the procedure and feel that efforts to encourage use of it should be promoted.

This work gives us more confidence in the reliability projection at the end of the next program phase. However, it is empirically based and the projection is made over a short duration. There is no data base which permits the estimation of the reliability of a mature system which now exists only in concept.

For electronic components, there are handbook values for failure rates in MIL STD 217 and there are adjustment factors to reflect varying en-

vironmental conditions. However, as yet there is no satisfactory way to estimate system reliability from the component data.

Relative to mechanical components, we are not that advanced. AMSAA, in a task undertaken through The Technical Cooperation Program (with the United Kingdom, Australia, Canada and New Zealand), has initiated the development of a handbook for the estimation of reliability of mechanical systems. The first step resulted in a draft handbook for the estimation of the reliability of valves. It is undergoing widespread review to determine its utility. In any event, it would be expected that such component data could, at best, only slightly reduce the requirement for systems tests to establish reliability.

The severest criticism within the Army, directed at reliability evaluations, is that they require long test times and large sample sizes. AMSAA is very sensitive to this view. It challenges us to present program risks associated with alternative test plans so that they are clearly understood by program managers and decision makers.

We are also challenged to insure that the generated values are appropriately interpreted with respect to the risks associated with statistical values.

Our objective is to insure that the decision makers are aware of these risks when they define program and duration. In making these decisions they influence the test plan–or at least the extent of testing–just as directly as the test design planners do.

The test actually carried out is that for which decision makers, at whatever level, provide funds, test samples, and program time. Thus, the test program which is executed is not independently established by the evaluators.

Tests which generate the reliability values are also analyzed for an evaluation of maintainability and at times are augmented by special tests to measure specific times associated with specific maintenance tasks. The output of the maintainability evaluation is usually limited to the determination of the maintenance ratio, i.e., manhours expended in active maintenance divided by the number of system life units (hours, rounds, or miles) and the distribution of times to repair.

The values thus calculated are more indicative of the order of magnitude of the real values rather than precise values. For example, development and operational tests are too short to cause a large number of maintenance actions, and the principal thrust is to generate performance data rather than maintainability data so that contractor engineers influence a high percentage of the maintenance actions.

Additionally, the development of the test hardware always precedes the development of test sets, manuals and special tools, etc. The Army however, is becoming much more sensitive to maintainability because of the increasing complexity of equipment and its requirement for built-in-test equipment (BITE) or test measurement diagnostic equipment.

An evaluation of BITE is now an integral part of the materiel evaluation and it requires the same rigor as the reliability assessment of the materiel itself. It is anticipated that analyses of maintainability growth will become institutionalized like reliability growth.

The major part of the *RAM Rationale Annex Handbook* is concerned with availability. From the test data, we regularly determine the inherent availability which measures the hardware performance. We can also determine the achieved availability during the test but, because this measure is test specific, it is of little use.

Operational availabilty is a product of extensive analyses and is very difficult to establish with credibility and to use correctly. Recently, the TRADOC and DARCOM commanders agreed that the primary RAM parameter to be given in the requirments document is operational availability. Two pilot programs were identified to determine the feasibility of its use in the requirements process.

Operational availability is a function of both the materiel performance and the logistics concept designed to support it, i.e., it is dependent on usage rates and modes and supply rates in addition to reliability. The representation of these parameters in the spectrum of scenarios remains a formidable analytic task. As a result, reliability and maintainability remain the essential parameters for measurement of equipment performance.

Significant progress has been made recently with respect to RAM evaluations in both the developer and user communities and it is visible to the decision makers. Clearly, there are additional areas for continued emphasis and pursuit. The current RAM community provides an excellent framework within which requirements for additional advancements can be identified. The increasing complexity of materiel systems provides major challenges in representing reliability, availability and maintainability in their most useful form.

MR. RONALD L. SIMMONS is chief, Reliability, Availability and Maintainability Division, U.S. Army Materiel Systems Analysis Activitiy. One of his primary responsibilities is supervision of AMSAA's studies of RAM methodology. He holds a bachelor's degree from St. John's College, Annapolis, MD.

Should Cost at AMCCOM

By John F. Dietz

- *"U.S. Contracts Go To Cheaters"*
- *"Report Raps M1 Tank As Too Expensive, Unreliable"*
- *"Defense Department Wastes Millions Of Dollars"*
- *"Soaring Costs Cut Weapon Numbers"*

Sound familiar? You bet! No element of the Federal budget receives as much attention and scrutiny as does defense spending, and justifiably so. However, while sound defense posture is both necessary and costly, it need not create headlines such as those shown above.

Given the current status of global affairs, a struggling domestic economy, and the ultra-sophistication of modern weaponry, the need to procure the most defense for the least dollar spent is perhaps more urgently required now than ever before.

As always, however, the essential question is "how?".

An approach which the U.S. Army Armament, Munitions and Chemical Command (AMCCOM) Rock Island, IL, is finding to be beneficial is that of the Should Cost analysis. Simply stated, it attempts to accomplish what its name indicates — determination of what an item or service "should cost" a contractor to produce rather than what it "will cost" the government to procure it.

The concept of discovering what a product or service "should cost" is relatively young. Conceived and utilized initially in the private sector, the DOD has made use of it for slightly more than a decade. Department of the Army Regulation 1-337 addresses the concept and its application.

Until the publication of DARCOM Regulation 715-92 in April of 1982, AMCCOM performed only a handful of such analyses each year. The new regulation, however, mandated full Should Cost studies on *all* sole-source acquisitons in excess of $25 million (level A) and less intensive studies for acquisitons in the $10-25 million range (level B).

This new regulation prompted the establishment of an office within AMCCOM's Procurement Directorate to implement the expanded Should Cost effort. It has been allotted 12 personnel spaces and is headed by a GS-14, supervisory procurement analyst. The office has been physically separated from the directorate and currently occupies some 17,000 square feet and has facilities to accommodate up to 14 teams simultaneously.

The Should Cost analysis is the most rigorous and detailed procedure currently available for the evaluation of a contractor's proposal. It not only uses existing tools, e.g., audits, cost/price analyses, but also broadens, lengthens, and deepens their applications while adding a number of novel approaches.

The analysis is accomplished by forming a team of 15-25 individuals from various disciplines and organizing them into three subteams: engineering, pricing, and managment. Ideally, the team is fully staffed and functional when the proposal is received.

Approximately three weeks of planning precede the team's up to six weeks on-site evaluation of the contractor's operations. This on-site phase attempts to verify or challenge the proposal data and to identify methods by which operational efficiency may be improved.

Following its return from the evaluation site the team prepares its findings for negotiation, and the team chief then releases members to return to their normal assignments as elements of the final report are completed. A majority of teams should be disbanded within three months of their initial organization. Some of the larger and more complex procurements, however, have required some key members to remain somewhat longer.

From initiation to completion, each Should Cost team strives to accomplish three principal objectives:

- Development of supportable negotiation positions.
- Identification and negotiation of improvements in the contractor's manufacturing and management operations in order to obtain maximum efficiency and economy in all areas of cost and performance for both the instant and future contracts.
- Identification of non-essential government requirements which increase costs.

The AMCCOM Should Cost Office has been functional for only 15 months. During this short time, however, two incontrovertible facts have crystallized:

- The Should Cost concept provides impressive, immediate returns as well as anticipated, future benefits.
- The heavy personnel demands create potentially damaging consequences.

The principal value of a Should Cost resides in what we commonly call "cost avoidance." The term "cost saving," although more common, cannot, from a purist point-of view, be used. The analysis replaces the normal evaluation procedures and thereby makes a true comparison of "savings" impossible. This should not be construed to mean, however, that significant reductions in costs are not realized. It simply reflects a desire to avoid semantic confusion.

The instant return from a Should Cost analysis is generally believed to be significant. The effort also produces "cost avoidances" as negotiated improvements are implemented and reduce the costs associated with follow-

	FY 82		FY 83	
Candidates	11	(8*)	26	(5*)
Value	$981M	($598M)	$2.4B	($407M)
Negotiated	–	($543M)	–	($376M)
Cost Avoidance	–	($55M)	–	($32M)
Personnel	187		375	

*completed

Raw numbers, cost avoidance and personnel used for AMCCOM's Should Cost effort.

on acquisitions. This effect has already been tracked in our studies. (See accompanying table.)

A dominant, overriding concern of the Should Cost Office has been the recruitment of motivated and qualified individuals to staff the Should Cost teams. The expanded Should Cost mission was not accompanied by a corresponding personnel increase.

Success of the analysis is directly proportional to the *quality* of the team members. The effort requires intensive, detailed work, often conducted under adverse conditions. Only dedicated, experienced personnel can be expected to function successfully under such constraints. Such individuals are, understandably, considered essential to their normal work positions, and their supervisors are hesitant to release them.

As an incentive, this office has offered temporary promotions and a liberal awards program. Even with these incentives, many otherwise qualified employees find it impossible to devote the time required to the Should Cost effort.

This drain of highly competent employees has created a substantial, real burden. In spite of the difficulties involved, the AMCCOM family has responded well to the challenge of Should Cost.

The demands generated by the Should Cost analysis are myriad and monumental. From the initial proposal through the formation of a team and the on-site evaluation to the signed contract, the analysis demands close cooperation and coordination among different disciplines and activities.

Because the analysis is comprehensive in scope and intensive in effort, Should Cost team members gain valuable experience. The analysis exposes each member, already knowledgeable in one phase, to the entire range of acquisition activities, including the manufacturing of the product itself.

The Should Cost experience enhances each employee's understanding of the critical function which each office plays in the acquisition process. Most team members return to their offices with a sense of personal satisfaction and with renewed appreciation for their normal duties.

The Should Cost Office has taken several innovative steps to fulfill this mission, some of which are described briefly below.

In order to alleviate personnel shortfalls, we have used procurement interns, military procurement officers, rehired annuitants, and employees of other DOD activities to staff the teams. This combination of personnel from different disciplines, the civilian and military sectors, the retired professionals, and the newcomers, has produced welcome dividends for the Procurement Directorate.

The most common reaction to the Should Cost experience that team members offer as they return to their regular assignments is that it is a "great learning experience." Even seasoned employees remark that their weeks with Should Cost have taught them more about the acquisition process than their many years of on-the-job experience.

Additionally, the Should Cost Office has used the Army's program of hiring faculty members from minority colleges in the summer. Thus far, two professors have worked eight man-months in the Should Cost effort.

To prepare employees for the analysis, the Should cost Office also conducts a 3-day training workshop for volunteers. This workshop outlines the Should Cost process and includes a discussion with battle-scarred team chiefs who share their experiences and field questions. To date, more than 250 individuals have completed the workshop and rate it as a valuable introduction to the Should Cost concept.

Because time and flexibility are crucial, we have also automated whenever possible. Currently, 15 portable data terminals and 19 portable multi-purpose microcomputers are in use by teams in the field.

Additionally, a data bank of shared Should Cost findings and joint efforts by other DOD activities, though in a formative stage, have paid early dividends in time savings and more effective analyses.

Many procurements will meet the criteria for Should Cost and qualify for an analysis in successive years. This repetitive nature, the need to establish significant cost avoidance, and the principle of diminishing returns have led AMCCOM to initiate an "issue oriented" approach. This philosophy recognizes the value of earlier Should Cost findings and reduces subsequent efforts in order to elimate costly duplication. Previous studies often direct current teams to areas of cost, which require additional emphasis.

Contractors, while not overjoyed at the prospect of having government employees at their plant for several weeks, have responded favorably to this Should Cost requirement. Contractors acknowledge that increased economies are in the nation's best interest.

Critics of the Should Cost concept often question the ability to conduct such an in-depth evaluation of the private sector. The determination of a fair and reasonable price for a quality product has been, is, and will continue to be, a prime objective of DOD procurement.

The vigilant stewardship of public funds is a responsibility which cannot be minimized or delegated or entrusted to "business as usual" procedures. Should Cost is assuming a vital position as a new, positive means of meeting that responsibility.

The Should Cost analysis is a simple, sound concept whose name adequately describes its intent. Although still fairly young, the experience at AMCCOM, Rock Island, is confirming its effectiveness and value. Perhaps sometime soon, we will see a headline which reads: "DOD Saves Millions With Should Cost Program." That, for a change, would be nice!

MR. JOHN F. DIETZ is Should Cost coordinator and chief of the Should Cost Office at the U.S. Army Armament, Munitions and Chemical Command, Rock Island Arsenal, IL. He holds a master's degree in procurement and contract management from Florida Institute of Technology.

"HYDRA 70" – What's in a Name?

By Robert Brock

The original 2.75 Inch Rocket was developed in the early 1950's by the Navy as an air-to-air weapon, and was nicknamed "Mighty Mouse." However, since the mid-1960's, the tri-service 2.75 Inch Rocket system has been used and managed by the Army, but until recently has not had an official, approved popular name.

Recent system improvements, which include an increased stand-off engagement range capability for all Army attack helicopters, greater system accuracy and performance, increased firepower and system effectiveness, and a multi-target engagement capability, have resulted in the need for naming this "new and improved" generation to distiguish it from the original 2.75 with its Vietnam-era reputation for inaccuracy and limited effectiveness.

Accordingly, the improved rocket family was recently named "HYDRA 70" by the Army. "HYDRA", in Greek mythology, was a many-headed serpent. Every time Hercules chopped off a head of the serpent, two grew back in its place. The rocket diameter in millimeters is "70."

To achieve major system improvements, the HYDRA 70 Rocket Management Office (RMO) at the U.S. Army Missile Command, Redstone Arsenal, AL, has developed a new generation of warheads, fuzes, rocket motor and launchers to adapt to the needs of the Army's modernized Cobra and Apache Attack Helicopters.

Under a cooperative program with the Army, the U.S. Navy Ordnance Station, Indian Head, MD, served as design agency in developing the MK66 Mod 1 Rocket Motor. The U.S. Army Armament R&D Command's (now Army Armament, Munitions and Chemical Command) Large Caliber Weapon Systems laboratory, Dover, NJ, and the U.S. Army Missile Command's Missile Laboratory, Redstone Arsenal, AL, were the design agencies responsible for fuze/warhead and lightweight launcher developments, respectively.

The improved HYDRA 70 Rocket includes the Multipurpose Submunition (MPSM) Warhead with a cockpit remote range settable M439 Fuze, the High Explosive (HE) 10-pound warhead with a cockpit remote settable multioptional M433 Fuze (HERS Rocket), the fixed stand-off range Illumination Warhead, the fixed stand-off range Screening Smoke Warhead, the extended range and more accurate spin stabilized MK66 Mod 1 Rocket Motor and the 7 and 19 tube Lightweight Rocket Launchers which are compatible with and required for the new warhead/fuze/motor combinations.

Initial procurement of the MPSM Warhead with MK66 Mod 1 Rocket Motor began in FY 82. Initial production of the HERS Rocket was completed in December 1982, and these rockets are undergoing world-wide distribution. Illumination rockets and the initial production quantities of lightweight launchers also have been fielded. Screening Smoke Warheads are scheduled to be released in September 1984.

What do all these improvements mean? First, the new M260 (7-tube) and M261 (19-tube) Lightweight Launchers give the pilot of the aircraft the capability to independently set the mode of operation and the function range for the new electronic rocket fuzes from the cockpit.

Second, the new MK66 Mod 1 Rocket Motor also has the capability of delivering a variety of warheads to ranges in excess of 6,000 meters, *accurately*. Additionally, the new HERS Rocket allows the pilot to select superquick, bunker penetration or canopy penetration (targets under trees) functioning of the HE Warhead.

Finally, the new MPSM Warhead provides an accurate "fire and forget" system for suppressing multimedia area targets. The MPSM Warhead alone increases the lethal effectivenss and ability of HYDRA 70, to include:

- The ability to engage a variety of battlefield area targets comprised of materiel, personnel and light armor.
- The ability to engage targets by direct or indirect fire out to 6,000 meters with the additional capability to select the range through the use of a cockpit remote range settable fuze.

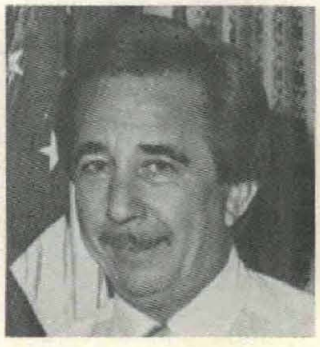
To assess how potent the MPSM Warhead is, consider the fact that just one of the nine M73 Grenades delivered by the warhead yields a lethality against prone personnel targets comparable to one standard 10-pound unitary HE Warhead of the Vietnam-era rocket. Considering some pattern overlap in deploying the new M73 Grenades, a single MPSM Warhead possesses a lethal area much greater than the unitary HE Warhead.

The M73 Grenade shaped charge will also perforate light armor and, through controlled fragmentation, penetrate materiel/vehicular targets. The target engagement opportunities of this versatile warhead are virtually unlimited.

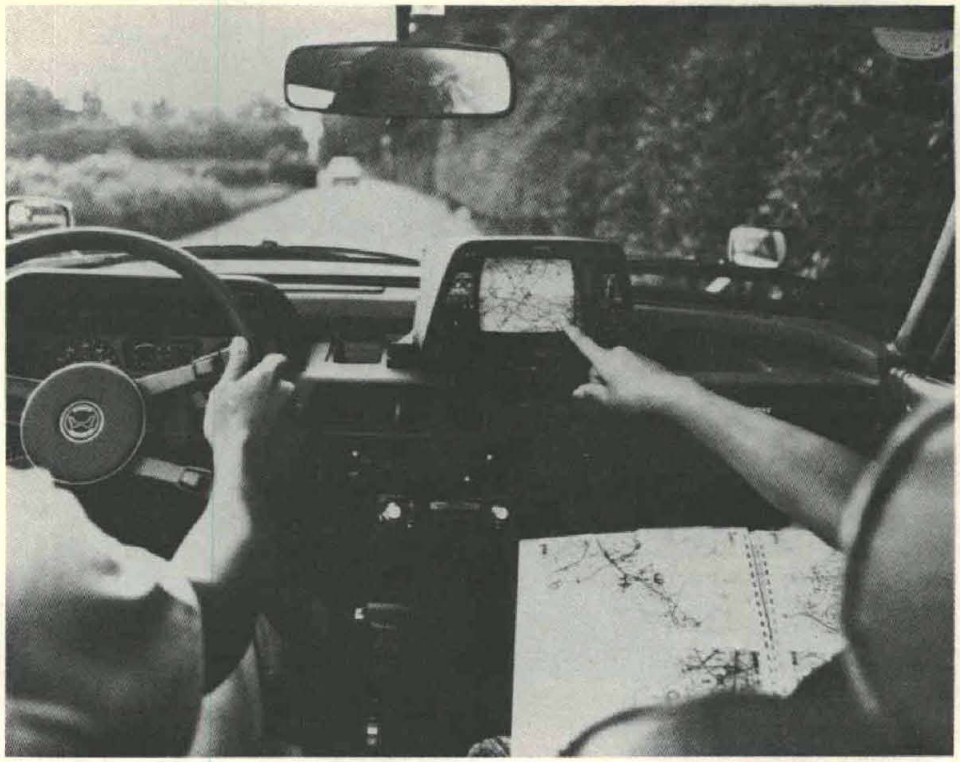
The U.S. Army Materiel Systems Analysis Activity has noted that the improved lethality and accuracy of the MPSM Rocket with the upgraded ability of the latest Attack Helicopters to precisely deliver the rockets, improves system effectiveness over the Vietnam-era system. Hence, the need to distinguish the new rocket family with the HYDRA 70 name, and thereby dispel any misconceptions that may linger from user experience with the old "Mighty Mouse" vintage rocket.

What's in a name? HYDRA 70 is an extremely accurate fire and forget system capable of engaging a large variety of targets... *effectively*. Coupled with the Modernized Cobra and new Apache Attack Helicopters' Rocket Management and Fire Control Systems, HYDRA 70 will substantially increase system performance and effectiveness while reducing aircraft attrition.

MR. ROBERT BROCK is a general engineer in the HYDRA 70 Rocket Management Office. He is currently serving as test director for RDTE programs and is also a project engineer responsible for development and production of fuzes and warheads. He holds BS and MBA degrees from Hofstra University.



Vehicle Maneuvering Aid Features Fluidics Technology



The navigation aid display is designed to sit up front of the operator where he can quickly check his position on the map against the land markings he is passing. If the display on the map does not match the terrain he can easily adjust the display of his position on the map to coincide with his actual position on the ground.

The Army is developing a simple, rugged, low cost battlefield navigation aid designed to increase the maneuvering accuracy of combat and logistics vehicles over unfamiliar terrain. Soldiers will reportedly need this aid to traverse the highly mobile and ever-changing battlefield of the future.

The aid uses fluidic technology pioneered by the Army Electronics R&D Command's Harry Diamond Laboratories (HDL) two decades ago. Fluidics is a way to build sensing and control systems with no moving mechanical parts. It can produce systems with low initial costs, high reliability, and little or no maintenance requirements.

Early research in this field by HDL has been adopted by the Honda Motor Co., Ltd., which built an inertial navigation system for its Accord passenger cars in Japan. A fluidic angular rate sensor is used to track the turning of the vehicle.

HDL has mounted an improved and modified version of the Honda navigation aid on a 4-wheel drive vehicle that is available to other Army agencies for test and evaluation.

The first all-Army fluidic navigation aid will consist of a heading reference unit. The device enables a vehicle operator to manually enter the bearing of the vehicle into the unit and the sensor keeps track of changes in that bearing.

By early 1984, the Army expects to have a first-generation battlefield navigation aid system that uses a state-of-the-art flat panel display and a heading reference sensor to perform a more complex navigation function. The electroluminescent flat panel display was developed for military applications by the Army Electronics Technology and Devices Laboratory, Fort Monmouth, NJ.

The system will display a vehicle's position, heading, and course as a series of luminous dots on a display screen and provide a printed standard digital readout of coordinates and bearing.

To use the aid, the driver sets the graphic position and heading indicator at his approximate location and drives off in a known direction. After about half a kilometer, the driver can align the displayed track with a map overlay showing geographical landmarks such as roads, contour lines, buildings and streams and enter the coordinates and bearing of the position and bearing indicators on the map. The navigation aid will then keep track of the vehicle's position.

The battlefield navigation aid is aimed primarily at giving the combat commander a tool to locate himself and his unit on the battlefield. However, it also enables logistics support vehicles to find their way from rear-area supply points to combat units that are frequently displaced.

Date Announced for 1984 Power Sources Symposium

Technical papers describing current and future work related to batteries and other power systems will be presented during the 31st Power Sources Symposium, 11-14 June 1984, at Atlantic City, NJ.

Sponsored by the U.S. Army Electronics Technology and Devices Laboratory in conjunction with other DOD agencies, the Communications Satellite Laboratories, NASA, and the Department of Energy, the meeting will feature 11 unclassified technical sessions devoted to topics such as fuel cell systems, rechargeable batteries, and thermoelectric power sources.

Additional symposium information is available from: Mr. Carl Berger, Power Sources Division, ATTN: DELET-P, U.S. Army Electronics Technology and Devices Laboratory, ERADCOM, Fort Monmouth, NJ 07703, or commercial telephone (201) 544-2084 or AUTOVON 995-2084.

DARCOM Program/ Project/ Product Managers

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ASH

COL William H. Forster

ADCCS

COL David L. Wyatt

ASE

COL Curtis J. Herrick

BFVA

COL Thomas K. Seybold

BFVS

BG Claude B. Donovan

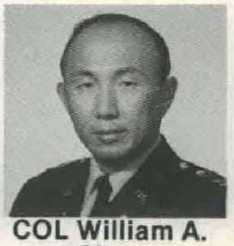
CAWS

COL John Kronkaitis

CH-47

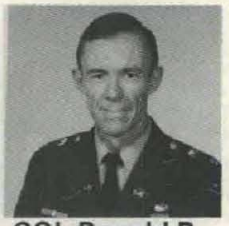
COL Norbert I. Patla

CHAP/FAAR



COL William A. Chen

COBRA



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COL Howard W. Roth

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JTACMS

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LAV

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COL Richard C. Dean

RPV

COL Robert D. Evans

TADS/PNVS

COL Donald P. Wray

TMAS

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COL Donald R. Kenney

Shown on these pages are DARCOM's program/project/product managers. This listing is correct as of 11 October 1983. Additional information regarding the Program/Project/Product Manager Program may be obtained from the Project Management Division, DEA, ATTN: DRCDE-M, HQ, DARCOM, 5001 Eisenhower Ave., Alexandria, VA 22333. Phone Autovon 284-9570, or Commercial (202) 274-9570. A listing of acronym definitions is on page 17.

ARD

LTC John A. Longhouser

ATACS

COL Glen L. Rhoades

ATSS

LTC John R. Power, Jr.

BLACK HAWK

COL (P) Ronald K. Andreson

CCE/SMHE

LTC Leroy W. Paul

DCS (ARMY)

BG Bruce R. Harris

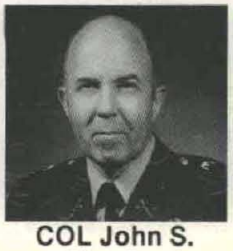
DIVAD

BG Charles C. Adsit

FATDS

COL Paul T. Wickliffe

FIREFINDER/ REMBASS



COL John S. Chesbro

HAWK

COL John S. Drosdeck, Jr.

M9/ACE

LTC Robert F. Huttner

M60

Photo Not Available

Mr. Fred Pradko (Acting)

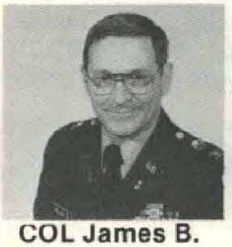
M113

LTC (P) James A. Logan

MEP

COL Michael S. Higgins

MPG



COL James B. Welsh

MICNS

LTC James A. Love

PERSHING

COL William J. Fiorentino

PSE

COL Robert K. Cornell

PLRS/TIDS

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Mr. Harold H. Bahr (Acting)

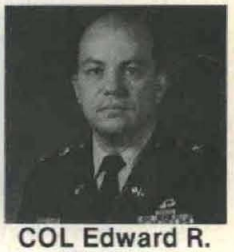
SATCOM

COL Charles F. Lindberg

SANG

VACANT

SINCGARS



COL Edward R. Baldwin

TMDE

Photo Not Available

Mr. Neal Atkinson (Acting)

TMOD

Photo Not Available

LTC Robert C. White

TOW

COL Bryon L. Powers

TRADE

COL James W. Ball

US ROLAND

Mr. John Robins (Acting)

VIPER

COL Robert T. Walker

Aircraft Exchange Program Keeps Technology Current

Five OV-1 Mohawks and their crews ready for departure from Grumman Aerospace Corporate Depot Facility, Stuart, FL, to Germany and Korea.

The OV-1 Mohawk and its AN/APS-94 Side Looking Radar have provided the Army's only corps level, airborne surveillance capability since 1960. However, this does not mean that time has stood still in the technology utilized in this system which provides battlefield commanders with imagery on fixed and moving targets.

To keep up with the rapid changes in technology and opposing threats, the Special Electronic Mission Aircraft (SEMA) Product Managers Team, consisting of the U.S. Army Aviation Systems Command, the Electronics R&D Command's Combat Surveillance and Target Acquisition Laboratory, Motorola Government Electronics Division, and Grumman Aerospace Corp. have continually updated this system.

The latest configuration currently being fielded, known as the AN/UPD-7 Radar Surveillance System, includes the AN/APS-94F Radar, AN/AKT-18B Digital Data Link Transmitting Set mounted in the OV-1D aircraft and the AN/TKQ-2B Receiving Set mounted in an M-880 light duty truck. This sixth-generation system further increases the quality, speed & reliability of the intelligence collecting process.

Imagery is simultaneously displayed on an RO-495/U Recorder/Processor/Viewer aboard the aircraft and in the ground station as it is collected, and hardcopy film of the mission is provided for later reference.

The replacement of old systems with new systems is orchestrated for maximum continuity in operational capability through a direct exchange program of aircraft. The picture above shows five Mohawks and their crews led by LTC Paul Tanguay, assistant product manager for ELINT/Surveillance Systems, SEMA PMO, as they departed Stuart, FL, enroute to Korea on 16 September 1983.

Most people might consider ferry flights of Army aircraft to Europe and Korea an unusual event. However, SEMA crews have come to consider this challenging mission almost a routine matter. These flights, which include 80 hours of flying time, involve visits to 18 countries during the course of the trip and consist of anywhere from 2 to 6 aircraft in a flight.

After delivering the newly updated aircraft to the field unit, the crews will return to the Grumman depot with older equipment which will be inducted for programmed aircraft restoration or incorporation of engineering changes, depending on their condition and configuration.

Technical Escort Unit Performs 'Unique' Mission

Although the first large-scale use of chemical warfare occurred during World War I, it wasn't until World War II, in 1943, that the need for a specially trained and equipped unit to accompany chemical agents to all theaters of the war was recognized.

This prompted the establishment of the Guard and Security Section of the Chemical Warfare Service, forerunner to the present Technical Escort Service (TEU). Today, TEU, an element of the U.S. Army Armament, Munitons and Chemical Command, can look back on a history of accomplishment unlike that of any other defense organization. This is because the unit itself is unlike any other.

Located at Aberdeen Proving Ground, MD, the unit has been renamed many times but the mission has remained constant...."to perform escort, disposal, demilitarization, decontamination, safety and related security duties in connection with the handling and movement of hazardous types of chemical, biological, and radiological agents, munitions and related items in the United States and overseas."

Initially, the Guard and Security section operated from its Alabama location until February, 1944, when it was moved to Edgewood Arsenal, MD. A year later the section was redesignated the 9710 Technical Service Unit, Guard and Security, and became a separate organization authorized to carry out its own functional operations.

Until 1946, the duties of the unit were limited for the most part to accompanying shipments of chemical munitions. However, at the end of World War II, a new task arose — disposing of the thousands of tons of unused chemical agents that had accumulated since the beginning of the war.

However, no one was prepared for this job. No guidelines had been devised for the destruction of poison gases. The Technical Service Unit, to which this responsibility fell, was therefore required to develop the procedures for disposal as well as carry them out.

The first disposal mission of the unit occurred in 1946 when a team was sent to Germany to dispose of captured German chemical munitions. In 1947, munition disposal, decontamination, and demilitarization became an official function of the Technical Service Unit.

In 1969 the name of the unit was changed again, this time to its present designation of Technical Escort Unit.

Under the command of LTC John M. Moerls, the Technical Escort Unit is comprised of 17 officers, 100 enlisted personnel and 5 civilian employees.

Acronym List of DARCOM Program/Project/Product Managers

(See pages 16 and 17)

AAH . . . . . Advanced Attack Helicopter
ASH . . . . . Advanced Scout Helicopter
ADCCS . . . . . Air Defense Command and Control System
ASE . . . . . Aircraft Survivability Equipment
ARD . . . . . Armored Training Devices
ATACS . . . . . Army Tactical Communication Systems
ATSS . . . . . Automatic Test Support Systems
BFVA . . . . . Bradley Fighting Vehicle Armament
BFVS . . . . . Bradley Fighting Vehicle Systems
CAWS . . . . . Cannon Artillery Weapons System
CH-47 . . . . . CH-47 Modernization Program
CHAP/FAAR . . Chaparral/FAAR
CCE/SMHE . . . Commercial Construction Equipment & Selected Material Handling Equipment
DCS(ARMY) . . Defense Communications Systems (Army)
DIVAD . . . . . Division Air Defense Gun
FATDS . . . . . Field Artillery Tactical Data Systems
HET . . . . . Heavy Equipment Transporter Systems
HELLFIRE/GLD HELLFIRE/Ground Laser Designators
JTACMS . . . . . Joint Tactical Missile System
LAV . . . . . Light Armored Vehicles
M1 . . . . . M1 Abrams Tank System
M1E1 . . . . . M1E1 Abrams Tank
M9/ACE . . . . . Armored Combat Earthmover
M60 . . . . . M60 Tanks
M113 . . . . . M113/M113A1 Family of Vehicles
MEP . . . . . Mobile Electric Power
MPG . . . . . Mobile Protected Gun
MICNS . . . . . Modular Integrated Communications and Navigation System
MLRS . . . . . Multiple Launch Rocket System
MSCS . . . . . Multi-Service Communications Systems
9MM . . . . . 9MM Pistol Program
NUC/MUN . . . . Nuclear Munitions
OPTADS . . . . . Operations Tactical Data Systems
PSE . . . . . Physical Security Equipment
PLRS/TIDS . . . Position Location Reporting System/Tactical Information Distribution Systems
SATCOM . . . . . Satellite Communications
SANG . . . . . Saudi Arabian National Guard Modernization Program
SINCGARS . . . Single Channel Ground and Airborne Radio Subsystem
SMOKE . . . . . Smoke/Obscurants
SEMA . . . . . Special Electronic Mission Aircraft
RPV . . . . . Tactical Airborne Remotely Piloted Vehicle/Drone System
TADS/PNVS . . Target Acquisition Designation System/Pilot Night Vision System
TMAS . . . . . Tank Main Armament System
TMDE . . . . . Test Measurement and Diagnostic Equipment
TMOD . . . . . TMDE Modernization
TRADE . . . . . Training Devices

New Technique Unveiled For Detecting Nitroglycerin Contamination In Soil

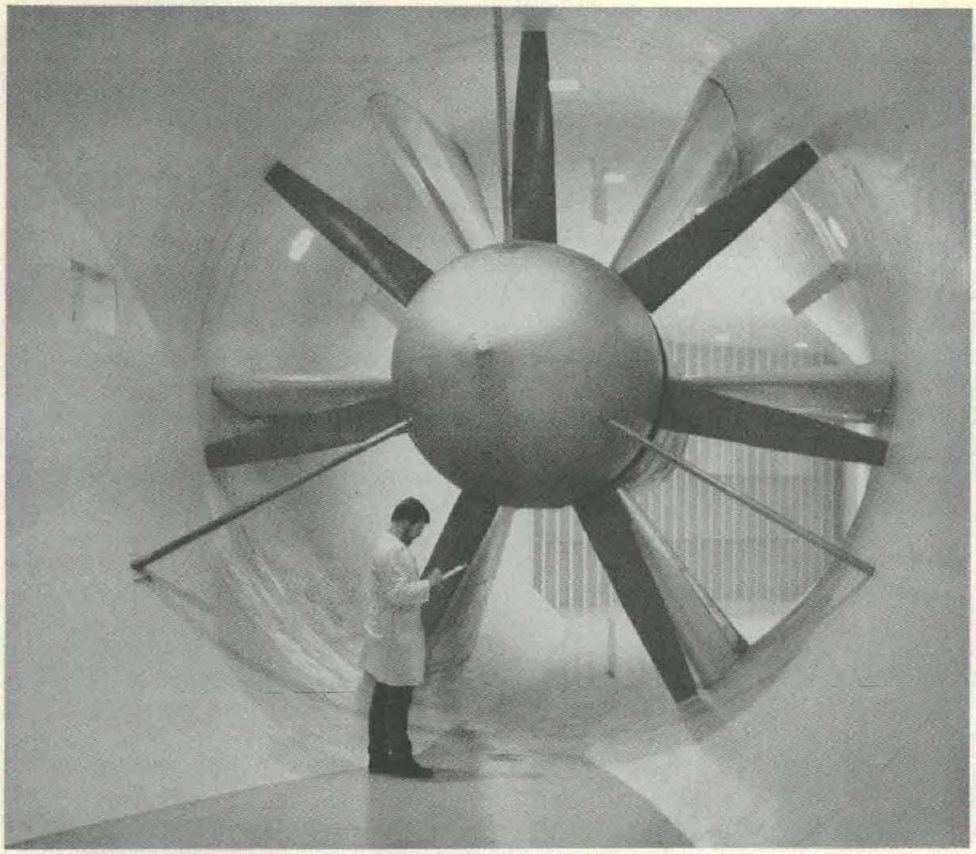
Development of a new method for detecting nitroglycerin contamination in soil has been announced by the Army Armament R&D Center, Dover, NJ. Dr. T. H. Chen, a research chemist and acting chief of the Analytical Section, Large Caliber Weapon Systems Laboratory, devised the new method as part of the Installation Restoration R&D Program for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA).

The new method, which contributes to an ongoing Army pollution abatement environmental control program, involves use of a new gas chromotograph technique to detect one part per million nitroglycerin in soil.

Chen, who was assisted in his work by Mr. Lorenzo Piparo, a science and engineering intern, reports that the detection method can be used by contractors to detect and quantify levels of nitroglycerin in soil. Chen is in the process of submitting a procedure to USATHAMA which will be put on a computer file for contractor use.

"Our program provides input to USATHAMA in its effort to have Army installations meet Environmental Protection Agency guidelines for all pollutants," said Chen.

In order to use the gas chromotograph method, one must first get a soil sample and air dry it. A small portion of soil is then mixed with the solvent, ethylacetate, which separates nitogenous compounds from soil. The compounds are then inserted into the injection post where they are heated to a set temperature and moved by the carrier gas. The gas carries the compounds through special columns that separate nitrogen compounds such as nitroglycerin and TNT according to their physical-chemical characteristics. About 20 minutes after injection, nitroglycerin can be detected and measured.



Drive fan of the Glenn L. Martin low-speed wind tunnel.

The development of rotary wing aircraft is some 40 years behind the development of fixed wing aircraft. The allocation of funds for research and development has been relatively small, yet tremendous gains have been made in the rotorcraft field. There is also a lack of formal training in the universities in the rotary wing aircraft field. Some universities offer introductory courses, but there remains a need for specific programs at the undergraduate and graduate level. ("Editors Corner," Vertiflite *May/June 1982).*

Army Research Office Establishes Centers of Excellence

By Dorothy Jean Killian

The Engineering Division at the U.S. Army Research Office (ARO), Research Triangle Park, NC, has initiated the establishment of three Centers of Excellence in Rotary Wing Aircraft Technology. Dr. Robert Singleton, division director, explains: "In rotorcraft technology, there were not enough educational opportunities for our undergraduate and graduate population to specialize in those fields of particular importance to the rotorcraft field, thus the helicopter industry bore the burden of this required additional training.

"Research in the field was supported at a relatively modest level compared to the fixed wing technology community. Though the problem was recognized both in the division and in the Army aviation community, there were not sufficient fiscal resources to alleviate the problem. However, in the spring of 1980, a panel commissioned by the Assistant Secretary of the Army for RD&A conducted a vertical lift technology review and recommended the establishment of a small number of Centers of Excellence in rotary wing technology among respected U.S. universities and colleges."

With this mandate, the necessary funding ($1.2 million) was made available in FY82 to initiate three Centers of Excellence. On July 1, 1982, the first was established at Georgia Institute of Technology and the second at Rensselaer Polytechnic Institute.

The third center was initiated with FY83 funds on November 22, 1982 at the University of Maryland. The total fiscal outlay for the program during the 5-year period is a little over $13 million.

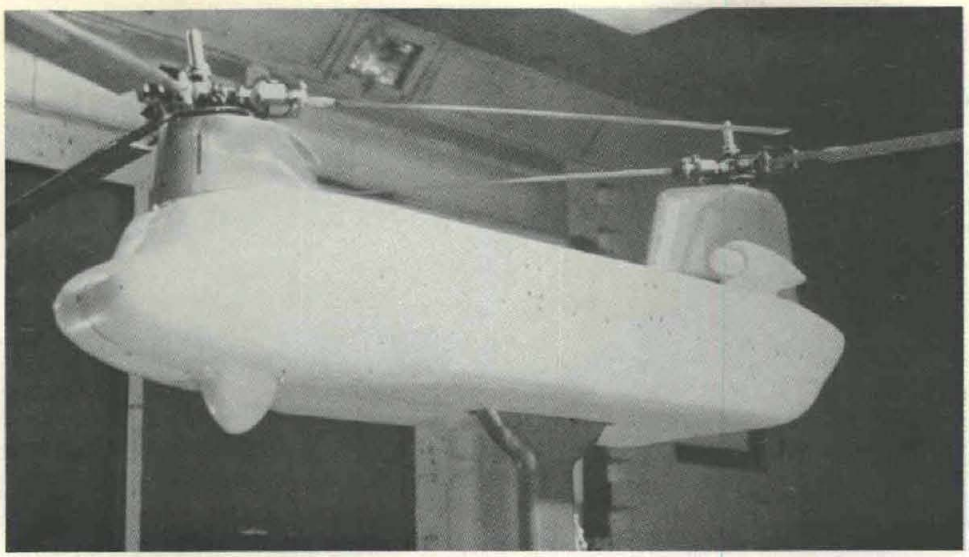
These schools will have the objectives of establishing in-depth and fundamental research programs, updating and developing the necessary equipment/facilities for supporting the expanded research and establishing the related curricula for advanced degrees in rotary wing aircraft technology. This program now underway will, consequently, provide the entire helicopter industry with an additional technology base for advancing the state-of-the-art in this important field.

The Selection Process

The procedure for selecting the three universities began in 1981 when ARO issued a request seeking proposals from United States institutions of higher learning with graduate-level programs for establishing one or more Centers of Excellence in rotary wing aircraft technology.

The proposals were to address original and basic research investigations in some or all disciplines such as gas dynamics, aerodynamics, aeroacoustics, vibrations, and others. The proposals were also to provide plans for updating existing equipment and facilities or developing new facilities.

ARO received proposals from 17 well qualified universities. An evaluation panel was set up to screen the proposals. The criteria used to evaluate the proposals included: organizational structure, research topics, facilities and equipment, academic curriculum, prestigious fellowship programs, personnel, technology transfer and university commitment.



Developmental tests of a fully powered tandem rotor system in the Glenn L. Martin low-speed wind tunnel (conducted for the Boeing Vertol Company).

About the Universities

Georgia Institute of Technology has worked in this field for 50 years and has five faculty members working extensively in helicopter technology. Dr. Arnold Ducoffe, director of Georgia Tech's School of Aerospace Engineering, explained: "We will fulfill our commitment to the Army by establishing full MS and PhD level curricula in rotary wing aircraft technology, with a special emphasis on design, and by conducting state-of-the-art research in the discipline of aerodynamics, aeroelasticity and structures."

During the next five years, Georgia Tech will recieve $5.8 million from the Army Research Office to expand their activities and facilities. Some of the facilities that will be upgraded include Georgia Tech's 9-foot wind tunnel facility, which will receive a computer/controller, graphics terminal and printer, mean measurement data system, microphone data system, hot wire data system and a laser doppler velocimeter data system.

New facilities will include a 16-foot static thrust stand along with computer hardware and software for use in computer-aided engineering and design, a computer-aided flight vehicle engineering center, a transient dynamic stress analysis facility and a 9-foot static thrust facility.

Some of the research tasks that Georgia Tech will undertake in the coming years include: experimental studies for tip vortex core modeling; modification of blade tip loading to improve hovering figure of merit; a procedure for computing rotor-blade/tip-vortex interactions; structural dynamic system identification; crashworthy characteristics of composite airframe structures; study of the airframe flow field in forward flight; helicopter vibration suppression techniques; and studies of unsteady rotor aerodynamics.

Dr. Robin Gray will direct Georgia Tech's helicopter programs. For more information, contact him at: Georgia Institute of Technology, School of Aerospace Engineering, Atlanta, GA 30332.

Rensselaer Polytechnic Institute, like the other universities selected, will have three objectives: to provide the most highly qualified students with the opportunity to acquire advanced training and education in vertical flight technology, conduct basic research and investigations, and ultimately to provide the United States with a unique new national resource and capability in the area of rotary wing capabilities.

In research, the materials and structures portion of the program will be focused on advanced composite development, using the facilities and expertise of RPI's Composite Materials and Structures Laboratory. In structural dynamics and vibrations, RPI will utilize finite element methods and computer graphics to make the reliable prediction of complex structural dynamics behavior a part of the iterative helicopter design processes.

Unsteady aerodynamic research will include both experimental and theoretical investigations. In this area, a low-speed wind tunnel, designed specifically to investigate blade-vortex interactions, will be developed. Aeroelasticity research will deal with structural dynamics and unsteady aerodynamics.

Theoretical analyses will be carried out to investigate the inherently complex interactions between elastic, inertial and aerodynamic factors; coupling between fixed and rotating systems; and fuselage, controls and lifting surfaces.

RPI's program of research and instruction will rely and capitalize on the techniques of interactive computer graphics that are currently being vigorously pursued at the school. It is hoped that the interactive computer graphics capabilities that are developed for several important aspects of rotorcraft technology will provide a tremendous resource in the development of future aircraft.

During the next four years, RPI's Center of Excellence program will receive $3.1 million. Dr. Robert Loewy will direct the activities of the RPI Center of Excellence program and will be co-principal investigator of the project. Dr. Loewy is recognized in the fields of aeroelasticity and vibration and has published some of the first theoretical results describing the aerodynamic interaction of a rotor with its wake.

Dr. Rusell J. Diefendorf is the other co-principal investigator. He is an expert in the field of composite materials and has done extensive research on their applications to space structures. For more information, contact Dr. Loewy at: RPI, Troy, New York 12181.

The University of Maryland will recieve $4.6 million during the next five years under the program and will specialize in the areas of aeroelasticity, vibrations and structural dynamics, and aerodynamics.

Some of the major research facilities available at the University of Maryland include the modern, completely equipped and staffed Glen L. Martin 8 by 11-foot subsonic wind tunnel, a fully instrumented rotor tower capable of testing rotors up to 20 feet in diameter, a 380-foot track with a computer-controlled carriage for tests within and out-of-ground effect, and a new vibration and dynamics facility.

In the area of aeroelasticity, some of the major research tasks will include:

dynamic stability of composite blades, aeroelastic optimization of a rotor blade and air and ground resonance of a bearingless main rotor.

Major tasks of vibrations and structural dynamics will include: finite element analysis of coupled rotor-fuselage vibrations, parametric vibration testing of helicopter structures, coupled helicopter fuselage/rotor vibrations (testing methodology), multiple shaker testing, multi-cyclic control systems and feedback systems effects on a flight stability of the rotor.

In aerodynamics, the tasks include: effects of tip shape on vortex formation and interaction, interactive aerodynamic studies, and correlations of helicopter model and full scale characteristics.

Maryland's program will be directed by Prof. Alfred Gessow, well known for his writings and research in vertical flight technology. He can be contacted at: University of Maryland, Department of Aerospace Engineering, College Park, MD 20742.

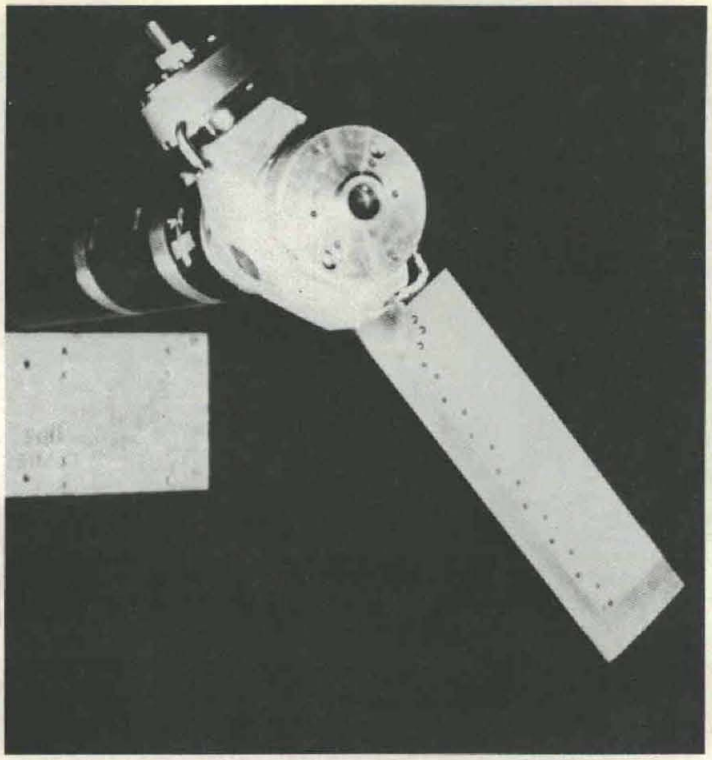
Students who enroll for the Centers of Excellence programs at any of the three colleges are eligible for fellowships that pay up to $12,000 a year plus tuition fees. This stipend is purposely higher than most ordinary fellowships to attract the leading engineering students and ensure that the Centers of Excellence program can reach its full potential.

The Evaluation Process

An evaluation panel has been established for all three Centers consisting of senior engineers from Army Aviation R&D Command and Dr. Singleton. This panel will conduct thorough reviews of the progress and performance at each of the Centers.

Reviews will be conducted throughout the span of these contracts with special emphasis on the fourth year, at which time decisions will have to be made regarding the level of activity to be supported during the fifth year as well as to determine the feasibility of another 5-year follow-on contract.

Since the very nature of this type of research and academic program support is very long-term, it is important for the Army to recognize this long-term commitment and plan accordingly. Of course, as the program progresses, it may be necessary to either contract or expand the out-year funding plans, but for the present, it is anticipated that each contract will level off at approximately $1 million in the out years.



This shows a single-bladed model rotor in the static thrust facility at the Georgia Institute of Technology. The model is instrumented for measuring the pressure distribution in the blade tip region. Flow field studies have also been conducted for this model.

Each center will also have an Advisory Board comprised of senior technical executives from the helicopter industry, National Aeronautics and Space Administration and the Army Aviation R&D Command. These Boards will provide guidance to the Centers regarding current rotorcraft programs, personnel needs, and research opportunities.

The combination of the Advisory Board's input and the in-depth technical reviews of the evaluation panel will thus provide an effective mechanism for determining the level of progress at each of the Centers as it develops and becomes productive. With this program and similar programs throughout the United States, the future of vertical flight technology looks extremely bright.

Portions of the preceding article originally appeared in the Jan-Feb 1983 issue of Vertiflite, a publication of the American Helicopter Society.

MS. DOROTHY JEAN KILLIAN is a freelance writer residing in Chapel Hill, NC. A former writer with the U.S. Army Research Office, she holds bachelor's and master's degrees from Winthrop College and has taught English and writing at the high school level.

Correction

On page 10 of our September-October 1983 issue we improperly listed the Army Research Institute for the Behavioral and Social Sciences (ARI) as an element of the Army Medical R&D Command. ARI is a field operating agency of ODCSPER. Additionally, on page 13, ARI psychologists Dr. Newell K. Eaton and Dr. M.A. Fischl, recipients of Army R&D Achievement Awards, were incorrectly identified as employees of the Army Medical R&D Command. Our apologies for these errors.

ABCA Today...

Washington Standardization Officers Announce Personnel Changes

Several key personnel changes among the American British, Canadian and Australian (ABCA) Washington Standardization Officers (WSO) were announced recently along with some other important ongoing standardization officer activities.

The standardization officers manage the ABCA Program and are appointed under provisions of the Basic Standardization Agreement of 1964. Each of the ABCA Armies designates a senior officer as its Washington representative. Duties of the officers are specified in the Basic Standardization Agreement and include coordination, policy and procedures, and resolution of differences in the standardization process.

Newly appointed is MG Richard D. Kenyon who became the U.S. representative on 1 October 1983, concurrent with his assumption of duties as Assistant Deputy Chief of Staff for Research, Development and Acquisition for International Programs, Department of the Army. He served formerly as Director of Weapons Systems, Office of the Deputy Chief of Staff for Research, Development and Acquisition, DA.

Brig Stephen R. A. Stopford assumed duties as the United Kingdom representative in July 1983. He is the British Military Attache in Washington. An expanded article on Brig Stopford appears on page 19 of the July-August 1983 issue of *Army RD&A Magazine.*

The Canadian member of the group, BGEN W. J. Dabros, assumed his duties on 1 August 1983. He is the Canadian Forces Washington Military Attache and served previously as Chief of Staff, Administration, HQ Mobile Command, St. Hubert, Quebec.

The position of Washington Standardization Officer chairman, which is rotated among the four Armies, is currently held by the Australian representative BRIG R. A. Sunderland. A member of the group since January 1982, BRIG Sunderland is the Australian Army Attache. Prior to his Washington assignment he served in Canberra as Deputy Exercise Director for Exercise Kangaroo 81, the biennial Australian, New Zealand, and U.S. exercise.

It was also announced recently that the Washington Standardization Officers are developing a draft agenda for TEAL XXV, which will be held in Australia in November 1984. A draft agenda supporting the theme "The Deployment and Maintenance of ABCA Forces for Conventional Warfare in Mid- and Low-Level Conflict up to the year 2000" will be distributed to the Armies for comment in December 1983. Based on replies, the standardization officers will prepare and circulate a final agenda in April 1984. TEAL discussions, which are formally termed the Quadripartite Standardization Discussions, are convened about every 18 months and are attended by the ABCA Vice/Deputy Chiefs of Staff or equivalent level personnel.

As part of TEAL, the officers provide written and oral reports on their assessment of the ABCA Program. These reports address management activities since the preceding TEAL, address progress on actions arising from TEAL directives and recommendations, and summarize Quadripartite Working Group activities.

Washington Standardization Officers normally meet monthly at the Primary Standardization Office in Falls Church, VA. This is the permanent office of record for the ABCA Program, and carries out the daily management of the ABCA Program under supervision of the Standardization officers.

Generally, discussions address all aspects of the ABCA Program. A typical agenda might include a report on a recent Quadripartite Working Group meeting, proposed changes to program policies and procedures, and TEAL issues.

The officers also manage the work of the Quadripartite Working Group by issuing comments which address working group activities and by assigning work priorities. Each working group meets about every 18 months and a member of the Primary Standardization Office attends each meeting as the Washington Standardization Officers representative.

The representative reports back on all aspects of the meeting and this report, in conjunction with a Memorandum for Record, provides the basis for management comments which are disseminated to the Armies and the QWG. Work of all QWG's is monitored by the officers to ensure that the program is proceeding according to TEAL guidance.

Quadripartite Working Group programs are developed by the Washington Standardization Officers based on TEAL specified areas, standardization officers work projects, and the Armies areas of interest.

Work priorities of all working groups are used by the standardization officers to define achievements, identify obstacles that may require action, and serve as aids in preparing reports on the status of TEAL.

The Washington based standardization officers have provided member Armies with a highly responsive and dynamic management organization because they meet on a regular basis and have the authority to reorganize priorities and tailor ABCA policies. They also serve as the focal point in the chain between Armies and working groups in attaining ABCA standardization and interoperability goals.

Because of significant changes of RDA personnel at DA and HQ, DARCOM, the listings below are being provided to the RDA community. This list was correct as of 11 October 1983.

Key DA Staff & HQ, DARCOM

ODCSRDA

Title	Name	Commercial Telephone (Area Code 202)	Room No.
Deputy Chief of Staff	LTG James H. Merryman	697-8186	3E412
Assistant Deputy Chief of Staff, RDA, & Assistant DCSRDA (International Programs)	MG Richard D. Kenyon	697-8187	3E412
Executive Officer	COL Fletcher H. Maffett	695-4997	3E412
Assistant Executive Officer	MAJ Vincent R. Joswiak	697-8188	3E412
RDA Analysis Office	Mr. Hunter M. Woodhall, Jr.	695-9720	3E411
Systems Reviews & Analysis Office	Mr. Rob Roy McGregor	695-7404	3E360
Management Support Office	COL John A. Duff	697-4016	3D463
Director of Army Research	Mr. Richard B. Lewis II	695-1447	3E426
Advanced Concepts Team	Dr. Charles A. Church	695-3718	3E363
Director of Combat Support Systems	BG(P) Donald S. Pihl	697-0387	3E432
Deputy Director of Combat Support Systems	BG Roy H. Lee	697-0387	3E432
Command, Control, Surveillance Systems Division	COL Lawrence J. Schumann	694-8165	3D433
Munitions Division	COL Robert J. Hudak	694-4287	3D433
Support Systems Division	COL J. Paul Goncz	697-7752	3D422
Director of Weapons Systems	BG Donald P. Whalen	695-3115	3E448
Deputy Director of Weapons Systems	BG James C. Cercy	695-3115	3E448
Aviation Systems Division	COL David L. Funk	695-3869	3B454
Missiles & Air Defense Systems Division	COL Samuel N. Liberatore	694-8214	3B455
Ground Combat Systems Division	COL John H. Tilelli, Jr.	697-0046	3D455
Director of Materiel Plans & Programs	BG Michael L. Ferguson	697-1646	3E374
Deputy Director of Materiel Plans & Programs	COL(P) August M. Cianciolo	697-4944	3E374
Program Coordination Division	COL John E. Miller	695-0330	3D380
Acquisition, Test, Industrial Base Policy	COL Nicholas P. Vamvakias	695-7670	3C367
Procurement Programs & Budget Division	COL Gregory W. Mason	697-0416	3D366
RDTE Programs & Budget Division	COL John J. Ramsden	695-3098	3D375
Congressional Affairs Division	LTC(P) Joseph A. Petrolino, Jr.	697-7975	3E443
Future Development Division	COL Richard F. Pell	695-9712	3C354
International Office	COL Bernard P. Manderville	697-7879	3E413

Materiel RDA Personnel

HQ, DARCOM

Title	Name	Commercial Telephone (Area Code 202)	Room No.
Commanding General	GEN Donald R. Keith	274-9625	10E08
Deputy CG for Materiel Development	LTG Robert L. Moore	274-9705	10N06
Principal Assistant Deputy for RDA	VACANT	274-9709	10N06
Assistant Deputy for Science & Technology	Dr. Richard L. Haley	274-9560	10N12
Assistant Deputy for International R&D	Mr. Bryant R. Dunetz	274-8252	10N12
Executive Officer	COL A.D. Rogers, III	274-9710	10N06
Director for Development, Engineering & Acquisition	MG John B. Oblinger	274-9490	8E08
Deputy Director for Development, E&A	Mr. D.L. Griffin	274-9493	8E08
Executive Officer	COL John P. Herrling	274-9404	8E08
Deputy Director for Systems Management	Mr. J.T. Newman	274-9850	8N54
Aviation Systems Division	COL William Maloney	274-8117	8N32
Missiles & Air Defense Systems Division	LTC(P) Albert F. Gleim	274-9651	8N31
Ground Combat Systems Division	COL F.W. McDonald	274-9870	8N48
Support Systems Division	COL P.N. Kane	274-5522	2S15
Munitions Systems Division	COL Joseph F. Salmon	274-8604	8N42
Command, Control, Communications & Surveillance Division	COL Harold L. Patrick	274-9295	9C32
Battlefield Automation Management Division	COL Harold R. Archibald	274-9318	9N23
Deputy Director for Program Management	Mr. R.D. Greene (Actg.)	274-9848	8E14
R&D Program Budget/Control Division	COL J.G. Land (Actg.)	274-9849	8E14
Automated Information Division	COL William R.S. Peters	274-9855	8E14
Program Integration Division	COL G. Rostine	274-9200	3W14
Project Management Division	Mr. R.L. Michellon (Actg.)	274-9571	10N18
Operations & Support Division	COL Martin E. McKinley	274-9586	8N25
Foreign Science & Technology Division	Mr. B.G. Pales	274-8853	8N47
Acquisition Assessment & Policy Division	COL John N. Tragesser	274-9811	8N22
International RD & Standardization Division	COL H.G. Glock	274-8367	9W14
Director for Technology Planning and Management	Mr. J. Bender	274-9561	10N24
Deputy Director for Technology Planning & Mgt.	COL Charles J. Sollohub	274-9561	10N24
Longe-Range Planning	Dr. G. Andersen	274-8372	10N33
IR&D Manager	Mr. Karl Bastress	274-9147	4S38
Tri-Service Industry Information Office	Mrs. Dolores Mahon	274-8948	8S58

From The Field...

Portable Unit Improves Decontamination Capability

Engineers assigned to the Physical Protection Division at the Army's Chemical Research and Development Center, (CRDC), Aberdeen Proving Ground, MD, have developed a portable decontamination apparatus that provides the American field soldier with an improved capability to scrub and decontaminate military vehicles.

The portable decontamination unit, designated the M13, has been type classified by the Army and is expected to begin reaching field units in 1985 following production initiation and testing.

Mr. Sheldon E. Day, an engineer who served as the development project officer, said the apparatus can be used to decontaminate wheeled and track vehicles as well as combat construction equipment and towed and self-propelled artillery and large weapons.

In addition to being portable, manually operated, and easy to maintain, the apparatus is mounted on the equipment it is intended to decontaminate.

"The idea is to decontaminate those areas of the vehicle required for normal operations and maintenance," according to Day. Day added that "the apparatus has drawn the interest of other armed services and can easily be adapted for use by other service ground forces."

The M13 decontamination apparatus is designed to disperse a standard chemical deconamination solution. It provides the American soldier with a capability to cover selected surfaces of the vehicle with decontaminant, scrub with a brush and continue the military mission.

The lightweight apparatus consists of a prefilled decontaminant container, a manual pump, hose, wand and attached brush. It does not weigh more than 60 pounds when filled.

Day also said that the project, started in March 1979, skipped the engineering development phase, saving about four years in development time.

The early development represents a clear response to the demand for military researchers to cope with current fixed and increasingly scarce resources. This is the direct result of a DARCOM program designed to improve producibility entitled, Resources Self-Help Affordability Planning Effort (RESHAPE).

RESHAPE is geared to maintain and advance the technology base in Army research and development laboratories as well as in the facilities of commercial and industrial organizations under contracts managed by the Army.

Diesel Fuel Blending Guide Published

Soldiers should have an easier time keeping their diesel engines and generators running this winter thanks to a guide published by the Army's Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA.

The *Field Blending Guide for Improving the Low Temperature Properties of Automotive Diesel Fuels* contains information about alternative fuels that can be blended with diesel fuel to improve its low temperature performance. In addition, the guide describes a simple test to determine the cloud point of fuel sampled from a vehicle or storage tank that can be done with materials readily available in the field.

The cloud point is the temperature at which paraffinic hydrocarbons, which are natural ingredients in petroleum fuels, begin to freeze causing a clouding of the fuel. These wax crystals can clog filters making an engine inoperable.

The test is very simple, according to Dr. Madeline Swann of MERADCOM's Materials, Fuels and Lubricants Laboratory, one of the developers of the guide. Once you determine the cloud point of your fuel sample, the charts included in the guide will tell you how much blending component you need to lower the cloud point to the temperature you want, says Swann.

The guide was developed as a result of cold weather starting problems in Europe. "We kept getting complaints that the fuel was no good, but as it turned out, there was nothing wrong with the fuel, it just wasn't designed or blended for cold weather use, recalls Swann.

Cold weather starting problems are common when equipment is shipped overseas and remains in storage for several months. When the equipment is built or prepared for storage, it is generally filled with diesel fuel common to that geographical area. For example, the fuel will be blended for summer use when cold temperatures aren't a problem. Later, in cold weather, it must be reformulated or the equipment may not run.

Copies of the guide may be obtained from contacting the U.S. Army Mobility Equipment R&D Command, ATTN: DRDME-VF, Fort Belvoir, VA, 22060.

WSMR Tests Projectile Velocimeter System

The Instrumentation Directorate at White Sands Missile Range, NM, has begun testing a prototype of a new velocity measuring system. Called the Real Time Velocimeter System (RTVS), it will be used to gauge the performance of various projectiles and munitions.

The system is designed to provide a bullet's or projectiles's velocity and acceleration, azimuth and elevation angle and the range or distance from the firing point. Upon successful completion of testing the RTVS will be turned over to the Test and Evaluation Command (TECOM) for use at its test ranges.

For many years TECOM's test ranges have been using old radars for making velocity measurements. Most of the radar units have been used for more than 15 years and parts are no longer in the Army supply system. The continued problem of maintainability has reportedly made it difficult for the ranges to provide reliable test support.

The RTVS, which White Sands has developed, not only does the same job as the old radars and does it better, but the RTVS also will do more. In the past, it has been difficult to determine simultaneously both velocity and distance on a small projectile.

The Georgia Tech Engineering Experiment Station, working under contract to Daytron Systems, the prime contractor for RTVS, has helped develop the necessary high-speed signal processing techniques which give the system its capability to produce both velocity and range data in real time. Final system integration was accomplished at NMSU's Physical Sciences Lab, the other major participant in the development.

Radar waves are bounced off the bullet or projectile back to the RTVS. Because the object is moving away from the radar, the wave's frequency is shifted as it bounces back. This is commonly known as the Doppler shift.

By rapidly measuring the magnitude of the shift the computer calculates the velocity of the projectile through a unique set of software. Simultaneously, the computer processes data from three separate radar frequencies and computes the range of the projectile. The system will then display this and other information in real time.

Real time is a relative term and actually refers to the delay from the time a measurement is made and the time it is displayed. Different systems are called "real time" but the delay times in these vary from fractions of a second to several minutes.

In the past, velocity and range calculations have taken hours to produce. With RTVS the readouts will reportedly be available as the projectile actually flies to its target and printouts will be available immediately thereafter.

The RTVS allows an instant look at the performance of the projectile and allows personnel to make changes after each firing without significant delays.

The multimillion dollar RTVS prototype consists of two units. The antenna and associated pieces are mounted on a trailer and the control and support equipment is housed in a van. The radar can be placed in a hazardous area while the operating personnel and computer equipment remain in a safe, remote location in the van.

Once testing is completed at White Sands, the system will be moved to Aberdeen Proving Ground, MD. Range officials expect this prototype RTVS will provide the technology for future real time systems at other TECOM installations.

Colleges May Participate in TECOM Projects

ROTC cadets, faculty members and engineering and science graduate students from three California schools may soon become involved in testing a wide range of materiel under consideration for Army use.

Administrators from the University of Southern California (USC), Harvey Mudd College and California State Polytechnic University have expressed an interest in a sabbatical and academic program developed by the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, MD.

The program is designed to provide ROTC cadets, faculty members and graduate students with an opportunity to work on projects with TECOM scientists and engineers at different installations. It also affords them the chance to work with some of the more sophisticated, state-of-the-art instrumentation and test equipment in the world.

USC and Harvey Mudd College have signed agreements with TECOM supporting the program. California State Polytechnic University is reviewing a similar agreement. Each participant will be required to submit a technical paper to the Army and to their university at the end of their tenure at one of the TECOM installations.

The sabbatical and academic program, which is soon to be expanded to universities on the east coast, requires the Army to pay the university for round-trip airfare for participants in addition to one half of their lodging and local transportation. When possible, participants will be billeted in on-post housing. Programs vary from six weeks to 12 months in length, according to the specific project the participant selects.

TECOM installations which are initially participating in the program include: White Sands Missile Range, NM; Yuma Proving Ground, AZ; Electronic Proving Ground, Fort Huachuca, AZ; Dugway Proving Ground, UT; and the U.S. Army Aviation Development Test Activity, Fort Rucker, AL.

Since October 1982, TECOM has hosted three tours of nearly 60 ROTC cadets, faculty members and graduate students from the three universities to White Sands Missile Range, and the Yuma and Electronic Proving Grounds. Each tour provided visitors with a hands-on opportunity to witness the latest Army application of engineering and science skills and to familiarize them with the facilities and opportunities available to participants.

Participants also received extensive briefings on a variety of TECOM projects, and had an opportunity to meet with technical experts in a wide variety of areas ranging from lasers to robotics. They also saw some of the latest military hardware being tested, including the Bradley Fighting Vehicle and an Advanced Cobra Attack Helicopter.

Tour participants included the president of Harvey Mudd College, the dean of the USC Engineering School, and the assistant to the vice president for Academic Affairs for California State Polytechnic University.

Because of the success of the first tour, Chief of Army Public Affairs MG Llyle Barker, presented TECOM with the Army's Community Relations Award of Excellence last December. The command was credited for increasing the public understanding of the Army's R&D mission and for enhancing its relationship with the academic community.

$19.3M Contract Calls for 794 Generator Sets

The first installment of a 4-year, $19.3 million contract to buy new generator sets for Army aviation support has been awarded by the U.S. Army's Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA.

The initial award of $3.4 million, made to Tiernay Manufacturing Co. of Pheonix, AZ, will cover the production of 135 10kW, 28 volt dc gas turbine engine driven wheel mounted generator sets. In operation, these units will be used for aircraft maintenance, ground checkout, and to start helicopters and small planes.

Under the provisions of the contract, MERADCOM will buy 794 generator sets over a four-year period with the option of purchasing as many as 794 additional sets. Delivery of the sets is scheduled to begin in 1986 and be completed about three years later.

Tobyhanna Activates Wastewater Treatment Plant

The U.S. Army Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA, as a participant in the U.S. Army Materiel Development and Readiness Command (DARCOM) pollution abatement program, is reportedly providing solutions to the problem of pollution produced by the Army's depots, plants, and research and development facilities. As a result of these efforts, an electroplating wastewater treatment plant, designed under MERADCOM contract, recently began operation at Tobyhanna Army Depot, PA.

Opening of this plant is the culmination of work which began three years ago when the Army's Toxic and Hazardous Materials Agency, which administers the program, asked the command to evaluate a relatively new process for removing toxic heavy metals from wastewater coming from an electroplating facility at Tobyhanna.

Wastewater from the operation was being inadequately treated and discharged into the installation's sewage treatment plant where toxic byproducts of the electroplating process were killing the bacteria used to treat sewage. Because of this, the plant couldn't meet its discharge standards.

In 1980, MERADCOM awarded a $300,000 contract to J.R.B. Associates, Inc., of McLean, VA, for the design and installation of a prototype treatment system. That was completed in 1982. Since that time, the plant has been used to treat about 20,000 gallons of electroplating wastewater per day. The Army Environmental Health Agency had just completed a water quality engineering study at the facility and will report its findings on the plant's performance.

MERADCOM Orders 12 PATRIOT Power Plants

The U.S. Army's Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, has awarded the George Engine Co. of Harvey, LA, nearly $1.1 million to build 12 electric power plants for the PATRIOT missile system.

Under the terms of the contract, the company will fabricate the truck assembly which will carry the generators that power the missile's weapons control and radar equipment. This involves building the truck bed, attaching the cable racks, and installing electric wiring and fuel lines for the generators.

Once the truck bed is completed, two 150-kW generators will be mounted on the assembly to complete the unit. The generators, built by Detroit Diesel Allison,, are nuclear-hardened and use a regenerative heat cycle process to reduce fuel consumption.

This latest award is an add-on to a $1.4 million contract for 14 power plants which was awarded to the George Engine Co. last year. The new power plants will bring the total number of units being procured by MERADCOM to 26.

Awards...

Golub Receives Distinguished Service Decoration

Mr. Abraham Golub, a member of the Army Science Board and an independent consultant in the areas of operations research and systems analysis, has received the Department of the Army Decoration for Distinguished Civilian Service.

A former Department of the Army Employee, he was cited specifically for his efforts as the innovator of analytical methods that have revolutionized the design and development of Army combat and service organizations. His methods permit the design of organizations so they can achieve explicit performance goals and combat sustainability. Additionally, his methods permit the redefinition of casualty criteria into terms of organizational effectiveness rather than simplistic attrition counts.

Prior to his retirement from government service in 1976, Golub had served from 1974 to 1976 as technical advisor to the Army Deputy Chief of Staff for Operations and Plans. He was responsible for analyzing the operational requirements for major weapon systems.

Listed among his previous honors are the Army Research and Development Award for Technical Achievement, the Department of the Army Decoration for Exceptional Civilian Service with two Laurel Leaf Clusters, and the Department of Defense Decoration for Distinguished Civilian Service.

Acurio Recognized for Meritorious Service

Mr. John Acurio, director of the Army Propulsion Laboratory, NASA Lewis Research Center, Cleveland, OH, received the Decoration for Meritorious Civilian Service, the second highest award granted to civilians by the Department of the Army. The presentation was made by retiring MG Story C. Stevens, commander of the U.S. Army Aviation Research and Development Command, St. Louis, MO.

Acurio was cited for his "exemplary performance, professional competence, dynamic leadership, and managerial ability in pursuing new propulsion system concepts for the U.S. Army."

Acurio has been the director of the Army Propulsion Laboratory since 1971, when that unit was established at Lewis Research Center. He is responsible for developing, managing, and executing the basic research and exploratory development programs for aircraft propulsion and drive-train components.

BRL Presents 3 Meritorious Service Awards

The Department of the Army's Decoration for Meritorious Civilian Service has been awarded to two scientists and an engineer at the Army's Ballistic Research Laboratory (BRL), Aberdeen Proving Ground (APG), MD.

The award is the second highest honor granted by the Secretary of the Army in recognition of outstanding technical or professional accomplishments.

Dr. William J. Gillich, chief of the Armor Mechanics Branch in BRL's Terminal Ballistics Division, was commended for his technical breakthroughs in the field of armor which led to the development of improved armor and kinetic energy penetrators.

Recognized as an international expert in evaluating Soviet armor and tank armament, Gillich received a BS degree and an MS degree in mechanical engineering as well as a doctorate in mechanics from the Johns Hopkins University.

He is listed in *American Men of Science, Who's Who in America, Who's Who in the East,* and has been awarded the Army R&D Achievement Award and the BRL R.H. Kent Award.

Dr. Walter B. Sturek, chief of the Aerodynamics Research Branch in BRL's Launch and Flight Division, received his award for contributions to a computational and experimental aerodynamics research program which led to a highly improved capability to predict the flight stability and aerodynamic behavior of artillery shell designs.

He holds a BS degree and an MS degree in mechanical engineering from Oklahoma State University and the Massachusetts Institute of Technology, respectively, and a doctorate in applied science from the University of Delaware.

Sturek's honors include the Army R&D Achievement Award, and the Bronze Medallion for Scientific Excellence from the U.S. Army Science Conference.

Mr. John M. Hurban, chief of the Ballistic Technology Team in BRL's Interior Ballistics Division, was commended for implementation of user-oriented, cost effective ballistic mission programs which resulted in high pay offs for future Army Weapon Systems. He was also cited for his efforts in the areas of liquid propellants for guns, low vulnerability ammunition, and precision aim techniques.

Hurban holds a BS degree in mechanical engineering from Lafayette College, Easton, PA, and has served on numerous weapons technology committees with the Tri-Services and allied countries in areas of interior ballistics.

CH-47 Personnel Cited for Meritorious Service

Mr. John P. Clarke, deputy project manager for the CH-47 Modernization Program, and Mr. Dean D. Hemmer, chief of the Logisitics Management Division, Office of the PM for the CH-47 Modernization Program, are recent recipients of the Decoration for Meritorious Civilian Service, the second highest honor presented by the Department of the Army for civilian employees.

Clarke was recognized for his competence and dedication in keeping the CH47-D Program on schedule and for his innovative management which resulted in program cost savings of $582 million and a negotiated multi-year contract which saved $74 million.

Clarke began his civil service career as an aerospace/flight test engineer at the Naval Air Test Center in 1959, and has worked on projects such as the Heavy Lift Helicopter and the Advanced Scout Helicopter. He was also responsible for developing electronic fly-by-wire flight controls technology.

Hemmer was cited for achievements associated with integrated logistics support. His award certificate specifically noted his efforts related to the recent fielding of the CH-47D at Fort Campbell, KY. This was reportedly the first time in the history of Army aviation that 100 percent of the support requirements were provided prior to delivery of the first aircraft.

A civil service employee since 1951, Hemmer joined the CH-47D PM's Office in 1974.

German National Gets Army Contracting Award

Presentation of the first Annual U.S. Army Europe HCA (Head of Contracting Activity) Contracting Award for individual contracting excellence was made recently to Mr. Arthur C. Meyer, a German local national contracting officer and team leader in the Repair and Maintenance Branch of the Fuerth Regional Contracting Office, Fuerth, West Germany.

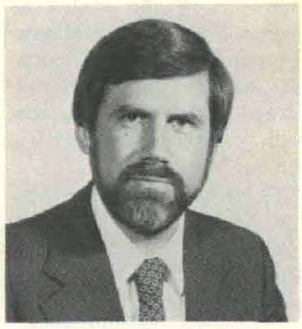
Established to acknowledge sustained outstanding performance of the contracting officer function, this award is expected to serve as an incentive in promoting excellence, according to LTG John F. Forrest, head of the Contracting Activity for U.S. Army Europe.

Meyer, who has worked for the U.S. Government for 37 years, was cited specifically for his overall performance of duty, knowledge of Defense and Army contracting policies and procedures, superior business acumen, and exceptional administrative skills.

He was selected for the award by a panel of experts who reviewed an extensive list of nominations from throughout Europe. U.S. Army Europe's program encompasses a workforce of approximately 800 personnel serving in contracting offices from England to Saudi Arabia.

Personnel . . .

Lewis Takes Over as Army Research Director



Mr. R. B. Lewis II

Mr. Richard B. Lewis II, technical director of the U.S. Army Aviation R&D Command (AVRADCOM) since 1978, has succeeded Dr. Marvin E. Lasser as Director of Army Research, Office of the Deputy Chief of Staff for Research, Development and Acquisition.

Backed by more than 14 years of government service, Lewis has repeatedly been recognized as a leader in advancing the state-of-the-art of Army aviation. He graduated with honors from Princeton University, receiving a bachelor's degree in aeronautical engineering, and holds a master's degree in aerospace engineering from Rensselaer Polytechnic Institute.

Prior to entering government service, Lewis was employed at Sikorsky Aircraft and Lockheed-California Co. From 1969 to 1974 he was deputy director of Flight Tests at the U.S. Army Aviation Systems Test Activity. From 1975 to 1977, he was chief of Systems Concepts and Technology in the Army Aviation Systems Command's Directorate for Research, Development and Engineering.

Lewis has served also as deputy technical area chief on the Utility Tactical Transport Source Selection Evaluation Board and as deputy chairman of the Advanced Attack Helicopter and Target Acquisition Designation System/Pilot Night Vision System Source Selection Evaluation Board.

Earlier this year Lewis was presented with the Department of Defense Distinguished Civilian Service Award, the DOD's highest award for civilian employees. Only six such awards are presented each year. He was recognized for exceptional contributions to aviation research and development.

Karl Becomes Watervliet Arsenal Commander

COL Edward V. Karl

COL Edward V. Karl, former staff director, Industrial Base Programming, Office of the Under Secretary of Defense (Research and Engineering), has assumed new duties as commander of Watervliet Arsenal, Watervliet, NY.

He graduated from St. Bonaventure University in 1959 with a BS degree in mathematics and also holds a master's degree in mathematics from the University of Delaware. Additionally, he is a graduate of the Industrial College of the Armed Forces and the Command and General Staff College, and has completed the Ordinance Officers Career Course and the Artillery Officers Basic Course.

Listed among his key assignments are commander, Detroit Arsenal Tank Plant, Tank Automotive Materiel Readiness Command; procurement program analyst, Program Development Division, Program Analysis and Evaluation Directorate, Office of the Army Chief of Staff; and executive officer, Watervliet Arsenal.

COL Karl is airborne qualified and is a recipient of the Legion of Merit, Bronze Star Medal, Defense Meritorious Service Medal, Meritorious Service Medal with second Oak Leaf Cluster (OLC), Air Medal, and Army Commendation Medal with OLC.

Theuer Chosen as CERL Commander/Director

COL Paul J. Theuer

COL Paul J. Theuer has taken over as commander and director of the U.S. Army Construction Engineering Research Laboratory, Interstate Research Park, Champaign, IL. He previously served since July 1978 as an assistant director of Engineering and Construction (Army and DOD Programs) in the Office of the Chief of Engineers, U.S. Army Corps of Engineers, Washington, D.C.

COL Theuer has received bachelor's degrees in mathematics from Saint Peter's College and civil engineering from Iowa State University at Ames, and a master's degree in engineering from Pennsylvania State University. He is also a graduate of the Army Command and General Staff College and the Army War College.

Col Theuer's major assignments have included commander, 808th Engineer Battalion (Construction), Fort Wainwright, AK; chief of Operations, U.S. Army Support Command, Cam Rahn Bay, Republic of South Vietnam; commandant of Cadets and director of Instruction for the Corps of Cadets, Pennsylvania State University Army ROTC, University Park, PA; executive to the Deputy Chief of Staff, Engineer, HQ, U.S. Army Europe (USAREUR); and representative for the Commander-in-Chief, USAREUR, at the Pentagon.

Among his military awards are the Legion of Merit, Bronze Star Medal (two awards), Meritorious Service Medal, and Army Commendation Medal (two awards).

HEL Names Hofmann as Associate Director

Dr. M.A. Hofmann

Dr. Mark A. Hofmann has assumed the position of associate director of the U.S. Army Human Engineering Laboratory (HEL), Aberdeen Proving Ground, MD. He was formerly the assistant director of HEL, a corporate laboratory of the Army Materiel Development and Readiness Command.

Hofmann will also continue to serve in his capacity as chief, Field Support Directorate, which consists of on-site direct technical support personnel located at military installations throughout the United States. He holds a PhD in human factors from the University of South Dakota and master's degrees from the Universities of South Dakota and Southern California.

Hofmann joined the Human Engineering Laboratory in 1976, after serving the Medical R&D Command in both military and civilian capacities for eight years. His first assignment was to serve as the lab's first representative to the Aviation R&D Command and the Army Troop Support and Aviation Materiel Readiness Command, St. Louis, MO. In 1978, he was assigned as the first lab representative at the U.S. Army Aviation Center and School, Fort Rucker, AL, while retaining supervision of the St. Louis office. In 1980, he assumed the position of assistant director.

The author and coauthor of more than 30 publications and a member of a number of professional organizations, Hofmann is a recipient of the Department of the Army's Meritorious Civilian Service Award.

Rahman Picked as Food Program Special Assistant

Dr. Abdul H. Rahman is the newly appointed special assistant to the Department of Defense Food Program at the U.S. Army's Natick R&D Laboratories. He is responsible for the direction of all food research and development programs for the entire Department of Defense.

Recently returned to Natick after serving 27 months with the Food and Agriculture Organization of the United Nations as director of the Regional Food and Nutrition Center for the Near East, Dr. Rahman was involved in studies related to food and nutrition intervention, food planning, food quality control, food losses and food research in 24 countries of the region.

Former head of Natick's Plant Products Division, Food Engineering Laboratories, he had been responsible for planning and conducting research investigations and development projects pertaining to new or improved fresh, frozen, dehydrated and compressed fruits, vegetables and other plant products, including space foods.

Dr. Rahman received his BS degree in agriculture from Cairo University, Egypt, his MS degree in horticulture from Utah State University and his PhD degree in food technology from Oregon State University. In 1953 he was awarded a UNESCO scholarship and has held professor appointments at the Universities of Bagdad, Iraq, and Puerto Rico.

His memberships include Sigma Xi, Research Society of America, Phi Sigma Biological Society, Gamma Sigma Delta, American Chemical Society, Institute of Food Technologists, the American Association for the Advancenment of Science, and the International Platform Association.

Listed in *American Men of Science, Men of Achievement, Who's Who in the East, Dictionary of International Biography* and *Community Leaders and Noteworthy Americans,* Rahman is the author of 100 scientific publications and 20 patents issued and pending, and is the recipient of numerous awards, including the Technical Director's Gold Pin Award for Engineering and the Inventor of the Year Award, the Army Research and Development Achievement Award and the Research and Development Associate's Isker Award. He has also received the Department of Army's Meritorious Civilian Service Medal, and was selected by the National Academy of Science to participate in the World Food and Nutrition Study.

Hidalgo Commands Hazardous Materials Agency

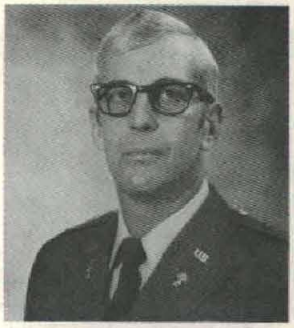
COL Peter D. Hidalgo, has become the third commander of the Army's Toxic and Hazardous Materials Agency. Former assistant commandant of the Army Chemical School, he succeeds COL John D. Spence.

A veteran chemical officer, Hidalgo is a 1958 graduate of the U.S. Military Academy, West Point, NY. He has served as a staff officer in Vietnam, commandant of the CBR School in Hawaii, and as an exchange officer at the British Chemical Defence Establishment in Porton Down, Salisbury Wilts, England.

Stateside assignments included duty as an instructor at the Army Chemical School; staff officer in the Chemical and Nuclear Directorate, HQ Department of the Army; director of Production Operations at Pine Bluff Arsenal, AR; deputy commander, Pine Bluff Arsenal; commander, Indiana Army Ammunition Plant; and director of Combat Developments at the Army Chemical School.

He received his master's degree in business administration from the University of Pittsburgh and is a graduate of the Army Command and General Staff College and the Army War College. Hidalgo's military decorations include the Bronze Star Medal, the Meritorious Service Medal with two Oak Leaf Clusters, the Air Medal, the Army Commendation Medal with OLC, and the Vietnamese Hazardous Service Medal.

Ross Joins AMMRC as Deputy Director/Commander



COL L. C. Ross

COL Lawrence C. Ross, following a 2-year tour as ordnance readiness coordinator, Army Readiness and Mobilization Region I, has assumed new duties as deputy director/commander of the U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, MA.

A 1959 graduate of the U.S. Military Academy, COL Ross holds a master's degree in engineering from Purdue University. In addtion, he is a graduate of the Army Command and General Staff College, Ordnance Officers Advanced Course, Parachutist School, and the Field Artillery Basic Officers Course.

During 1980-81, COL Ross served as assistant deputy chief of staff, Materiel, 19th Support Command in Korea. Prior to this, he served as 541st maintenace battalion commander, Fort Riley, KS, and associate professor, Department of Engineering, at the U.S. Military Academy.

Listed among his other assignments are combat developments study project officer, U.S. Army Combined Arms Combat Activity, Fort Leavenworth; maintenance battalion executive officer and materiel management officer, 101st Airborne Division; and test project officer and R&D coordinator, Project MASSTER, Fort Hood, TX.

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

Career Programs...

Erickson Selected for Executive Training

Mr. Merlin L. Erickson, a mechanical engineer, has been selected to participate in the technical executive training program at the Army's Chemical Research and Development Center (CRDC), Aberdeen Proving Ground, MD.

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

Erickson is the 49th civilian employee selected to participate in the special 6-month program which includes a 3-month assignment with the CRDC command group and a similar period of training in the Office of the Deputy Chief of Staff for Research, Development, and Acquisition at the Pentagon.

Erickson has been employed at the Chemical R&D Center in Edgewood, MD, for almost 10 years. Before his selection for executive training, he was assigned to the Smoke Branch in CRDC's Munitions Divisions.

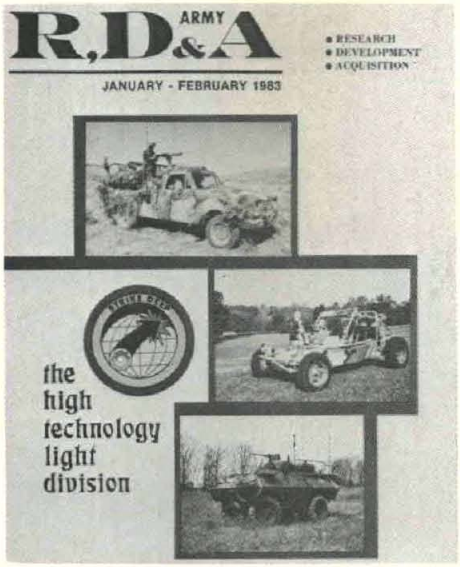
He has a BS degree in mechanical engineering from North Dakota State University and an MS degree in industrial engineering from Texas A&M University.

He began his Federal career in the Army's scientific and engineering intern program at Red River Army Depot, TX, in 1969, where he worked in the production design engineering program in areas of industrial and produciblity engineering.

Erikson has served as project engineer on programs related to munitions and suppressive shielding and was the production engineer on several manufacturing methods and technology projects. Since September 1979, he has been the project engineer on an R&D project to develop an infrared screening grenade for armored vehicle protection.

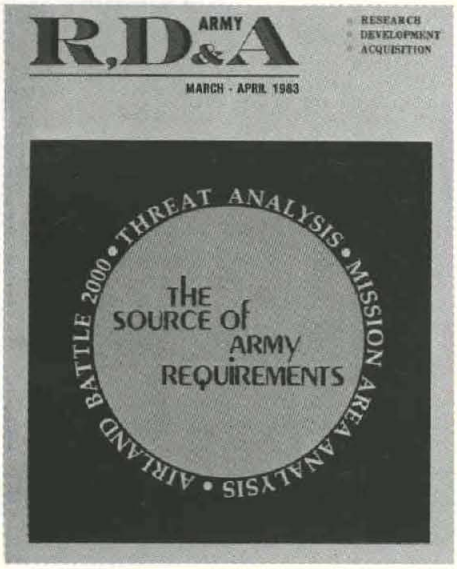
1983 Index of Army RD&A Magazine Articles

The following is a headline list of feature articles published in the Army RD&A Magazine *during calendar year 1983.*



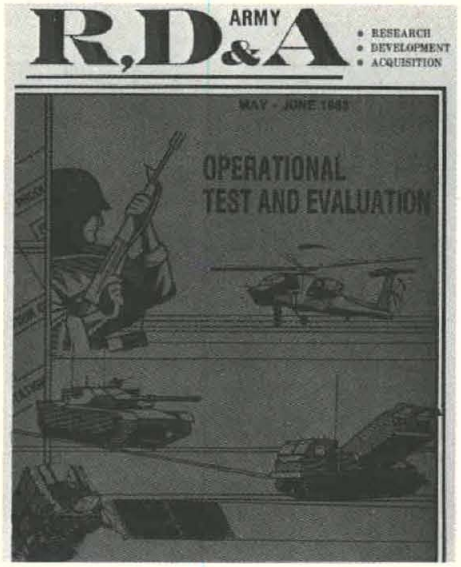
JANUARY-FEBRUARY

- PM Conferees Focus on Key Materiel Acquisition Issues
- Accelerating the Army Acquisition Process
- DARCOM CG Reports on Materiel Acquisition Progress
- Merryman Urges Innovation
- The High Technology Light Division
- 'Skunk Works' Aids in New Light Division Development
- Training With Industry
- Materiel Acquisition Management
- The Military Computer Family
- XV-15 Completes Navy Shipboard Evaluations
- Battelle Forecasts $83.6 Billion For U.S. R&D in '83



MARCH-APRIL

- The TRADOC-DARCOM Partnership in RDA Planning
- TRADOC and the Tech Base
- Documenting Force Modernization
- We Don't Go It Alone: TRADOC-TAC Cooperation
- Total System Management — Representing the User
- Modernizing Military Symbology
- TRADOC and Army RSI
- Training Device Development and Management
- ISS: What Is It?
- The Combat Development Process in the Canadian Army
- The Army Track Program For Combat Vehicles
- Human Factors Considerations For C³I
- Foam Domes As Expedient Structures
- Firing Tables



MAY-JUNE

- Thoughts on Operational Testing
- An Introduction to Army Operational Test and Evaluation
- Resources: The Key to Meaningful Testing
- Operational Testing — Organizing For Success
- The Army and Joint Testing
- TRADOC's Guidelines and Philosophy on Operational Testing
- Army Long Range RDA Planning
- ASA (RD&A) Dr. Sculley Terms Acquisition Management Progress 'Significant'
- TRADOC Testing Activities and Facilities
- CDEC's Unique Capabilities
- User Testing of Medical Equipment
- The Army Communications Command's Role in Operational Testing
- The Armored Combat Earthmover
- A New Way to Melt Explosives
- DARCOM Comptroller Reviews Cost Analysis Guidance
- Training with Industry at Martin Marietta

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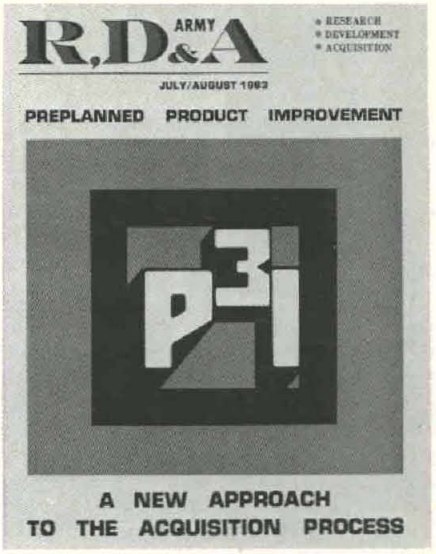
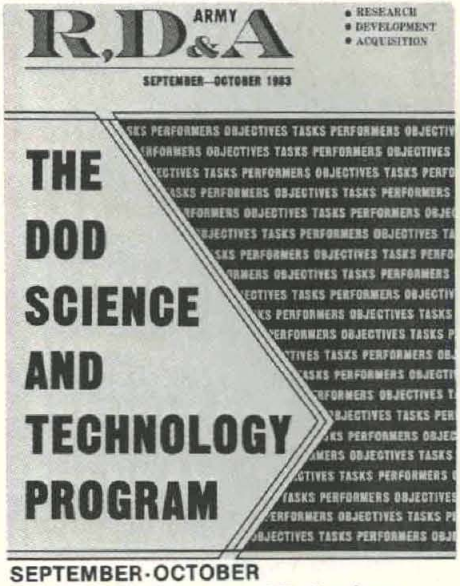
- Preplanned Product Improvement
- Producibility Engineering and Planning Conference
- New Simulator for Army Helicopter Research
- Interview with ARO Director Dr. Robert E. Weigle
- Red Cockpit Lighting Requirement Fades Away



- WRAIR Probes Novel Treatments for Battlefield Shock
- The PATRIOT Antenna Mast Group
- Portable Helicopter Shelter Provides Versatility
- Natick's Science and Technology Prioritization System
- Commercial Trucks Slated as Partial Jeep Replacements



SEPTEMBER-OCTOBER

- The DOD Science and Technology Program: Some Management Perspectives
- Army R&D Achievement Awards
- Applications of Robotics and Artificial Intelligence to Armament
- Profitability and Resource Management Conferees Stress Cost Control
- The Low Vulnerability Ammunition Program
- NATO Smoke Trials in France and Norway
- Geographical Information Systems for Training Land Evaluation
- The Changing Face of Tactical Trucks
- Adding Computer Graphics to Telephone Conferences

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