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ARP-70 Reflects Emphasis Shifts to Achieve Future Army Goals

Constrictions imposed by budgetary adjustments, compounded by inflationary trends that cut purchasing power of funds for research and development, are reflected in the Army Research Plan-1970 (ARP-70).

Scheduled for distribution this month, ARP-70 is a classified document that will be sent to all Army major commands and staff agencies having a related interest, as well as to other U.S. Government agencies concerned with Army research and development planning.

ARP-70 provides guidance for over-all research and exploratory development programs of the Department of the Army. The plan is intended to insure that programs are responsive to long-range concepts, operational capability objectives, and the Army's future materiel and nonmateriel goals.

Based upon the longer-range effects of relatively short-range (1-5 years) research planning decisions, ARP-70 addresses operational requirements for up to 20 years in the future.

(Continued on page 4)

Army Distributing Master Plan for AMIS

Design and development principles and procedures for a coordinated Army Information System (AMIS), extending to all operations, are prescribed in a new "master plan," reflecting 10 years Army experience.

Described as a commander's prerequisite to bringing about discipline in this ever important field and in achieving useful systems at a reasonable cost," the plan being issued was prepared by the Management Information Systems Directorate, Office of the Chief of Staff, HQ DA.

Adherence to the plan and initiation of action to review command planning in perspective of the objectives outlined are required of all Army elements using automatic data processing information systems.

Under the operational control of the HQ DA Information Systems Office (ISO), each Army General Staff agency will have an ISO with assigned functions to formulate and validate statements of information requirements.

Each ISO will propose conceptual approaches, control related regulations and directives, minimize concern caused by changes in requirements, and be the single contact point within the agency for its functional information systems and related actions.

Addresses for implementation of the plan include deputy chiefs of staff; Comptroller of the Army; Chief

(Continued on page 3)

Army R&D Units Convert To Mob Des Detachments

Conversion of U.S. Army Reserve Research and Development Units to R&D Mobilization Detachments in 51 cities throughout the nation has been effected by direction of Chief of Reserves Maj Gen William J. Sutton.

Inactivation of the USAR R&D Units, as originally scheduled June 30, required that members find assignments in established Mobilization Designation positions. Recognizing that this would cause considerable turbulence, General Sutton ordered direct conversion of the units to retain many highly qualified officers.

Under this change, all persons originally assigned to USAR R&D Units automatically become members of the Mob Des Detachments, even though

(Continued on page 2)

HumRRO Terminates 18-Year GWU Link

Control of activities of HumRRO (Human Resources Research Office), the U.S. Army's primary training and education contract agency for 18 years, has passed from George Washington University to a nonprofit corporation with the same acronym.

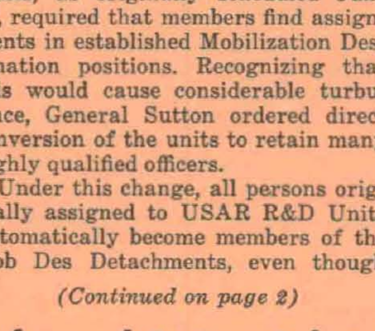
Completion of separation from GWU was announced after months of negotiation and establishment of the management structure of the new agency.

HumRRO remains essentially unchanged with respect to key personnel, staff, location of the headquarters office in Alexandria, Va., and its well-known five principal field ele-

(Continued on page 6)

Forsythe Commands CDC

(See story on page 7)



Lt Gen George I. Forsythe

Safeguard System Debaters Support ABMDA Mission

Congressional debate on deployment of the Safeguard System in recent weeks has been highlighted by strong support of the need for research and development of system components. This viewpoint serves to accentuate the U.S. Advanced Ballistic Missile Defense Agency's mission.

ABMDA's mission is delineated in a recently published pamphlet as:

- Perform advanced BMD developments leading to new system concepts and components which can result in significant improvement in the state-of-the-art of BMD effectiveness.
- Develop system response and necessary technology to counter a sophisticated urban threat from the Soviets or a future Chinese Communist threat.
- Perform advanced development necessary to counter the Soviet threat to U.S. Strategic Offensive Forces and control and communications centers.
- Utilize experimental facilities to assist the evaluation of the U.S. Strategic Offensive Forces through acquisition of field data from their reentry and penetration systems tests.

Creation of ABMDA as a Class II

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Army R&D Newsmagazine

Vol. 10 No. 8 • October 1969

Editor . . . . Clarence T. Smith
Associate Editor . . . . George J. Makuta

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Purpose: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among Army R&D 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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CHANGES OF ADDRESS for AE and R&D Officer Special Career Program enrollees should be addressed to: Specialist Branch, OPXC, Department of the Army, Stop 106 Washington, D.C. 20315. R&D Mobilization Designees should contact the Office of Personnel Operations, Reserve Components Center, Fort Benjamin Harrison, Indianapolis, Ind. 46249—ATTN: Mob Des Career Branch.

OTHER GOVERNMENT AGENCIES' requirements should be submitted directly to the Army Research Office, OCRD, Department of the Army, Washington, D.C. 20310, ATTN: Data Management Division Publications Branch.

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Army R&D Units Convert to Mob Des Detachments

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many do not have mobilization assignments. Officers who were pending R&D mobilization assignments, or who thought they were reassigned, are requested to check their status.

Lt Col William D. Guinn, assistant executive for administration, Office of the Chief of Research and Development, HQ DA, said that all former USAR R&D Unit members will be retained until it can be determined that a mobilization assignment is not available or another appropriate assignment can be provided.

Persons interested in joining an R&D Mobilization Designation Detachment may contact the detachment commander for information. Detachments, commanders and addresses are:

No. 1561, Maj John Litchfield, 505 King Ave., Columbus, Ohio 43201; No. 1662, Maj Philip J. DeInvernois, USAR Center, Avenue A, Leetsdala, Pa. 15056; No. 1663, Col John B. Davis, USAR Training Center, Route 8, Box 34–B, Morgantown, W. Va. 26505; and

No. 1664, Col Adolph H. Humphreys, U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va. 22060; No. 1665, Col Alexander D. Johnson, USAR Center, 1250 Fox Hollow Road, State College, Pa. 16801; No. 1666, Maj Joseph J. Parnicky, USAR Center, 1020 Sandy Street, Norristown, Pa. 08505; and

No. 1667, Lt Col John D. Winebrenner, P.O. Box 16065, Louisville, Ky. 40216; No. 1670, Capt Stoyell Robbins, James W. Wadsworth Training Center, 2035 North Goodman St., Rochester, N.Y. 14609; No. 1671, Lt Col David A. Warren, Sgt Reynold J. King USAR Center, 101 Sunrise Road, Ithaca, N.Y. 14850;

No. 1672, Brig Gen Harry L. Willard, USAR Center, 529 W. 42d St., Bronx, N.Y. 10036; No. 1673, Capt James H. Brillinger, 380 Irvington Ave., Kearny, N.J. 07208; No. 1674, Lt Col Harry M. Anderson, 20 Glenwood Ave., Newton Center, Mass. 02159; and

No. 1675, Lt Col Robert J. Morrissey, ROTC Building, University of Massachusetts, Amherst, Mass. 01002; No. 1676, Lt Col Peter R. Raczowski, National Guard Armory, New London, Conn. 06320; No. 1677, Col Richard M. Story, School of Business Administration, University of Connecticut, Storrs, Conn. 06268; and

No. 1678, Lt Col Edward B. Williams, 408 N. Gettysburg, Dayton, Ohio 45417; No. 1679, Col Joseph A. Julian, USAR Center, 3931 Kirkwood Highway, Wilmington, Del. 19808; No. 1680, Brig Gen Joseph P. D'Arezzo, Lieber USAR Center, 6901 Telegraph Road, Alexandria, Va. 22310; No. 1681, Lt Col Henry Naylor, Maus-Warfield USAR Center, 1850 Baltimore Road, Rockville, Md. 20853; and

No. 303, Lt Col Jena C. Collier II, 2385 Carroll Ave., Chamblee, Ga. 30005; No. 304, Col John H. Neiler, USAR Armory, P.O. Box 3416, Oak Ridge, Tenn. 37830; No. 306, Lt Col Beryl C. Nichols, Armed Forces Center, Area B, Holston Army Ammunition Plant, Kignsport, Tenn. 37662; and

No. 307, Lt Col Norman R. Bell, 3115 Western Boulevard, Raleigh, N.C. 27606; No. 574, Col Byrne M. Daly, USAR Training Center, 1401 W. Argyle St., Jackson, Mich. 49202; No. 575, Col Saul Fidleman, 1812 Saunders Ave., St. Paul, Minn. 55116;

No. 576, Lt Col Conrad A. Blomquist, USAR Center, 2025 E. 71st St., Chicago, Ill. 60649; No. 577, Maj Robert Butler, 1402 S. Park St., Madison, Wis. 53715; No. 578, Col Gustav E. Cwalina, USAR Center, 1301 South St., Lafayette, Ind. 47901; and

No. 579, Lt Col Robert R. Stone, 2901 Webber St., Saginaw, Mich. 48601; No. 580, Lt Col Aubrey B. Larsen, Iowa State University, Ames, Iowa 50010; No. 581, Lt Col Garland T. Riegel, USAR Center, Wright Ave. & U.S. Highway 45, Mattoon, Ill. 61938; and

No. 582, Lt Col Edward E. Newton, 1001 W. Deyoung St., Marion, Ill. 62959; No. 610, Col John H. Meyer, Building 1086, Oakland Army Base, Oakland, Calif. 94625; No. 621, Col Milton H. Mater, USAR Center, 1100 Kings Road, Corvallis, Ore. 97330;

No. 622, Lt Col Donald R. Cone, 352 Churchill Ave., Palo Alto, Calif. 94301; No. 623, Lt Col Francis A. Richards, USAR Center, Seattle, Wash. 98199; No. 624, Lt Col Martin H. Curtiss, Building T–1, Ainsworth St., Richland, Wash. 99301; and

No. 625, Col Jerome Belksy, 655 Westminster Drive, Pasadena, Calif. 91105; No. 626, Col David Bruce, 2731 S.W. Multnomal Boulevard, Portland, Ore. 97219.

Featured in This Issue . . .

Army Prepares Master Plan for Management Information System

(Continued from page 1)

of Research and Development; Adjutant General; Chief of Engineers; Surgeon General; Judge Advocate General; Chief of the National Guard Bureau; Provost Marshal General; Chief of Personnel Operations; and

Commanders in Chief of the U.S. Army Europe and U.S. Army Pacific; commanding generals of the U.S. Continental Army Command, U.S. Army Materiel Command, U.S. Army Combat Developments Command, U.S. Strategic Communications Command, U.S. Army Security Agency, U.S. Army Air Defense Command, U.S. Army Alaska Command; and

Commanders of the U.S. Army Forces Southern Command, U.S. Army Military Traffic Management and Terminal Service, and superintendent of the United States Military Academy.

"The main thrust of the plan," a foreword states, "is to provide better and standard responsive systems, in less time and with a significant reduction in developmental resource requirements. During the past year, as a result of the SOMISS (Study of Management Information Systems Support), effort, major strides in improving management in this important area have been accomplished.

"This master plan is an important step in providing the impetus for making this new system work, and disciplining systems development programs. Its accomplishment requires active support and cooperation Army-wide from commands and staffs responsible for the development and operation of these computer-based systems."

"In the final analysis," the plan states, "management information and ADP systems will respond only to the degree that the user can determine his need for response. . . ."

To accomplish the complex and widespread over-all program, the U.S. Army Computer Systems Command, established in 1969 and given its initial HQ DA guidance in June this year, has projected and submitted to the Secretary of Defense for approval a phased buildup of strength to 4,000 personnel by FY 1975. The FY 1970 augmentation will raise strength to 1,400.

Similarly, the Computer Systems Support and Evaluation Command was recently authorized an augmentation of 49 personnel to begin development of a nucleus capability to increase technical ADP equipment support to users. Further augmentation, by 83 personnel, is approved during FY 1971.

Exempted from the master plan implementation program are scientific and engineering information systems supported by ADP equipment, except where such systems are being developed in conjunction with a management information system.

The master plan implementation approach follows the sequence of:

- Defining the conceptual framework for AMIS design.
- Defining functional management requirements.
- Defining supporting functional system objectives.
- Defining the over-all master design.
- Relating the master design to projects and tasks necessary for execution.
- Relating the master design to staff and command responsibilities for execution or further planning.
- Defining schedules to include major decision points, major developmental phases and other elements of the AMIS life cycle.
- Establishing resource requirements as guidance for further refinement and development of supporting plans.
- Defining the AMIS management system and those tasks required for its further development and use.

Cautioning against development of complex and expensive information systems not essential to accomplishment of command missions, the master plan says scarcity of talent requires consolidation of activities and personnel in ADP-based systems. Allocation of resource skills will give priority to centralized activities, particularly in the Computer Systems Command.

Plans developed by each command must be completely coordinated to "permit early incorporation of resource requirements in Army programs and budgets which require long lead time, such as for training, communications and facilities."

In phasing out individually developed nonstandard systems at each command level, AMIS planning will stress development of modular applications produced by the Computer Systems Command. Fragmented effort is to be reduced by adoption of standard systems.

Planning for system development will include consideration of what may be required for change from a peacetime management mode to a wartime tactical mode—that is, can peacetime/wartime conversion be accomplished? Many similar doctrinal problems that must be solved are presented in the plan.

Specific responsibilities for guidance and reporting systems are fixed by the master plan as follows:

Deputy Chief of Staff for Personnel (DCSPER)—Personal Management Information System (PERSINS), involving Military Personnel Information System (MILPERSINS); Civilian Personnel Information System (CIVPERSINS); Military Police Management Information System (MPMIS); Adjutant General Management Information System (AGMIS); and Medical Management Information System (MEDMIS).

Deputy Chief of Staff for Logistics (DCSLOG): Logistics Management Information System (LOGMIS), involving Supply and Maintenance Management Systems (S&MMIS); Integrated Transportation Management Information System (ITMIS); Integrated Facilities Management Information System (IFMIS); and Support Services Management Information System (SSMIS).

Assistant Chief of Staff for Force Development (ACSFOR): Force Development Management Information System (FDMIS)

Comptroller of the Army (COA): Financial Management Information System (FIMIS).

Chief of Research and Development (CRD): Army Research and Development Management Information System (ARDIS).

Chief of Reserve Components (CORC): Reserve Components Management Information System (RCMIS).

Deputy Chief of Staff for Operations (DCSOPS): Readiness Information System (REIS).

Assistant Chief of Staff for Communications and Electronics (ASCE-E), Army Communications and Electronics Management Information System (ACEMIS).

Major Army commands are charged with development of the master design for command-unique and assigned functional portions of AMIS, and all related implementation requirements.

The U.S. Army Computer Systems Command is responsible for providing technical assistance to HQ DA and Army major commands, as requested, in the development of the master design for AMIS and preparation of Detailed System Functional Requirements (DSFR).

ARP-70 Reflects Emphasis Shifts to Achieve Future Army Goals

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Shifts in funding patterns or program orientation are recommended only for the time period FY 71–74. An appraisal is made of the ability of ongoing 6.1 and 6.2 efforts to support the operational capability objectives. A broad strategy enumerates the shifts in emphasis required to achieve the long-range goals.

Several changes have occurred since publication of the last ARP in 1967. One decision is that the ARP will be published every two years rather than annually; second, the ARP will cover all of the 6.1 Research and 6.2 Exploratory Development categories (ARP–67 covered all of the 6.1 but only about one-half of the 6.2 category). Third, ARP–70 will use the recently approved Army Operational Capability Objectives (OCOs) published in the Combat Development Objectives Guide, Chapter 1, Change 15.

Responsibility for the publication of the ARP is assigned to the Research Plans Office, Army Research Office. Collection and coordination of information and preparation of the ARP–70 have been in progress under direction of Lt Col E. H. Birdseye, chief, Research Plans Office and James W. Sterling, project officer, since late 1968.

Methodology employed in ARP–70 is essentially that used in ARP–67, e.g., evaluating the relevancy and adequacy of 6.1 and 6.2 categories in support of Army operational needs. A matrix approach is used to depict two relationships: twelve 6.1 Defense Research Sciences subelements versus thirty 6.2 elements; thirty 6.2 elements versus the 56 OCOs.

The matrices provide a qualitative (or at most a semiquantitative) profile of the current distribution of research and exploratory development efforts. The matrix entries indicate:

• The degree of potential relevance of the research or exploratory development effort to the supported area.

• The adequacy of the current and programed level of support (funding) of the research or exploratory development effort.

A numbering system is used to designate the degree of relevancy or adequacy of support. Relevancy is on a scale of 4, ranging from minor to essential application. Adequacy of support is on a scale of 5, ranging from significantly underfunded to significantly overfunded efforts.

Matrix entries were prepared by the OCRD project officers and reviewed by the Research Plans Office. Matrices and the supporting narratives for each 6.1 subelement and 6.2 element provide a much-needed complete overview of these programs.

A third matrix, not included in the published plan, appraised 237 of the 6.2 projects against the 56 OCOs. This matrix was used in the preparation of the 6.2 element versus the OCO matrix.

ARP–70 presents a considerably expanded funding analysis down to the subelement/element level, including past, present and future funding. Levels used are those described in the January 1969 R&D Project Listing and CRD–9 Report, September 1968. The analysis covers the period FY 65–74.

A conservative 5 percent per year cost of research increase is used to show how the level of effort has been affected. In addition, the facilities and installation support funding has been identified, beginning with FY 68, so that the actual level of effort is properly portrayed.

Figures 1–4 illustrate the 6.1 and 6.2 funding for the period FY 65–69. Figure 1 shows the relative funding of the total research, development, test and evaluation (RDTE), 6.1 and 6.2 programs.

Figure 2 portrays 6.1 and 6.2 funding as a percentage of RDTE funding. Figures 3 and 4 adjust actual dollars by a 5 percent per year increased-cost-of-doing-research factor to show the serious diminution of level of effort that has occurred in both the 6.1 and 6.2 categories since FY 65.

In addition to the analysis of relevancy and funding for each 6.1 subelement and 6.2 element, several other factors were considered, including:

• Priority requirements and objectives in the Combat Development Objectives Guide, the Combat Developments Command Army 85 Concept Study, Army Strategic Plan, and Joint R&D Objectives Document.

• Identification of in-house research areas where emphasis is needed because they are unique to Army requirements and the work would not be done by others except under contract with the Army.

• The degree of "directed" work that the Army must perform.

• The Army's research responsibilities as executive agent for the military services.

• Previous recommendations of The Army Research Council and ARP–67 and subsequent funding response.

Part IV of the ARP, Findings and Guidance, discusses the current status and summarizes the material presented for each 6.1 subelement and 6.2 element of these categories.

Graphs are included that depict the funding of each element/subelement for the period FY 65–74 in terms of the percentage of their category funding and shifts in their level of effort.

Subelements and elements, however, are grouped according to the criticality of their need for increased emphasis. Group One contains those efforts determined to be most in need of increased effort.

Group Two contains those efforts also determined to be in need of increased effort, with lesser priority than those in Group One. Group Three lists those efforts appraised to be funded at a projected level that is satisfactory. No priority is established within the groups.

The intent of this grouping is to direct the allocation of additional resources toward the efforts in Groups

Col Meara Assigned as Deputy CO at Aberdeen PG

Deputy commander of Aberdeen (Md.) Proving Ground is the new title of Col William D. Meara, formerly director, Plans and Operations Directorate, U.S. Army Test and Evaluation Command headquartered at APG.

Until assigned to APG in 1967, he was with the U.S. Army Combat Developments Command Experimentation Center, Fort Ord, Calif., for three years, following a 3-year tour in Germany with the Military Assistance Advisory Group in Bonn, Germany.

After graduating from the Army Command and General Staff College in 1954, he was assigned for three years to the Office of the Deputy Chief of Staff, Personnel, HQ Department of the Army, Washington, D.C. He later served in Korea with HQ U.S. Eighth Army and then went to the 1st Armored Division, Fort Hood, Tex., as a battalion CO.

Col Meara has studied at the University of Kentucky (prior to entering the Army in 1941), Columbia University and the University of Maryland. His honors include the Legion of Merit, Bronze Star Medal for Valor, Joint Service Commendation Medal, Army Commendation Medal and the Purple Heart.

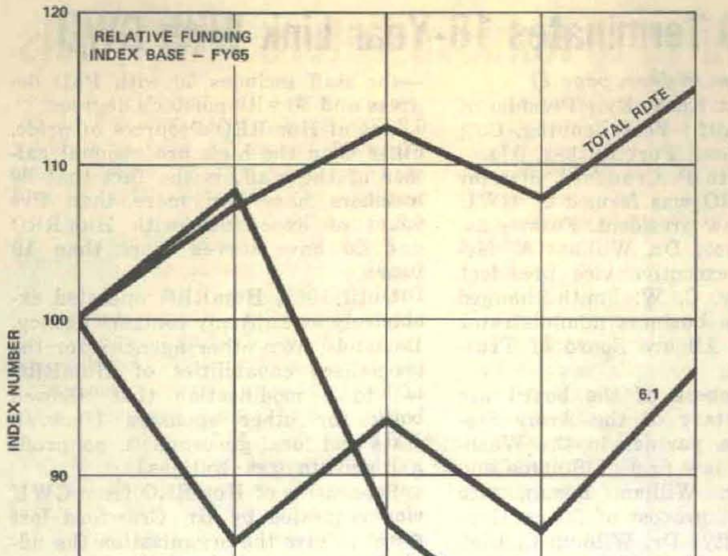

FIG 1

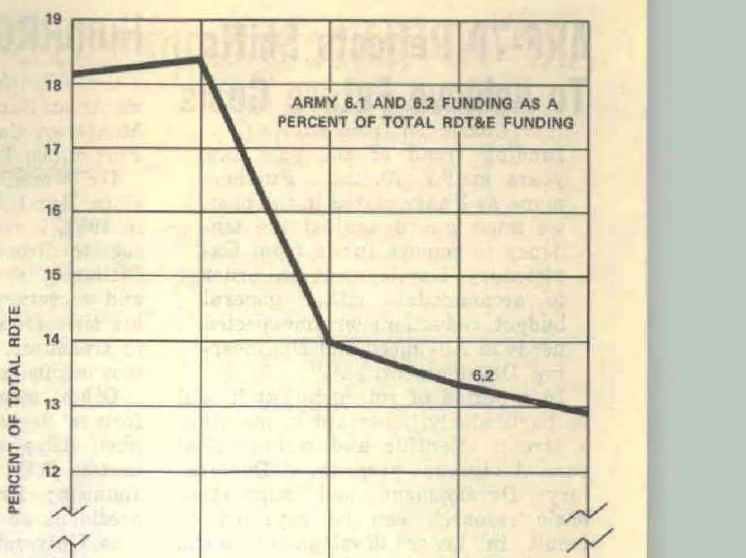

FIG 2

I, II and III, in that order. Conversely, if available resources are reduced, selective cuts should be made in the order Groups III, II and I.

The ARP–70 cautions that reductions in 6.1 and 6.2 effort must consider the impact on maintenance of in-house laboratory capability.

SUMMARY STATEMENT. In conclusion, ARP–70 says effort in both the 6.1 and 6.2 categories has declined since FY 65 as measured by the change in percentage of total RDTE funding and the decrease in level of effort. Particularly significant is the 6.2 reduction where, from FY 65–69, the percentage declined from 18 to 13 percent of total RDTE funds and the adjusted level of effort declined by about one-third.

In the short run, this reduction is justified in order to respond to critical technical problems emerging in Vietnam. In the long run, however, the emphasis could seriously deplete the Army's scientific and technological base. This problem was recognized by the Director of Defense Research and Engineering when he stated:

"We must plan to try to reverse the Exploratory Development

(Continued on page 6)

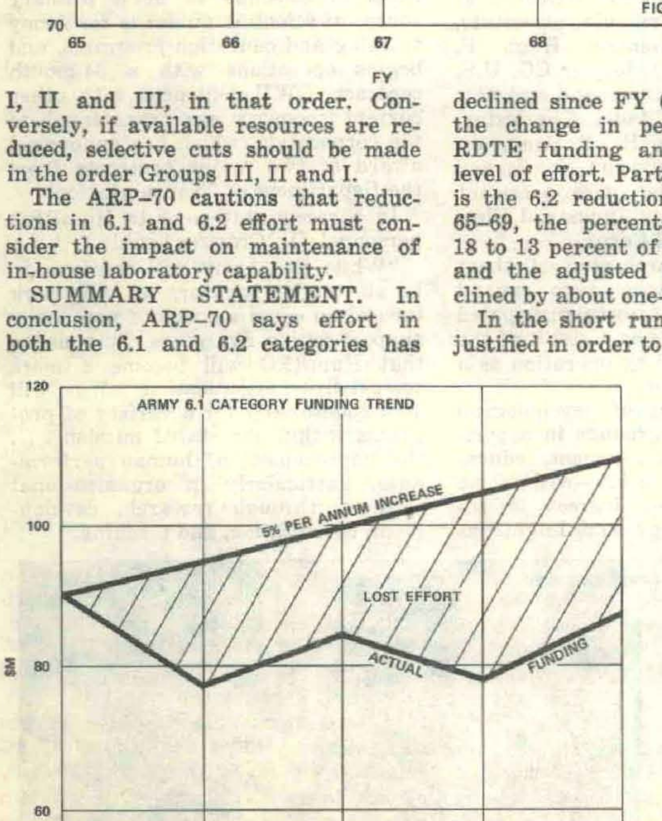

FIG. 3

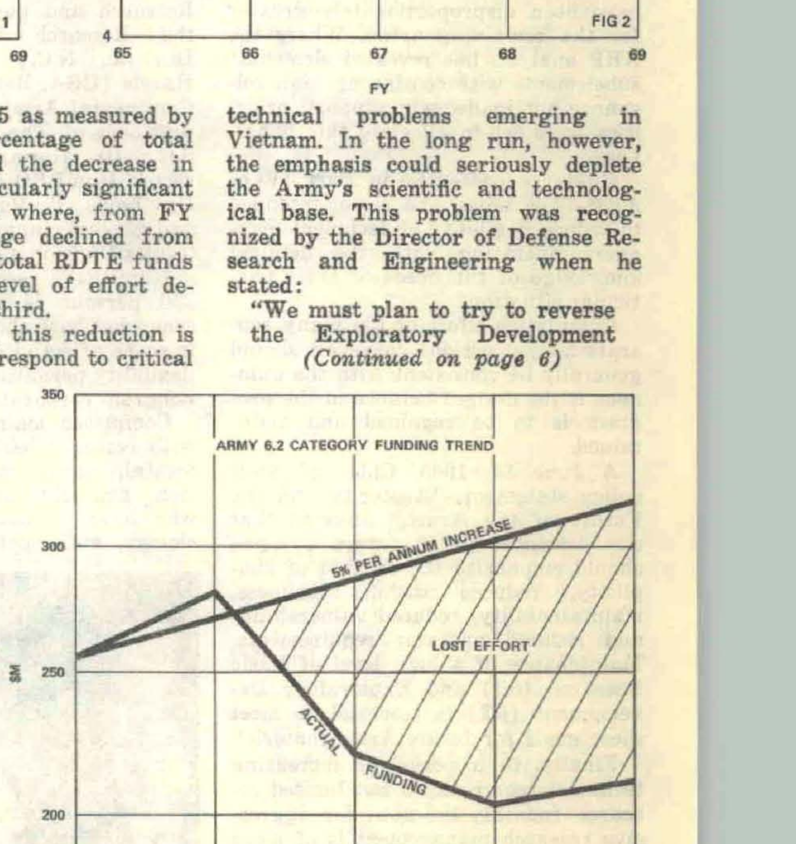

FIG 4

ARP-70 Reflects Shifts To Achieve Future Goals

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funding trend of the past few years in FY 70. . . . Furthermore, as I have stated in the past, we must guard against the tendency to remove funds from Exploratory Development in order to accommodate either general budget reductions or unexpected needs in Advanced and Engineering Development. . . ."

In a period of retrenchment it will be particularly important to maintain a strong scientific and technological base. A vigorous program of Exploratory Development and supporting basic research can be expected to result in lower development costs, shorter lead times, higher systems reliability, improved capabilities and decreased probability of technological surprise by the potential enemy.

During this past period of declining effort, emphasis on certain essential elements/subelements was held constant or increased. Therefore, the cuts have been disproportionately greater for the remaining areas. Where the ARP analysis has revealed elements/subelements with continuing high relevance but inadequate support, priorities were set to alleviate this imbalance.

Guidance presented in Part IV of ARP-70 is broad and is not intended to reduce flexibility of technical managers operating with the detailed knowledge of the needs of their particular situation.

Cumulative effect of the many separate budget actions, however, should generally be consistent with the guidance if the desired balance in the program is to be regained and maintained.

A June 14, 1969, Chief of Staff policy statement, "Austerity and the Future of the Army," directed that the development of future systems should emphasize the criteria of simplicity, reduced costs, timeliness, maintainability, reduced vulnerability and reduced operator requirements. Maintenance of a high level of Basic Research (6.1) and Exploratory Development (6.2) is essential to meet these goals for future Army materiel.

Finally, in a period of increasing technical requirements but limited research funding, the need for aggressive research management is of more importance than ever. Limited resources must be focused on those scientific and technological areas that can be expected to make the greatest contributions to the needs of the Army of the future.

HumRRO Terminates 18-Year Link With GWU

(Continued from page 1)

ments at Fort Knox, Ky.; Presidio of Monterey, Calif.; Fort Benning, Ga.; Fort Bliss, Tex.; Fort Rucker, Ala.

Dr. Meredith P. Crawford, director since HumRRO was formed by GWU in 1951, is now president. Former associate director, Dr. William A. McClelland, is executive vice president and secretary. C. W. Smith changed his title from business administrator to treasurer. All are Board of Trustees members.

Other members of the board are former Secretary of the Army Stephen Ailes, a partner in the Washington, D.C., law firm of Steptoe and Johnson; Dr. William Bevan, vice president and provost of Johns Hopkins University; Dr. William C. Biel, associate dean of the Graduate School and coordinator of research at the University of Southern California; Dr. Charles Bray, now retired but formerly special research director for the Smithsonian Institution; and

Dr. Chester W. Clark (Maj Gen, USA, Ret.), former Director of Army Research and now vice president of the Research Triangle Institute, Durham, N.C.; General Hugh P. Harris (USA, Ret.), former CG, U.S. Continental Army Command and now president of The Citadel, Charleston, S.C.; Dr. Howard H. McFann, director HumRRO Division No. 3; and Dr. Louis T. Rader, vice president and general manager, Industrial Electronics Division, GE Corp.

HumRRO's research staff of about 250 persons is expected to expand somewhat with the growth anticipated in scope of activities as a result of the flexibility permitted by operation as a nonprofit corporation.

Comprised mainly of psychologists with research backgrounds in experimental, social, measurement, education, and clinical fields—with some who have advanced degrees in sociology, anthropology and linguistics—the staff includes 60 with PhD degrees and 30 with master's degrees.

One of HumRRO's sources of pride, other than the high professional caliber of the staff, is the fact that 60 members have had more than five years of experience with HumRRO and 20 have served more than 10 years.

Until 1967, HumRRO operated exclusively as an Army contract agency. Demands from other agencies for the specialized capabilities of HumRRO led to a modification that allowed work for other sponsors (federal, state and local government, nonprofit and private organizations).

Separation of HumRRO from GWU was requested by Dr. Crawford last April to give the organization the administrative and fiscal flexibility to pursue an expanded R&D program in the fields of training and education. Diversification of sponsorship was viewed as an avenue of modest growth, and an opportunity to serve civil as well as military needs.

The new HumRRO corporation expects to continue to be a primary source of scientific guidance for Army training and education programs, and begins operations with a 34-month contract. GWU contracts with other current sponsors are transferred to the corporation, which has announced award of two major contracts from the Department of Transportation.

In a recent statement to HumRRO personnel, Dr. Crawford said:

"While the Army will continue to be our major sponsor, we will work toward an equal amount of non-Army support within five years. This means that HumRRO will become a more competitive organization. We will seek sponsorship for a variety of programs within our stated mission . . . the improvement of human performance, particularly in organizational settings, through research, development, consultation, and teaching."

HumRRO TRUSTEES, first row (l. to r.), Dr. McClelland, Dr. Clark, Dr. Crawford, Dr. Bevan, Dr. McFann. Second row, Mr. Smith, Dr. Bray, Dr. Rader, Dr. Biel, General Harris. Stephen Ailes was not available for photo.

U.S. Steel Foundation Announces $2.37 Million Aid to Education

Aid to education totaling $2.37 million, including grants to 711 liberal arts colleges, institutes and universities, was announced by the United States Steel Foundation, Inc., early in August.

The expansive program also provides for grants to about 40 educational organizations and educational research projects concerned with raising the quality and improving the effectiveness of teaching and learning in America, as well as providing additional opportunities in higher education for the underprivileged.

About 50 percent of the total ($1,198,000) is for unrestricted operating grants to colleges, universities and institutes. About 33 percent ($775,000) is restricted for use by recipients only as to their institutionally chosen major-purpose or capital priorities.

A third category of grant, accounting for about 10 percent of the total, is $232,500 for national and regional application toward research or projects designed to improve educational methods and administration. An additional $164,500 (about seven percent of the total) is for programing manpower and womanpower development and for departmental grants.

Operational grants totaling $1,198,000 include $502,000 in unrestricted aid to all 502 accredited 4-year institutional members of 40 state and regional fund-raising associations federated national under the Independent College Funds of America.

Assistance totaling $186,000 is provided to 172 non-group-related liberal arts colleges, universities, scientific and engineering institutes. Fifteen Canadian higher educational institutions will share $70,000.

Twenty-two private institutions at major universities each will receive a grant of $20,000 under the Leadership Institution Aid Plan, which is a part of the over-all program supported by U.S. Steel Foundation, Inc. The plan provides national universities with substantial unrestricted sums for priority use.

Capital grants totaling $775,000 will benefit four national universities —Case Western Reserve, California Institute of Technology, Stevens Institute of Technology, and Notre Dame—and five regional institutions as well as 18 liberal arts and science colleges.

Since 1954, including the 1969 grants, some 375 liberal arts colleges and other institutions have received major-purpose or capital grants totaling nearly $8 million.

Research and project grants amounting to $232,500 are distributed among 25 organizations, including renewed support to the American Alumni Council for its general program and for the U.S. Steel Foundation-initiated Alumni-Giving Incentive Awards Plan. The plan is open to hundreds of private and public educational institutions, from secondary-school through university level.

Manpower development grants totaling $164,500 place special emphasis upon needs of the culturally and economically disadvantaged. Particular concern is reflected for improving educational opportunities for able and motivated Negro students. Such grants in recent years have funded programs at selected institutions in the fields of architecture, engineering, political science, the physical and behavioral sciences, and public and business administration.

Lt Gen Forsythe Takes Command of CDC

(Continued from page 1)

Lt Gen George I. Forsythe achieved 3-star rank Aug. 29 when he succeeded Lt Gen Harry W. O. Kinnard as CG of the U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va. General Kinnard retired after more than 30 years of service, the last two as CDC commander.

General Forsythe has been CG of the U.S. Army Infantry Center and commandant of the U.S. Army Infantry School at Fort Benning, Ga., since June 1969. He commanded the 1st Cavalry Division (Airmobile), U.S. Army Vietnam from Augus 1968 to April 1969.

He was assistant deputy for Civilian Operations and Revolutionary Development Support, commander, U.S. Military Assistance Command Vietnam (1967–68), and assistant chief of staff, G–3, U.S. Army Pacific (1966–67).

General Forsythe was assistant commandant of the Army Infantry School (1965–66); assistant commander, 25th Infantry Division, Schofield Barracks, Hawaii (1963–65), executive officer and senior aide to the Chief of Staff, U.S. Army (1962–63).

Commissioned a second lieutenant in 1940 following graduation from Montana University, he has completed courses at the Command and General Staff College, the Armed Forces Staff College (1953), and the Air War College (1958).

During World War II, he served with HQ XIX Corps in England and later was a member of the G1 Division of the War Department General Staff, Washington, D.C. (1945–48).

After duty as a faculty member of the C&GSC, he served with the 22d Infantry in Germany until December 1952. Other major assignments have included tours with the Offices of the Assistant Secretary of the Army, Comptroller, and Chief of Staff in Washington, D.C.; 101st Airborne Division, Fort Campbell, Ky.; HQ Third U.S. Army, Fort McPherson, Ga.; and several tours in Vietnam.

Among numerous honors, General Forsythe holds the Distinguished Service Medal with Oak Leaf Cluster (OLC), Legion of Merit with two OLC, Distinguished Flying Cross, Bronze Star Medal with three OLC, Air Medal with five OLC, and Army Commendation Medal with three OLC.

South Vietnam has awarded him the Vietnam National Order 4th Class with Rossette, Vietnam Distinguished Service Order 1st Class with Rossette, Vietnam Gallantry Cross with Palm, and the Vietnam Revolutionary Development Medal with Palm. He also has received the Croix de Guerre (French and Belgium) with Palms.

ARPA Advisory Committee Views Small Arms Program

Thirty-five of the nation's experts on small-arms weapons gathered Sept. 3–4 at HQ U.S. Army Combat Developments Command Experimentation Command, Fort Ord, Calif., for an Advanced Research Projects Agency Small Arms Advisory Committee meeting.

Dr. C. J. Wang, director of Advanced Engineering, Office of the Secretary of Defense/Advanced Research Project Agency, and chairman of the committee, said it was formed by ARPA to help in the planning of small arms research and development and to advise the Department of Defense in small arms matters.

In addition to reviewing the small arms program for FY 1971, the committee was briefed on CDCEC experiments in progress, and saw a display of instrumentation used in the command's experimentation.

David C. Hardison, scientific adviser for U.S. Army Combat Developments Command, Fort Belvoir, Va., is a member of the Small Arms Advisory Committee.

Safeguard System Debaters Support ABMDA Mission

(Continued from page 1)
Activity reporting directly to Army Chief of Research and Development Lt Gen A. W. Betts was approved by the Deputy Secretary of Defense Feb. 8, 1968.

Headquartered on the 11th floor of the Commonwealth Building in the Rosslyn area of Arlington, Va., ABMDA is collocated with the Office of Safeguard System Manager Lt Gen A. D. Starbird due to interfacing responsibilities. Brig Gen George Mayo Jr. is his deputy and chief, Safeguard System Office.

ABMDA Director Dr. Jacob B. Gilstein concurrently is Deputy Assistant Secretary of the Army (R&D) for Ballistic Missile Defense. In this capacity he is the primary adviser to the ASA (R&D) for formulation of policy guidance on ballistic missile defense. Archie Gold is his deputy and Col O. N. Esco is ABMDA commander.

Major goals of ABMDA are prescribed as: Demonstrate real-time discrimination of actual warheads in a reentry "cloud" of objects; handle high-traffic-rate threats; beat radar blackout; reduce costs of radars and computers; shorten lead time of new hardware—from concept to initial operational capability; extend operational lifetimes of deployed systems; devise and evaluate new defense concepts; demonstrate interceptors which use smaller yield or nonnuclear warheads; and provide general BMD technology upgrading.

Organizationally, ABMDA is structured to perform advanced development required for defense system responses to a spectrum of possible ballistic missile threats. Information from intelligence sources is analyzed to define the nature of the developing threat and estimated dates of operational capability of various threat elements.

Lead time available for U.S. countermeasures to the threat is determined as a basis for development of alternative conceptual responses to the threat. Response systems fall into four main categories of forward-area defense, mid-course defense, regional defense, and terminal defense.

System requirements for the various responses are developed and alternative concepts are evaluated comparatively to determine relative performance and sensitivities of the concepts, including engagement logic, command and control network, and integration of the system into the total force structure. Warhead requirements specifications are defined from analyses.

ABMDA enters into advanced development of a concept or component within one or more of its eight technology divisions: Advanced Systems; Data Processing; Discrimination Technology; Missile Development; Nuclear Effects; Optical Systems; Radar Systems; and Reentry Physics.

Frequent interface meetings are held with the Safeguard System Manager (SAFSM) as the advanced development of the concepts or programs progresses within ABMDA. ABMDA's primary objective is to transfer to the Safeguard organization, as soon as possible, those technologies and components whose feasibility has been demonstrated, and which are considered jointly to be a desirable upgrading of the Safeguard System.

Based on this analysis and integrated planning, a joint decision by the Chief of R&D and SAFSM proposing initiation of an engineering development program to meet the envisioned threat is presented to the Chief of Staff for approval by the Assistant Secretary of the Army (R&D) and the Director of Defense Research and Engineering.

To achieve this objective, ABMDA uses, as a line of departure, the Safeguard design system defined by SAFSM. Components are identified which should be designed with growth capability to allow incorporation of advanced development in responses to increased threats. ABMDA assists the SAFSM in performing system effectiveness analyses.

ABMDA-Huntsville (Ala.) provides scientific and engineering support, and may be assigned program manager responsibility and authority for accomplishment of technical direction functions on specific programs. This ABMDA element also gives technical support in planning and conducting supporting studies and analyses.

Organization of ABMDA-Huntsville includes a director, Julian Davidson, with Norman C. Buchholz as deputy and Lt Col Johnie B. Spruiell as assistant director and commanding officer. In addition to a Systems Requirements and Control Office, there are five divisions: Systems Analysis and Environment; Reentry Physics and Range Measurements; Radar and Data Processing; Optical Systems; and Missile Development.

Basically, ABMDA-Huntsville acts as an executive agency in implementing plans and programs developed by ABMDA-Washington. In FY 1969, ABMDA-Huntsville, operating through the SAFSCOM contracting office, had awarded more than 200 contracts to industry, academic institutions and not-for-profit research agencies.

Contracts of ABMDA-Huntsville have called for studies or developmental work on ballistic missile defense systems concepts; logic and programs analysis; interceptor systems and warhead development; radar systems development; optical systems development; and data processing systems.

Future areas of increased emphasis have been identified by ABMDA as data processing; mid-course homing and intercept; boost phase and deployment phase surveillance and RV trajectory prediction; radar blackout analyses; nuclear vulnerability and hardening of radar and IR-optical sensors; systems analyses; and cost analyses.

Accomplishments listed by ABMDA during the first 18 months of its existence, as published recently in an unclassified brochure, are impressive, reflecting the intensity and the scope of the over-all Advanced Ballistic Missile Defense R&D effort.

In the area of radar systems, ABMDA lists four major achievements in FY 1969. ALTAIR, a low-frequency, high-performance radar constructed at Kwajalein Missile Range in the Pacific Ocean, is reported to "greatly enhance a technological base for measuring and evaluating reentry vehicles." ABMDA is engaged in development, construction and evaluation of this system.

The baseline design for CAMEL, a solid-state radar, has been completed and engineering development of transmit-receive modules has been initiated.

An operational phased-array radar known as HAPDAR is being tested with a newly developed sidelobe canceler system. ABMDA also sponsored a 1968 study that resulted in publication of a 6-volume report titled "Concepts for Urban Defense."

Missile systems accomplishments reported by ABMDA include UPSTAGE, a program to determine feasibility of engaging a highly evasive maneuverable reentry vehicle. All analyses and preliminary engineering design, major subcontracts, ground and flight test planning, and about 30 percent of vehicle detailed design are completed.

In keeping with the evolving threat, ABMDA completed three concept formulation studies of the Spartan high-performance third stage (improved) to permit multimode missions.

Effort was initiated on LoRAH, the objective of which is to determine feasibility of intercept in a high density penetration aid environment. An applications study of the Sprint missile, a major component of the Safeguard System, was initiated to determine growth potential and usefulness in various terminal modes.

Other progress on missile systems includes HOSS, a survey to investigate the role of homing techniques in intercept modes; RHOGI and GLINT, studies for endoatmospheric homing; and a study of slender cones in hypersonic flow for interceptor shapes.

Development of discrimination technology included the formulation of a 5-year program designed to have available, when needed, discrimination technology for implementation into U.S. ABM systems. Action was taken for updating modifications to range radars at Kwajalein Missile Range and White Sands (N. Mex.) Missile Range for improved performance.

ABMDA studies impacted on the Safeguard System decision to accept Improved Spartan and Improved Missile Site Radar for engineering development. More intensive studies are under way.

Reentry physics accomplishments listed by ABMDA as significant include a successful flight of the first RMIP (Reentry Measurements Instrumentation Package), which has yielded the most detailed data to date.

A substantial and reliable data base was developed for small-body drag effects through comprehensive investigration of high-altitude drag phenomena. Measurement of close-in near wake phenomena of cones and spheres was accomplished on the ballistic range.

Other reentry physics progress includes use of laser holography to obtain interferograms of flow fields of hypersonic bodies at the ballistic range; comparisons of reentry observables from flight tests, using the latest chemistry flow-field computer techniques; development and demonstration of special processing for coherent analysis of mid-course chaff clouds; and study of radar scattering from near wakes of large spheres (9-inch diameter) under hypersonic flow conditions.

Nuclear effects studies achievements listed by ABMDA include Phase I evaluation with the Atomic Energy Commission, leading to warhead candidate development and selection for future interceptors. A study was made of the equilibrium charge state of high-energy ions passing through a neutral gas target. Experimental work was accomplished on the phenomena of atmospheric ionization clustering.

Under the heading of optical systems accomplishments, ABMDA points to development of a sensor for target data collection, which is to be flown on the Special Defense Program upcoming flights. Parametric designs also were performed on advance sensors for use against threats with large numbers of decoys.

ABMDA KEY PERSONNEL. *Dr. Jacob B. Gilstein* was appointed ABMDA director and Deputy Assistant Secretary of the Army (R&D) for Ballistic Missile Defense in September 1968.

Selected to succeed Dr. Patrick J. Friel, who resigned to return to private industry, Dr. Gilstein had distinguished himself in research assignments with General Electric Co. in Philadelphia, Pa., since 1956.

Graduated from City College of New York with a BS degree in physics in 1943, he received MS and PhD degrees in physics from New York University (1950–58). He was a part-time instructor and research associate (1947–56) in the NYU Research Division, engaged in temperature instrumentation and R&D in combustion phenomena in jet and rocket engines.

After serving three years with the U.S. Army, he was employed in 1946–47 as an aeronautical research scientist with the National Advisory Committee for Aeronautics, Langley Field, Va.

With General Electric Co., Dr. Gilstein worked three years as physicist and acting manager, Aerospace Sciences Laboratory, Missile and Space Vehicle Department, where he was concerned with shock tubes, aerodynamic arc development, plasma jet investigations and spectroscopy.

In 1959 he became a physicist/consultant with the Special Program Section on weapons effects, vulnerability countermeasures and penetration aids. As manager of a group of scientists (1961–63), he directed research in reentry vehicle penetration and general applied physics.

For the next two years he was systems engineer, responsible for monitoring and providing technical direction of effort in the Mark 12 penetration weapon system. Then he served 16 months as systems engineer of a study involving parametric configurations and packaging and deployment analyses, vehicle reentry dynamics and vulnerability and hardening.

After managing about 140 employes in the Aerospace Physics Laboratory from August 1966 to February 1968, he became manager of the Aerospace Physics and Systems Analysis Section. In this assignment he directed 250 engineers, scientists and support personnel in ballistic missile and space vehicle mission analyses and systems effectiveness studies.

This effort included computer simulation, automated design, reentry observables analyses and data interpretation, concept formulation of penetration aids, definition of earth, space and planetary environments, experiment synthesis, biophysics and bioengineering.

Archie Gold was appointed the ABMDA deputy director when the agency was formed. He was with ARPA (Advanced Research Projects Agency) as chief of the Missile Phenomenology Branch (1966–69), and also was acting chief, Radar and Optical Technology Branch, program manager for SPARTA AMRAD and the optics programs since 1967.

Among his qualifications are BS (1949) and MS (1954) degrees in mechanical engineering from Drexel Institute of Tecnology, and graduate studies at the University of Pennsylvania and Temple University.

He was employed with RCA (1954–66) as a staff scientist, with responsibility for radar technology for ballistic missile research and systems applications. His experience includes participation in the conceptual development of the BMEWS, DAMP, Optalos, Wizzard, and other ballistic missile defense systems.

From 1948 to 1954, while with the Naval Air Development Center at Johnsville, Pa., he worked on development of propulsion modifications for

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Dr. Jacob B. Gilstein

Archie Gold

Safeguard System Debaters Support ABMDA Mission

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pilotless aircraft and guided missiles fabricated at the center.

Gold has been granted several patents and has applications pending on other inventions. He is a senior member of the American Institute of Aeronautics and Astronautics (AIAA), the Institute of Electrical and Electronic Engineers, and American Association for the Advancement of Science, and a member of the National Academy of Science Review Board of Radio Standards.

Since 1961, he has served as chairman or member on a number of Air Force, Army and Department of Defense committees and panels. Among his honors are Letters of Commendation for work on the Ballistic Missile Early Warning System (BMEWS) in 1961, project scientist for Project 6.13, Project Fishbowl (1963), Shoran (1958), and scientific director of DAMP (1965).

Col Oliver N. Esco was assigned as

Col Oliver N. Esco

commanding officer, ABMDA, after receiving an MBA degree from the University of Alabama in 1968. He earned his bachelor's degree in general education at the University of Omaha (1960) and graduated from the Command and General Staff College (1963).

From 1963 to 1966, he served with the 4th Missile Battalion, 43d Artillery (Nike-Hercules), Fort Richardson, Alaska. He was division chief, Officer Instruction Division, High-Altitude Missile Department, Army Air Defense System at Fort Bliss, Tex. (1960–62), and assistant S–3, 1st Cavalry Division (Artillery) in Korea (1959).

Lt Col Elwood A. Lloyd recently became ABMDA executive officer after serving since 1967 as deputy commander of Fort Detrick, Frederick Md. He has BS (1949) and MS (1961) degrees in nuclear chemistry from the University of Tennessee, and completed the Command and Gen-

Lt Col E. A. Lloyd

eral Staff College in 1967.

Col Lloyd has served as chemical officer, 7th Infantry Division, Korea (1965–66); nuclear effects engineer, HQ Sixth Army, San Francisco, Calif.; and chief, Nuclear Chemical Division, and deputy commander, Nuclear Defense Laboratory, Edgewood (Md.) Arsenal (1961–63).

Dr. Ralph H. Pennington is assistant director and chief, Data Processing Division. Retired from the U.S. Air Force with the rank of colonel, he was chief of the ARPA Systems and Technical Requirements Division until he became a civilian.

From 1963 to 1966, he served at the Air Force Weapons Laboratory, Kirtland Air Force Base, N. Mex., following two years as special assistant to the Director of Defense Research and Engineering, Washington, D.C. He was assigned to the Defense Atomic Support Agency in Washington (1958–61).

Graduated in 1946 from the U.S. Military Academy, West Point, N.Y., he served at the Oak Ridge (Tenn.) National Laboratory in 1947–48 and then spent a year at the U.S. Naval Post Graduate School, Monterey, Calif.

After serving as a nuclear weapons staff officer with the Armed Forces Special Weapons Project at Sandia Base, Albuquerque, N. Mex., he was

Dr. Ralph H. Pennington

assigned as staff scientist on Project Matterhorn at Princeton University. Duty as a staff scientist (1952–54) at the University of California Radiation Laboratory at Livermore enabled him to complete his studies for a doctorate in 1954.

During an assignment at the Office of Special Weapons Development, Fort Bliss, Tex. (1954–56), he performed studies for the Continental Army Command on tactical employment concepts for nuclear weapons.

By request of the Army Chief of Research and Development, he then was assigned to Fort Campbell, Ky., until 1958 to serve with the 101st Airborne, the first Army division-level unit to receive nuclear weapons. He wrote standard operation procedures for division headquarters for firing, handling and employment of nuclear weapons.

Dr. Richard S. Rufine, assistant director and chief, Reentry Physics Division, was with the Advanced Research Projects Agency (ARPA) for two years until he transferred to ABMDA last February.

Dr. Richard S. Ruffine

Dr. Ruffine is program manager for the RONDO and AMRAD radar field measurement program and on-board reentry measurement, and chairman of the ballistic missile defense experimental meetings.

In 1950 he earned a BS degree from Queens College (N.Y.), MS degree from Syracuse University in 1953 and PhD in 1960 from New York University, all in physics. His industrial experience includes research on thermodynamics of the flow-field surrounding a reentry vehicle as a staff scientist with G. C. Dewey Corp. (1960–62).

While employed with RCA Laboratories (1962–67), Dr. Ruffine performed research studies on radar returns from reentry vehicles and their intakes, and on electromagnetic scattering theory.

In 1966–67, he was chairman of a cross-section committee for the PEN-X study and served as a consultant to the Institute of Defense Analysis.

Dr. Ruffine has published and pre-

Vahey S. Kupelian

sented several papers in the field of atomic scattering. A member of the American Association for the Advancement of Science (AAAS), the American Geophysics Union (AGU), and the American Physics Society (APS), he is listed in *American Men of Science.*

Vahey S. Kupelian is assistant director and chief of the ABMDA Missile Development Division after serving as an ARPA program manager since 1960. He was chief of the Missile Technology Branch since 1965, program manager for UpStage, and directed studies on control and guidance, propellants and propulsion.

Kupelian was program manager of the high-g boost experiment (HiBEX), which developed new technology for high-acceleration propulsion, control, launch and instrumentation and the PreSTAGE Program. This work developed new technology of external burning for high-response control of hypersonic vehicles.

In 1959–60 he directed various missile system feasibility and development studies as chief of the Missile Systems Engineering Division, Naval Weapons Plant. As director of engineering, Naval Ordnance Experimental Unit (1950–59), he was responsible for the PETROL missile program.

For eight years he was with the Goodyear Aircraft Corp. and he served a year in R&D program management with the Kuljian Corp.

Lindsey B. Anderson, assistant director/chief, Radar Systems Division,

Lindsey B. Anderson

has a BS degree in electrical engineering from Cornell University (1954) and an MS degree in applied science from Adelphia College (1962).

Prior to joining ABMDA, he was engaged in design and development of advanced radar systems and programs, such as ADAR, ALCOR and ALTAIR, at the Massachusetts Institute of Technology Lincoln Laboratory, Lexington, Mass. (1964–68).

Anderson served in the Army (1954–56) as a Signal Corps officer. Following his return to civilian status he was employed by Sperry Gyroscope Co. at Great Neck, Long Island (1956–60) and by Raytheon Co., Burlington, Mass. (1960–64).

Leonard I. Kopeikin became assistant director and chief, Advanced Systems Studies Division, after 10 years with General Electric, TEMPO, as supervisor of advanced weapons systems studies.

During this time he supervised publication of 20 major technical publications, presented four technical papers at national meetings, and served as

Leonard I. Kopeikin

director of Advanced Systems in Engineering at the University of California, Berkeley.

Kopeikin is an engineering graduate of the City College of New York and has done graduate work at the University of New Mexico, University of California at Los Angeles, and in a special General Electric Co. program.

While in military service, he was a weapons systems officer for three years at the Naval Air Special Weapons Facility, Albuquerque, N. Mex. There he had direct responsibility for assuring compatibility of AEC warheads with Navy delivery systems, and contributed to staff studies on future nuclear requirements for the Navy.

Robert Norling, assistant director and chief of the Optical Systems Division, has a BSME degree from Bradley University (1952) and an MS degree from Notre Dame (1956).

Until he joined the ABMDA staff, he was responsible for the reentry optical program at the AVCO Everett

Robert Norling

Research Laboratory, Everett, Mass. For several years he analyzed data on the Air Force Terminal Radiation Measurements Program.

One of the originators of the length/ballistic coefficient discrimination technique, he participated in a program sponsored by Bell Telephone Laboratories and the Army Nike-X Project Office on reentry measurements.

More recently he initiated work on optical discriminations for mid-course penetration aids and in 1968 was commended by the Assistant Secretary of the Army (R&D) for his contribution to a "Summer Study on Concepts for Urban Defense." He is the author of numerous papers on optical measurements and optical discrimination.

Lt Col Harry J. Skinker was ABMDA executive officer until assigned recently as assistant director and chief, Program Management Office. From 1966 to 1968, he was deputy and then commanding officer, U.S. Army Maintenance Plant, Schwaebisch Gmuend, Germany.

He has a BS degree in agricultural education from Virginia Polytechnic Institute (1953), an MBA degree from the University of Alabama (1966), and was graduated from the Air Defense Missile School, Fort Bliss, Tex. (1958) and the Ordnance Officer Career Course (1964).

He served in Korea with the 71st Ordnance Group, Ammunition (1962–63), and with the Sergeant and Pershing Projects at White Sands (N. Mex.) Missile Range (1959–62).

Lt Col H. J. Skinker

Technological Application of Basic Research Supported by ARO-D

In recent years some questions have been raised about the benefit that the Army derives from the support of basic research. Since the immediate objective of basic research is the evolution of new knowledge and understanding, it is difficult to evaluate a basic research program in terms of potential technological applications.

Science and engineering history, of course, provides a few outstanding examples of by-product benefits, such as the transistor or nuclear energy, which justify investments in basic research from a very practical point of view. But these examples have been used so many times that they have lost their impact.

Furthermore, those who are asked to allocate funds may not be impressed if one explains the effect of Faraday's and Maxwell's discoveries on modern technology, since this would almost imply that research which is conducted today should not be expected to lead to significant applications before 40 or 50 years.

In trying to justify basic research for a mission-oriented organization, one is faced with three major problems. The first is that technological innovations are usually not based on a single discovery, but rather on the collective contribution and integration of a large number of individual research efforts.

Top-level managers may not have the time to digest case studies demonstrating that the operation of some gadget is based on a large number of fundamental investigations and publications in professional journals that can be traced back several decades.

A second factor is that results of an integrated and comprehensive basic research program will probably suggest several possible solutions to an applied problem or materiel requirement, but usually only one of the feasible methods is adopted.

While the basic research program does provide an option to the design engineer, it may appear inefficient therefore if a comparison is made of the number of basic research efforts and the final applications. Also, it is difficult to obtain information on the actual use of basic research results, because design engineers and manufacturers are not necessarily concerned with the origin of basic ideas and principles.

Finally, as far as current resarch and the selection of new research proposals are concerned, it is almost impossible to make reliable predictions with regard to future applications.

Most likely, some spectacular advances of technology will result from discoveries which cannot be anticipated. This may lead to the discouraging conclusion that there is nothing one can do but hope that people have faith in basic research.

In spite of these difficulties, the Chief of Army Research and Development, through the Army Research Office in Durham, N.C. (ARO-D), is able to report on recent basic research accomplishments that have significant contributions to present technology, or whose potential for applications in the near future is clearly established.

The few examples selected for this article are particularly impressive if one considers the ratio of potential product value to initial investment.

The ARO-D selection could be extended greatly by reports from numerous other Army basic research and exploratory development activities. The ARO-D list as here compiled is representative primarily of the payoff from the application of technology resulting from grants and contracts awarded by or supported through ARO-D.

Fast Fourier Analysis, which is now used at many computer centers in this country, was discovered several years ago by John W. Tukey at Princeton University, and James W. Cooley at International Business Machines in conjunction with research supported through ARO-D.[1]

The decomposition of a periodic function into n harmonic oscillations by conventional techniques requires a number of arithmetic operations on the order of n squared. By means of the Fast Fourier Analysis, this procedure is reduced to a few times n elementary calculations.

For typical problems in signal processing, with large values of n, one has achieved a reduction of computer time by a factor of 100. Problems have been solved that are beyond the capacity of available computers if conventional methods are used.

For example, certain investigations that are relevant to missile-defense problems, such as the analysis of high-order correlations in turbulent wakes, would not have been feasible without the use of the new technique.

Two independent investigators have made a breakthrough in the field of lubrication. One of these accomplishments, namely, the discovery of a dry-film molybdenum disulphide lubricant for applications under extreme conditions, was described in a previous issue of this magazine.[2]

The second breakthrough is based on the discovery by John L. Margrave at Rice University of a new technique for the controlled fluorination of certain organic compounds. In particular, Dr. Margrave has converted graphite to "perfluorographite," the lubricating properties of which have been tested at Frankford Arsenal and NASA's Lewis Research Center.

The new material is comparable to currently used solid lubricants at normal temperatures, but superior to them at temperatures in excess of 575° F. It requires little imagination to think of specific applications of these characteristics.

Col Cannady Assigned to Deputy Post at MICOM

Duties as deputy post commander and director of the Support Operations Directorate were assumed by Col Preston B. Cannady when Col J. N. Jean was assigned as special assistant to the CG of the U.S. Army Missile Command, Redstone Arsenal, Ala.

Col Cannady recently completed his second tour of duty in Vietnam, where he earned the Legion of Merit with Oak Leaf Cluster. He first served in Vietnam in 1958 as an adviser in General Headquarters of the U.S. Armed Forces.

The MICOM assignment is the first he has had in his home state since he began his military career in 1941. In recent years he has served with the Guided Missile Branch of the Artillery School at Fort Bliss, Tex., as commander of a gun and missile battalion in the Army Air Defense Command, and chief of Military Assistance and Programs Office in the Office of the Assistant Secretary of Defense for International Security Affairs.

In 1947 he was one of the first military personnel assigned to Turkey under the Truman Doctrine. He returned to the near East in 1962, when he represented Defense Secretary Robert McNamara in India. In 1965 he was chief of the U.S. Military Mission with the Imperial Iranian Gendarmerie.

Col Preston B. Cannady

In view of the Army's interest in vertical- or short-takeoff and landing aircraft, it is important to note that the subsonic aeronautics research program sponsored through ARO–D has made a significant contribution to a better understanding of the requirements on wind tunnels for the testing of V/STOL and helicopter models.

Investigations by Prof. William H. Rae at the University of Washington have shown that the downwash of air from the models can lead to completely erroneous results and has established the need for a reevaluation of a vast amount of experimental data.[3]

Perhaps of equal importance for Army mobility is the encyclopedic exposition of terrain-vehicle systems by Dr. M. G. Bekker,[4] which was produced under contract with ARO–D.

Recent scientific accomplishments in metallurgy and ceramics offer better solutions to military problems. An increase in the hardness of steel plate of almost 100 percent, without a significant decrease in toughness, has been demonstrated by Prof. A. S. Tetelman in Army-supported research at Stanford University.

This unexpected improvement in mechanical properties is obtained through exposure of steel plate to explosive shock. This technique may prove exceedingly useful in the strengthening of coarse-grained regions in the heat-affected zones about welds in large structures.

At North Carolina State University, Prof. H. Palmour has developed a new method for the production of magnesium aluminate spinel of high purity and fine particle size. The potential use of this high-purity spinel in transparent armor is now the subject of a developmental project in Palmour's laboratory under contract with the Army Materials and Mechanics Research Center, Watertown, Mass.

A team of investigators supported through ARO–D at the IBM Watson Research Laboratories deserves credit for two outstanding accomplishments that will probably change the design principles of pulsed lasers for optical rangefinders. One is discovery of the production of short light pulses by means of absorbing dyes rather than rotating mirrors; second is the use of organic dyes as the active laser material.

The inherent advantage of a pulse generator, which does not require any moving part, and that of cheap organic liquids for the production of laser beams at virtually any wavelength required for specific applications is obvious.

It is well known that a superconducting tunnel junction, consisting of two superimposed superconducting films separated by a very thin insulating layer, can serve both for the generation and detection of radiation in the millimeter and submillimeter region of the spectrum. However, the efficiency with which electromagnetic radiation is coupled into or out of a typical tunnel junction is very low, and the coupling mechanism is not well understood.

Recent theoretical and experimental work by Prof. D. N. Langenberg and coworkers at the University of Pennsylvania under Army support indicates that a considerable improvement can be achieved.

Preliminary experiments have demonstrated that sensitivities are feasible which exceed any other detector in the submillimeter range, not to mention the much faster response time of a tunnel junction as compared with bolometric detectors. This may open new possibilities for short-range, high-resolution detection and identification of military targets.

The present state-of-the-art of quantum electronics of superconductors[5] is based on several investigations that have been supported by ARO–D. This includes the fundamental theory of superconductivity by J. Bardeen, L. N. Cooper, and J. R. Schrieffer[6]; also, the discovery of magnetic flux quantization by H. S. Deaver and W. M. Fairbank, as well as independent theoretical formulations of flux quantization by J. Bardeen, and by J. B. Keller and B. Zumino.

Results of these investigations show convincingly how progress in the understanding of basic phenomena eventually leads to device applications, such as the radiation detector mentioned in the preceding paragraph.

A thorough historical study would be required to assess the contribution of the research program of ARO–D to the solution of more complex military problems. For example, it would be possible to show how the support of several well-coordinated investigations of atomic and molecular collision phenomena has advanced the understanding of radar blackout subsequent to a nuclear explosion in the upper atmosphere.

Collision cross sections and reaction rates measured at several laboratories with ARO–D support are now used in computer programs for the theoretical prediction of the duration of radar blackout. This is essential for the evaluation of missile defense systems. A detailed survey of the individual contributions of many investigators is clearly beyond the scope of this report.

Even though the research managers at ARO–D are concerned only with the support of basic unclassified research, it is felt that there is definite proof of the relevance of the program to the Army. Efforts will continue to maintain the broad spectrum and quality of the program, to keep it responsive to military requirements, and to recognize the potential of new scientific discoveries and engineering concepts.

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[1] A description of this method in non-technical language can be found in *Electronics*, Vol. 39, No. 20, October 1966, p. 52. See also "A Guided Tour of the Fast Fourier Transform" by G. D. Bergland in *IEEE Spectrum*, July 1969, p. 41.

[2] *Army Research and Development Newsmagazine*, Vol. 10, No. 4, April 1969, p. 10.

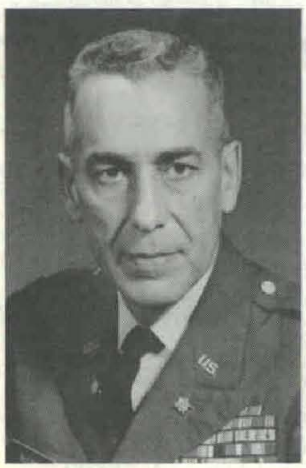
[3] *Army Research and Development Newsmagazine*, Vol. 9, No. 4, April 1968, p. 1.

[4] M. G. Bekker, *Introduction to Terrain-Vehicle Systems*, The University of Michigan Press, 1969.

[5] Arnold H. Silver, "Superconducting Quantum Electronics," *IEEE Journal of Quantum Electronics*, Vol. 4, November 1968, p. 738.

[6] Important results of the BCS theory are summarized in C. Kittel, *Introduction to Solid State Physics*, (3d Ed.) John Wiley, 1967, p. 357.

Col McGinnis Reports to MICOM for Second CofS Tour



Col Eugene W. McGinnis

Army Missile Command Chief of Staff Col Eugene W. McGinnis reported for duty recently for his second tour in that capacity and his third tour at Redstone (Ala.) Arsenal—each time with the same boss.

Col McGinnis has served under, progressively, Col, Brig Gen and Maj Gen Charles W. Eifler, CG of MICOM at present and in 1958 commandant of the Guided Missile School at the arsenal. In 1964 he was assigned to the Land Combat Systems Directorate at Redstone and in 1966 became chief of staff for the first time.

Col McGinnis recently concluded a tour of duty in Washington, D.C., in the Office of the Assistant Chief of Staff for Force Development. He has served with the Military Assistant Advisory Group in Vietnam, the Command and General Staff School at Fort Leavenworth, Kans., the Tokyo (Japan) Ordnance Depot, and the Butzbach (Germany) Ordnance Depot.

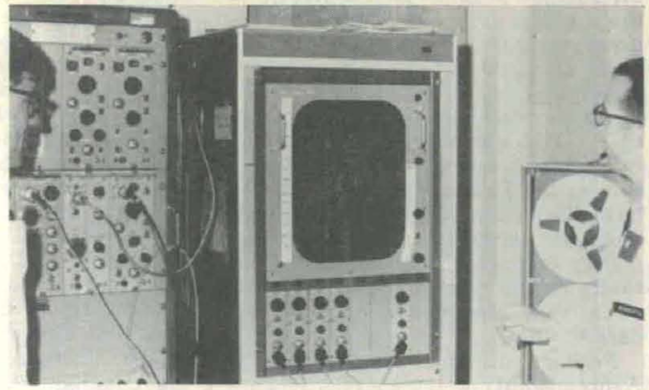
Letterman Army Institute of Research Reviews Gains, Goals

Prevention and reduction of military disability caused by selected diseases and injuries is the mission of Letterman Army Institute of Research (LAIR), established in October 1966, as the successor to the Army Medical Research Unit, Presidio of Montery, Calif.

LAIR conducts research in medicine and dentistry, guides and supports research projects of Letterman General Hospital (LGH) staff members, and similarly monitors research in hospitals at Class I installations. As directed by the CG of the Army Medical R&D Command, LAIR monitors various other research activities.

Dermatological problems, shock, and treatment of oral and maxillofacial injuries are currently LAIR's primary areas of research and development activities.

Professional caliber of the LAIR staff of 48 investigators is indicated by the fact that 5 have PhD degrees, 8 have MS degrees, 6 are doctors of dentistry, 5 have doctorates in medicine, and 2 are doctors of veterinary medicine.



LAIR investigators monitor hemodynamic data of a sheep to determine what organs or systems play the primary role in irreversible shock caused by loss of blood.

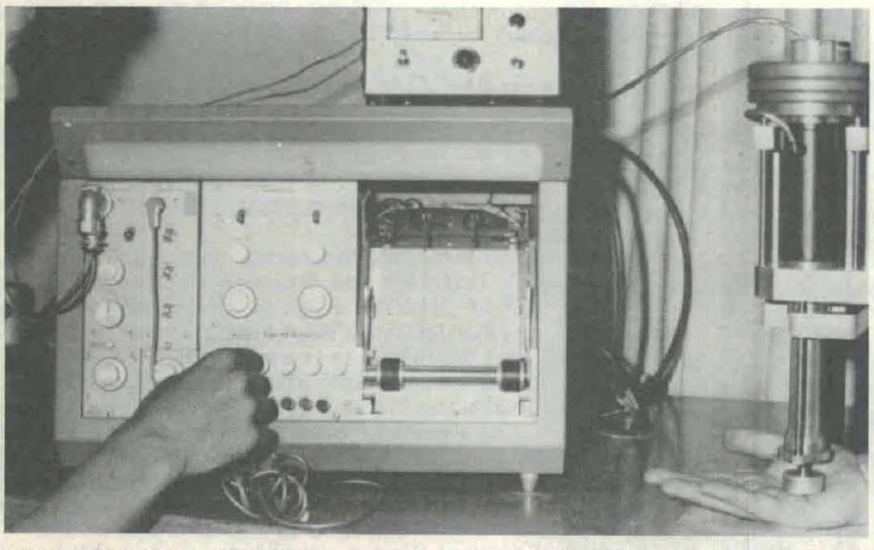
Working with the Pharmacy Service and Isotope Clinic of Letterman General Hospital, LAIR researchers have been successful in compounding radiopharmaceuticals for use in humans. This has been accomplished under the R&D provision of a broad license for development of by-product materials held by Letterman General Hospital.

A proposal to investigate and utilize a radiopharmaceutical must be approved by an Isotope Committee of LAIR and LGH staff members. The next step is to complete extensive testing of the compound in animals at the LAIR facilities. Compounding is then assumed by the LGH Pharmacy Service, where the formula is standardized and a rigid quality control system is established.

The formula, control system and animal data are then submitted to The Surgeon General of the Army in support of a request to use the compound in humans. Two agents that have passed through this developmental process and are being used in LGH patients are $99^{m}Tc_{43}$-sulfur colloid for liver scans and $99^{m}Tc_{43}$ (the isotope of the element of technetium with an atomic mass of 99 and an atomic number of 43) macroaggragated human serum albumin for lung scans.

The LAIR Dermatology Research Division is one of the few research groups in the military conducting research on skin diseases of military importance. During the monsoon season in the Mekong Delta, skin diseases account for 70 percent of man-days lost from all causes; the rate declines to 38 percent during the dry season.

In Vietnam, cutaneous afflictions are the fourth leading cause of hospitalization for disease, and the third leading cause of out-patient visits. The main research effort is directed toward protecting man's skin from injurious aspects of the environment such as heat, humidity, water immersion, friction, bacteria, fungi and insects.



DERMATOLOGY GROUP was responsible for design and construction of instruments used to study friction-blister formation under scientifically controlled conditions at Letterman Army Institute of Research in California.

These factors are studied alone and in combination. Since no animal has a skin identical to man's, the studies must be conducted on volunteers.

Conditions often considered trivial can seriously deplete the manpower of an infantry battalion. Among such common ailments are sores, infected friction blisters, insect bites, athlete's foot, prickly heat rash, warm-water immersion foot, abrasions and severe acne.

Afflictions such as these are most disabling to military personnel when the areas affected are the feet, groin, waist and back, thus interfering with walking or wearing equipment.

The LAIR dermatology group consists of three dermatologists, a physical chemist, a lipid and protein chemist, a bacteriologist, a mycologist, two mechanical engineers, and three ecologists. Accomplishments to date include:

- Development of methods for experimental production of friction and friction blisters, and the design and construction of instruments for producing various degrees of friction under scientifically controlled conditions.
- The elucidation of the mechanism of friction blister formation showing that the main effect is one of differential movement between upper and lower layers of the epidermis, leading to shearing and cleavage just below a layer technically termed the granular cell layer.

The consequent inference is that footgear may be designed to allow this differential movement to take place above the surface epithelium, by having one or more inner layers more adherent to the skin surface, with the outer layers sliding or moving over the inner ones without moving the epidermal surface.

LAIR researchers believe this objective could be accomplished, for example, by tight smooth-fitting socks with a slick outer surface, and boots or shoes with slick inner surfaces; or "sandwich" socks with proximal material tight on skin and outer material slipping over it with the boot movement.

Among other recent LAIR dermatology group results are:

• Demonstration that the best early management of friction blisters may consist in early top-removal and application of an artificial blister-top of polymerizing plastic (cyanoacrylate).

• Demonstration that widespread ordinary prickly heat can cause long-lasting inhibition of sweating and evaporative cooling, which may in turn produce heat-retention syndromes (heat exhaustion), even when the skin again looks normal.

• Miscellaneous studies showing that it may well be possible to develop contact insect repellents and other repellents which will resist sweat-off and wash-off substantially longer than those now available.

• Numerous basic scientific studies on the nature of the barrier to skin penetration via the stratum corneum; the development of materials to adhere to and to form depots within the stratum corneum (outermost layer of the skin); the mechanisms of friction blistering and the mechanisms of insect repellency.

The primary research effort, of the Medical-Surgical Research Division has been devoted to investigation of the effects of hemorrhagic shock on the lungs, heart and brain. Believed unique is the hemorrhagic shock model developed to utilize unanesthetized, non-heparinized animals (not given drugs to reduce coagulability of the blood).

By following the change in the electroencephalographic (brain wave) pattern to determine the end-point of the bleeding period, the survival/non-survival is predictable in 96 percent of the experiments.

Significant achievements and progress on projects of current interest in oral and maxillofacial injuries include:

• Subsequent to development in this research unit of a method for early restoration of oral integrity in experimental animals, a field study on human battlefield casualties was initiated and is currently in progress.

To date, eight patients with orofacial avulsion wounds (substantial amounts of tissue blown away) have been treated in Vietnam with the investigational drug, Dimethylsiloxane, RTV silicone 382. Six of these patients have been evacuated to Letterman General Hospital for reconstructive treatment. There has been no evidence of untoward reactions, and preliminary evaluation indicates that this material and technique can be of value in managing massive avulsion wounds.

• The study of the incidence of oral and maxillofacial injuries is designed to determine the incidence and nature of such injuries occurring in various segments of the military population. During FY 67 and FY 68, approximately 10,000 injuries were reported from worldwide reporting sites.

Analysis of these data will provide information for treatment facility planning, establish the incidence of maxillofacial injuries in relation to all types of traumatic injuries, identify treatment patterns and offer direction for future research objectives.

• Reaction of oral tissues to 13 suture materials has been studied histologically in dogs. Reactions differed from those reported at other anatomic sites, and were less severe with monofilament than with multifilament sutures. Systemic antibiotics did not alter the comparative response.

Presence of bacteria between the filaments of miltifilament materials appears to be responsible for variation in tissue reaction. Surface treatment of these sutures with silicone or Teflon does not alter the tissue response to the basic materials.

• A field study of early restoration of mandibular continuity (continuity of the fractured jawbone), employing preformed silicone mandibles in the treatment of human battlefield casualties in Vietnam, is in progress. Laboratory studies on dogs have indicated that silicone mandible segments can be used temporarily to restore mandibular continuity, support soft tissues and maintain space for future bone grafts. To date, one patient has been treated in this manner.

• Transitory bacteremia (in the blood stream) following tooth extraction may result in serious sequelae in patients with congenital or acquired heart defects. Effectiveness of the preoperative utilization of a phenolated topical (applied directly to the teeth and gums) antiseptic solution, in relation to the incidence of post-extraction bacteremia, was evaluated bacteriologically in a study on 301 patients. Results indicate a significant reduction in incidence of such transitory bacteremias when the topical antiseptic is applied in a specific manner.

Temporary accommodations for LAIR's expanding activities are provided in a portion of the old Letterman General Hospital buildings. Located close to the new hospital, the facility conveniently supports research efforts in surgery, ophthalmology, physiology, cardiology, pharmacology and pathology.

Installation of a liquid scintillation camera now gives a complete clinical and experimental research radioisotope capability utilizing the facilities of the hospital and LAIR. The use of positron-emitting isotopes will be investigated.

Additional investigations in maxillofacial research include studies on the use of mucosal grafts and alloplastics to repair soft tissue wounds; development of methods for reducing the incidence of post-tooth extraction osteitis (infection of the bone) and bacteremia; treatment of peridontal disease and sialadenitis; and procedures for the more rapid accomplishment of endodontic therapy (treatment of tooth pulp and tissues surrounding base of the tooth).

A 6-chair dental clinic in the Maxillofacial Research Division enables dentists to conduct more sophisticated clinical research because of the nearby location of the oral microbiology, oral pathology, chemistry and radioisotope laboratories.

Future studies of the Medical-Surgical Division on shock due to blood loss will use an unanesthetized, unheparinized sheep as a predictable model. The objective is to correlate findings from the lung, myocardium (heart muscle), brain, kidney, liver, vascular system, circulating hormones and enzymes, and the blood-brain barrier to find out what organs or systems play the primary role in irreversible shock.

If this knowledge could be discovered, more effective therapeutic measures could be devised to combat irreversible shock in injured soldiers.

Dermatological research has been aided greatly by a recent authorization for military medical research volunteers for the length of their military obligation. The arrangement permits long, closely observed experiments in the laboratory and field. This capability is especially valuable in studying the interrelated effects of water immersion, heat and humidity, cutaneous (skin) fungal and bacterial infections, and mosquito repellents.

Microorganisms attacking the skin often contain potent enzymes, some of which are also allergenic (exposed individuals may have allergic reactions on reexposure). Studies in enzymology and immunology of selected bacteria and fungi were started last month. This research program addition completes the scientific disciplines capability essential for a concerted attack on problems of tropical acne and cutaneous fungal infections.

Betts Cools Critics of M-I Complex at AOA-NSIA Conference

In addressing a joint meeting of the New York Chapter of the American Ordnance Association and the National Security Industrial Association in New York City, Army Chief of Research and Development Lt Gen Austin W. Betts continued his policy of strongly defending the "M-I Complex" as vital to national security. General Betts also explained in detail the complications in developing the M551 General Sheridan Armored Reconnaissance/Airborne Assault Vehicle and the M60A1E2 version of the M60 tank as indicative of problems of R&D decision-makers. Most of his address is published here.

* * *

. . . The so-called "Military-Industrial Complex," it appears to me, has become a convenient scapegoat to some people for all of the nation's current troubles. As for defense-oriented industry, *Newsweek* magazine points out that it is the "world's most efficient producer. It is the basis of American power."

Surely that is the important judgment to remain with us. The Department of Defense must make effective use of the development and production capabilities of American industry. Any other course would be foolish. We should not have a panic reaction to the critics of the M-I Complex.

There are those who say that the threat to U.S. security from militant communism is really a phony threat, born of the imagination of an industrial-military lobby. I wish it were phony, but nothing could be further from reality.

The fact is that the Soviets have large, combat-ready Armed Forces and, as reported recently by the Organization for Economic Cooperation, they are spending more each year for research and development than we are.

The large Soviet forces that invaded Czechoslovakia are well equipped with modern weapons. Defense Secretary Laird stated, in open testimony before Congress, that deployment by the Soviets of intercontinental ballistic missiles with 25 megaton warheads can scarcely be called a phony threat. His was not an attempt to frighten the American people, but a sober assessment of growing Soviet capability.

A prudent response is to protect our deterrent force, as is our present plan for the Safeguard defensive system. We are certain that as long as the Soviets are convinced that a nuclear attack by them on the United States would mean their own destruction by our retaliation, then our deterrence is effective and we are secure from attack.

Evidence that communist nations are exploiting the technological and scientific explosion for military applications is incontrovertible. The evidence of Communist Chinese thermonuclear warhead development, as well as ballistic missile development, is not conjectural. The modern sophisticated equipment and techniques displayed by the Soviets in their invasion of Czechoslovakia were not figments of U.S. military imagination.

The only question for debate is what these communist nations propose to do with their growing military capability. Until there is hard, factual evidence that the Free World does not need to fear military action against us by these communist powers, simple prudence dictates that we must maintain an effective military posture.

What I do believe will be a positive reaction to the criticism being levelled at the Defense establishment and its partners, will be a new effort to try to make the right technical evaluations at the right time—even though we in the R&D business recognize that much of the time we are being asked to measure and define unknowns.

That is the nature of our business —research and development necessarily deal continuingly with the unknown and the unproven. A certain degree of error is inherent in such a business.

Two vehicles from our armored vehicle program have been featured in the press in the recent past: the M551 General Sheridan Armored Reconnaissance/Airborne Assault Vehicle, and the latest model of the M60 tank, the M60A1E2. Both of these vehicles are capable of firing the Shillelagh antitank guided missile; both promise to provide new combat capabilities of considerable importance to the Army's field commanders. However, both vehicles have been the subject of recent investigative hearings, and it is true that we have a number of these vehicles in storage waiting retrofit to correct technical problems.

Let's look at events and the decision points leading up to today's situation, looking at them in light of the facts as available at the time key decisions were made, the alternatives,

DCA-Mallard Memo Establishes ITWG

Establishment of a Defense Communications Agency (DCA)-Mallard Interface Technical Working Group (ITWG) was announced Sept. 2 when a Memo of Understanding was signed.

Air Force Lt Gen Richard P. Klocko, DCA director, and Brig Gen Harold W. Rice, Army program/project manager for Mallard, signed the agreement to create the ITWG. Its function is to analyze the interface between the Defense Communications System (DCS) and tactical communications systems which utilize equipment developed by Project Mallard.

Initiated in 1965, Project Mallard is an international cooperative program by the United States, Australia, Canada, and the United Kingdom to develop a secure digitally switched tactical communications system common to the four nations. The project also is a U.S. joint effort with Army, Air Force, Navy and Marine Corps participation.

Mallard will employ all modes of message and data traffic ranging from simple written messages to voice, and facilities for mobile subscriber access. All modes will be automatically switched, and the system will employ multiple means of transmission including satellites.

DCA said establishment of the working group is a significant step toward the goal of fully compatible U.S. tactical and strategic communications systems.

The agency is responsible for management control and operational direction of the worldwide DCS, which is manned and operated by the U.S. Army, Navy and Air Force.

MEMO OF UNDERSTANDING establishing DCA-Mallard Interface Technical Working Group is signed by Lt Gen Richard P. Klocko, USAF, DCA director. Looking on is Brig Gen Harold W. Rice, who signed as U.S. Army program/project manager.

and their probable results. Both examples I will cite are from our armored vehicle program, and I'm sure you will recognize why I chose them.

Let us look first at the M60A1E2 battle tank.

For some years we have had a very effective series of main battle tanks that began with the M-48 tank and later was modified to become the M60. The changes were not only automotive, but also armor and armament in nature. We improved the ability of the tank to survive, improved its ability to function in a battle environment, and upgraded or increased the caliber of the guns that the tanks would carry.

Parallel to that battle tank development, we began the development of a missile for antitank warfare. It was our judgment that we ought first to put this missile on a relatively lightweight vehicle that would be used in an armored reconnaissance role. We call this armored vehicle the General Sheridan and its anti-tank missile is the Shillelagh.

Development of the Sheridan and the Shillelagh was accompanied with the usual kinds of technical problems that we have in research and development. But by 1965 the vehicle and the missile did prove to be meeting all of the important requirements determined by the Army as essential for that combination. Since there was an urgent requirement for this capability, we put the Sheridan and the Shillelagh into what we call limited production—to identify the fact that it still had some development problems that needed to be corrected before we would be ready, finally, to issue this system to troops.

We made one other decision with respect to that combination that we have since found gave us more technical trouble than we had then anticipated. We decided to incorporate a new kind of ammunition, to do away with the heavy brass cartridge, that promised weight and cost savings and an additional advantage from the tank user's point of view. When he put the round in the gun and fired it, the entire round was consumed. The cartridge itself was combustible; its residue would go out the tube.

In the initial tests, we had considerable success, and it looked as though this was a winning combination. But as we became more deeply involved in the very extensive testing program to which we subject all of these new items of equipment or materiel, we found out that under certain conditions the combustible cartridge case would not function reliably.

Clearly, improvements had to be made or the ammunition would not be acceptable for field use. So in early 1966 we went back to the developer to correct the problem. By about March or April of 1966, all evidence at hand indicated strongly that we had corrected the particular difficulty that the earlier testing had revealed.

We had design fixes, tested them, and put them through extensive environmental testing to check out that aspect. We were convinced by evaluation of technical experts that the difficulty had been solved.

Consequently, by May of 1966, we assessed the situation about as follows: We were in limited production on the vehicle and the Shillelagh missile. In the opinion of key elements of the Army staff, the vehicle/missile combination adequately met all of the essential requirements.

Now, the testing people had listed certain deficiencies that we needed to correct in the process of production engineering, but the facts as available told us that all the major deficiencies had been corrected. However, at this point, still another and completely new problem arose, one that had not occurred in any of the previous testing. This was premature, inbore explosion. This problem manifested itself only under certain conditions, and not always then. But the fact remained that the combustible cartridge case program would require still more development and testing before it could be safely released for field use.

Consequently, we agreed at that time that, while we could not release the combustible cartridge ammunition to production, we had the technical evaluation of competent engineers and scientists that the difficulties we were experiencing could be corrected.

Recognize that at this time—1966—we were also aware that the developer had been working on this type of ammunition for a good many years and had solved many problems before this. We might second-guess his optimism and our own, but we can understand his confidence.

Furthermore, we recognized that to stop production of the Sheridan vehicle at this stage would cost some \$3.5 million in termination costs. Since the vehicle and the Shillelagh missile had essentially met most of the user requirements, and the armored threat this weapon system was designed to meet had not changed, we thought it prudent not to stop production of that combination. Even without the 152mm ammunition, the weapon system could be deployed in an anti-armor role.

Our technical judgment at that time turned out to be wrong. It took us much longer to find the solution to the problem of this combustible cartridge than we had anticipated.

Consequently, about a year later, we found that we had Sheridan vehicles and Shillelagh missiles coming off the production lines, with no combustible cartridge ammunition we were ready to accept as fully satisfactory. We did not want to send the Sheridan to Vietnam with an expensive antitank missile as its only ammunition. Therefore, we stored the vehicles until we could correct the problems of the conventional ammunition.

Late in 1968, we felt that testing had adequately satisfied us that we had corrected the major problems of the ammunition. The Test and Evalu-

(Continued on page 18)

Maj Brown Heads R&E Division at Benet Laboratories

Qualifications of the new chief of the Research and Engineering Division, Benet Laboratories, Watervliet (N.Y.) Arsenal, include a doctorate in mechanical engineering from Massachusetts Institute of Technology and graduation from the U.S. Military Academy.

Maj Walter T. Brown Jr. assumed that responsibility after a tour of duty in Vietnam and graduation from the Army Command and General Staff College. He is a graduate of Army Airborne School, the Ranger School at Fort Benning, Ga., and has served with the 82d Airborne Division as a platoon leader and executive officer.

After transferring to the Ordnance Corps in 1961, Maj Brown attended New Mexico State University, where he received an MS in mechanical engineering in 1963. For the next two years he was stationed at White Sands Missile Range, N. Mex., as chief of engineering and evaluation for the Honest John, Little John and Lance missile systems.

In 1964 he was awarded a National Science Foundation Fellowship and attended Massachusetts Institute of Technology. In Vietnam he was materiel officer with the 25th Infantry Division. He was awarded the Bronze Star Medal with an Oak Leaf Cluster.

Maj Walter T. Brown Jr.

Chief of R&D Betts Cools Critics of M-1 Complex

(Continued from page 17)
ation Command under the Army Materiel Command then certified the combination of the Sheridan Shillelagh and the conventional ammunition for release to troops with certain limitations.

Since that time, we have sent significant numbers of these to Vietnam, where they have clearly proved their combat worth—in spite of the inevitable technical bugs that always must be worked out in the unduplicatable crucible of combat usage.

Nevertheless, it is obvious we did not get that vehicle and its weapons to the troops on the schedule we had originally planned. Before we look for lessons, let's turn to the M60A1E2.

The real dificulty here is that, in 1964, a suggestion was put forth in a meeting discussing the whole tank program, concerning the fact the Army did not have a missile-firing *tank* in its inventory, or even in development. The suggestion was that we ought to look at the possibility of putting the Shillelagh missile on the M60 tank then in production.

We decided to investigate the idea. We built a new turret for the M60 that would handle both the conventional combustible cartridge ammunition and the Shillelagh missile. We also added some complexity that was not in the turret of earlier design, by an improved fire-control system with stabilization.

In the tests of this new turret in early 1966, we had some trouble with the new requirement that we had added. Again the evaluation of the technical experts was that the difficulties could be readily corrected in the process of production engineering.

These difficulties were then seen to be relatively minor. During the testing program, the new turret had performed very well indeed—so well that Aberdeen Proving Ground testing experts remarked at the time that this year was the best stabilization system they had ever tested.

Consequently, when we came to the decision point in May of 1966, we were faced with this question. Should we stop production of the M60 with the old turret, or should we continue production of the basic M60 chassis and produce the new turret to put on that chassis?

We were rather confident that we had a very good tank because the basic M60 was a well-proven vehicle. With minor corrections between the development model and the production model, we felt we could satisfy the original requirement that we add a Shillelagh missile to the M60 tanks.

About this same time, we thought we had solved the problems of the conventional, combustible cartridge ammunition for the Sheridan. Later on those same problems came back to plague us with respect to the M60A1E2; that is, the new model that also was to use combustible cartridge ammunition.

The ammunition, however, did not prove to be our most critical problem. In the production model of this new M60 tank, we ran into conditions that we had not been able to define fully in the R&D model. There were reliability problems with the R&D models, but these problems came to light quite late in the development program.

Our analysis indicated to us at that time that these difficulties were attributable to worn and old equipment. Our judgment then, based on the evidence at hand, was that reliability in the new production model would not be a problem. Unfortunately, we were proven wrong.

Consequently, we are now faced with the necessity to store a large number of M60A1E2 tanks until we can correct the technical problems that we discovered during production verification testing. I am quite confident that we can correct the difficulties with this new turret, but we are not now able to predict at what time.

We were driven, by factors of urgency and expense avoidance, to take a calculated risk on items that had been tested in large measure. But, we found later, some aspects of which had clearly not been tested enough to reveal technical difficulties.

At each of the decision points, it was our considered judgment that it would have cost the taxpayer more to have stopped production at that time, to pick it up again later when we had solved the problems, than it would to continue to produce, put the vehicles in storage and correct them at a later date.

In the case of Sheridan, that has been proved to be the case, so our judgment was essentially correct. In the case of the M60A1E2, we will not know if our judgment was correct until we have proved or disproved our ability to solve technical difficulties.

In each of these cases, engineers, scientists and responsible decision-makers were called upon to evaluate technical progress and make judgments with respect to the risks involved. These risk judgments had to be balanced against the known costs that would be associated with terminating production activities.

These were not unusual situations. In the development and testing process for new materiel, it is inherent that we must create some sort of limited production capability in order to design and build prototypes for testing. It will always be more expensive to dismantle that capability and recapture it later than it will be to continue from early prototype production right into early production and deployment.

Nevertheless, we must recognize, where very new and complex equipment is involved, that limited testing is not likely to tell us all we need to know about the new materiel. It should be obvious that the important capability we must have within the U.S. government is the competency to evaluate the results of early engineering tests so that we might make wise decisions with respect to when to release designs to production.

It is easy to use the glib phrase, "fly before buy." It is easy to stop all preproduction design effort while we make exhaustive tests of the prototype equipment. Such an approach guarantees a long development period. Certainly it risks obsolescence of the materiel when finally released to production.

I submit that there is no easy solution to the dilemma that faces the program manager in the matter of when it is appropriate to commit a new item of equipment to production.

In conclusion, I assure you that we will certainly continue our efforts to define better what it is that we want, and to try to prove out—component by component, wherever possible—before committing ourselves to large-scale production.

Mob Des Detachments Plan 1970 Scientific Symposia

Scientific symposia linked to the U.S. Army Reserve Research and Development training program were cancelled this year because of the inactivation of the units in favor of Mobilization Designation assignments.

Plans are under way for four symposia in 1970, to be conducted by Mobilization Designation Detachments, as follows:

Symposium on Quality Control, University of Connecticut, July 5–17; Research and Development in the 1970s, Oregon State University, July 26 to Aug. 8; Army Engineer Research and Development, Fort Belvoir, Va., Aug. 2–15; Tactical Mobility, Inkster, Mich., Sept. 20–Oct. 3.

Information concerning quotas, attendance requirements and administrative arrangements will be announced at a later date.

WORSAM Study Seeks to Improve Army Health Care

Long-range, profound improvements in medical support to the soldier and his family are expected to originate from Army medical experts gathered in Washington, D.C., for a 9-to-12-month study.

The "Worldwide Organizational Structure for Army Medical Support (WORSAM) Study" is focusing on ways to improve the current organization of the Army Medical Department in the United States and in the field, during peace as well as war.

Headed by The Surgeon General and his office, the 20-member elite group will recommend changes for presentation to the Army Chief of Staff for approval and implementation. Four teams are each concentrating on specific areas of Army health care.

Col Richard H. Ross, a Medical Corps officer and former commander of the Medical Department's Combat Development Agency at Fort Sam Houston, Tex., is vice chairman. Col Lewis H. Huggins is study coordinator. Each team is led by a top-rated Army medical specialist. .

"This group," Col Ross said, "represents some of the best available talent in the Army Medical Department. We are analyzing current ways in which health services are delivered and are addressing ourselves, to all medical disciplines. The study results should generate much interest in the civilian medical community as well."

One of the goals is to determine the current system's strengths and weaknesses and to recommend alternatives.

Some of the areas being investigated include: personnel and manpower management; operation of treatment facilities; design and construction of facilities; financial management; research and development, preventive medicine; combat development; aviation medicine; medical planning and intelligence, and medical materiel management.

"After the study," Col Ross says, "we expect to have some suggestions, for example, concerning more efficient use of our '2-year draft doctors.' We will also look into the use of the 'assistant physician,' a newly developing medical discipline to provide an individual trained to perform some of the doctor's tasks."

Recommendations will also be made concerning the Surgeon General's staff and command relationship with major Army headquarters and all Army medical staffs and activities.

DCEO Employe Attending Resident Class of ICAF

Robert H. Levine, 40, a former Army Signal Corps employe who is now deputy chief and technical director, Defense Communications Engineering Office (DCEO), has been selected to attend the 1969–1970 Resident Class of the Industrial College of the Armed Forces (ICAF) at Fort Leslie J. McNair, Washington, D.C.

Levine, a resident of McLean, Va., was a member of the founding cadre in 1963 for DCEO, a DCA field activity collocated at HQ DCA, Naval Service Center, Arlington, Va. DCEO performs engineering for the Defense Communications System (DCS).

Appointed as the first director of engineering at DCEO, he was named technical director in 1965.

Currently he is serving also as chairman of the Functional Committee established by DCA to implement a professional Career Development Plan for all DCA engineers.

Levine was employed more than 10 years in the development of tactical and strategic communications equipment and systems at the Army Signal Research and Development Laboratories, Fort Monmouth, N.J. He later worked in private industry on systems engineering analyses of Navy Communications for the Fleet Ballistics Missile System.

ARO-D Program Strengthens BRL-University Ties

Doctorate representation on the staff of the Ballistic Research Laboratories (BRL), U.S. Army Aberdeen (Md.) Research and Development Center is augmented this summer by 17 university scientists under a research cooperative program.

Administered by the U.S. Army Research Office-Durham (N.C.), the program enables the university scientists to work side-by-side with Army in-house scientific and engineering personnel on projects where their specialized knowledge can best be used.

BRL Director Dr. Robert J. Eichelberg said services of the visiting scientists are particularly valuable at the outset of research projects or in the early developmental stage. Academic scientists recruited for the program are selected carefully for exceptional capabilities qualifying them to serve as consultants.

The cooperative research program is one of a number of Army in-house laboratory efforts designed to strengthen ties between Army in-house professional personnel and the academic scientific community throughout the nation. Visiting scientists also acquire an understanding of the Army's in-house research program and problem areas on which help is needed.

BRL is participating in the ARO–D Research Cooperative Program for the second year. Participants this year all have doctoral degrees in scientific areas of particular BRL interest. They are Charles E. Melton, U. of Georgia; W. E. Conway, U. of Arizona; Allan Rogers, U. of Delaware; F. N. Weber Jr., U. of South Alabama;

Also, James E. Miller, Transylvania College, Ky.; Carl Bachhuber, Portland State College, Ore.; J. B. Newman, Towson State College, Md.; C. R. Fuget, Geneva College, Pa.; Melvin H. Rice, U. of South Dakota; George H. Wahl Jr., North Carolina State U.; James E. Danberg, U. of Delaware; Adam R. Zak, U. of Illinois; Edward Fletcher, U. of Minnesota; Kenneth E. Harwell, Auburn U.; Peter Yedinak, Western Maryland College; Charles Stearns, U. of Wisconsin; and Harvey Palmer, Johns Hopkins U.

Scientific Calendar

15th Annual Army Human Factors R&D Conference, sponsored by OCRD, Fort Ord, Calif., Nov. 4-6.

Northeast Electronics Research and Engineering Meeting, sponsored by IEEE, Boston Mass., Nov. 5-7.

76th Annual Meeting of the Association of Military Surgeons of the United States, Washington, D.C., Nov. 16-19.

Symposium on Adaptive Processes, sponsored by IEEE, University Park, Pa., Nov. 17-19.

Data Relay Satellite Conference, sponsored by IEEE, Washington, D.C., Nov. 18-19.

Prevention of Microbiological Deterioration of Military Materiel, sponsored by AMC, Natick, Mass., Nov. 18-20.

Conference on Magnetism and Magnetic Materials, sponsored by IEEE, Philadelphia, Pa., Nov. 18-21.

Conference on Digital Satellite Communications, sponsored by IEE, London, England, Nov. 25-27.

KEYNOTE SPEAKER at the Institute of Electrical and Electronic Engineers 1969 Microelectronics Symposium in St. Louis, Mo., Sept. 10-11, was Frank A. Brand, research scientist at HQ Army Electronics Command, who discussed the future of microwave integrated circuits. He received the U.S. Army Electronic R&D Technical Leadership Award in 1965 and has been employed by the Army at Fort Monmouth, N.J., since 1950. Holder of three patents on electronic inventions, he has published more than 50 professional papers and has given papers at conferences.


Col J. B. Love


Col R. L. Martin


Lt Col G. G. Tucker Jr.


Lt Col E. M. Aguanno


Lt Col D. R. Bausler


Lt Col W. J. Livsey


Lt Col R. W. Newton


Lt Col J. P. Doyle Jr.


Lt Col J. J. Cook Jr.


Lt Col N. G. Delbridge Jr.

OCRD Announces Staff Officer Assignments

Assignment of staff officers announced recently by the Office of the Chief of Research and Development, HQ DA, is headed by selection of Col Raymond L. Martin as chief, Communications-Electronics Division, and Col Joseph B. Love as deputy director, Plans and Programs.

Another major assignment was the choice of Lt Col George G. Tucker Jr. as commanding officer, U.S. Army Research Office—Durham (N.C.) upon the retirement from active duty of Col Donovan F. Burton. Col Tucker had served in OCRD since June 1968.

Among those who reported for duty early in September are Lt Cols James V. Irons, Robert W. Noce and Cliff Worthy Jr., all assigned to the Combat Materiel Divsion, and Lt Col Clifford Jones Jr., a staff officer in the Missile Defense, Ranges and Space Division. (Pictures and biographical information on these officers were not available at press time.)

Recent newcomers include Lt Cols William J. Livsey, John P. Doyle Jr., Norman G. Delbridge Jr., John J. Cook Jr., Donald R. Bausler, Edwin M. Aguanno and Robert W. Newton.

Lt Col Sylvester L. Wilhelmi, who had served two years as a staff officer in the Research Plans Office and as executive secretary of The Army Research Council (TARC), became executive officer to the Director of Army Research when Lt Col Nathan Sibley departed for duty in Vietnam.

Lt Col E. H. Birdseye, chief, Research Plans Office, succeeded Lt Col Wilhelmi as Army representative on the Department of Defense THEMIS Task Group. James W. Sterling of the same office assumed the duties of executive secretary of TARC.

COL MARTIN succeeded Col George R. O'Neal following a year of service as director and commander of the Avionics Laboratory, HQ U.S. Army Electronics Command, Fort Monmouth, N.J.

Graduated from the National War College in June 1968, Col Martin is also a graduate of the Armed Forces Staff College, and Army Command and General Staff College (C&GSC).

He earned a BS degree in electrical engineering from Missouri School of Mines and Metallurgy in 1949, a master's degree in engineering administration from George Washington University (Washington, D.C.) in 1957, and a PhD degree in business administration from American U. (1968).

Other recent assignments include: staff officer, HQ U.S. Army Combat Developments Command, Fort Belvoir, Va., 1966–67, and commander of the 379th Signal Battalion followed by duty as deputy commander, HHD Logistical Command in Thailand, 1965–66.

COL LOVE is a 1969 graduate from the U.S. Army War College, which he entered after a tour of duty as chief, Data Management Agency, HQ Military Assistance Command Vietnam (MACV), and commander, 2d Battalion, 5th Cavalry, 1st Cavalry Division in Vietnam.

In 1966–67 he served as a staff officer with the Defense Communications Planning Group, Defense Communications Agency, Washington, D.C., and for a year prior was assigned to the Office of the Chief of Staff, HQ DA.

Graduated from the United States Military Academy in 1950 with a BS degree in military engineering, he is currently studying for a master's degree at the University of Maryland. He graduated from the Army C&GSC in 1960.

Col Love's decorations and honors include the Silver Star (Korea), Bronze Star (Vietnam), Legion of Merit (Vietnam), Joint Services Commendation Medal, Army Commendation Medal, and Air Medal with 16 Oak Leaf Clusters.

LT COL TUCKER's assignment as commander of the Army Research Office-Durham followed an assignment as staff officer, Air Defense and Missiles Division, OCRD.

Under the Army advanced education program, he studied two years at Georgia Institute of Technology to earn a master's degree in electrical engineering in 1968. He has a BA degree in mathematics from the University of Florida and is a graduate of the Army C&GSC.

Col Tucker served as commander of Battery B, 36th AAA Missile Battalion (1957–58); project officer, Combat Operations Division, HQ U.S. Army Air Defense School, Fort Bliss, Tex. (1959–62); project officers U.S. Air Defense Combat Developments Agency (1962–63); and plans officer, U.S. MACV (1965–66).

LT COL LIVSEY is a staff officer in the Southeast Asia Division and a recent graduate from the Army War College. In 1967–68 he served in Vietnam as G3 and then as a battalion commander, 4th Infantry Div.

Prior to that he was an instructor for three years at the United States Military Academy (USMA), and from 1961 to 1964 was with the 3rd Armored Division, U.S. Army Europe.

Col Livsey was graduated from North Georgia College in 1952 with a BS degree in biology, from Vanderbilt University in 1963 with a master's degree in psychology, and from the AFSC in 1967.

His decorations include the Silver Star, Distinguished Flying Cross, Air Medal with 11 OLC, ARCOM with V and 2 OLC and VN Gallantry Cross with Palm, Legion of Merit and Bronze Star.

LT COL DOYLE is assigned to the Technical and Industrial Liaison Office and was previously a staff officer at HQ U.S. Army Combat Developments Command in the Directorate of Doctrine, Fort Belvoir, Va.

In 1967 he served in Vietnam as Commander, 170th Army Helicopter Co., following a 3-year tour in Germany at HQ Seventh U.S. Army. He was with the Army Aviation Command in St. Louis, Mo. (1963-64) and the 55th Aviation Co. in Korea (1962-63).

Graduated from the United States Military Academy with a BS degree in 1955, he received a master's degree in industrial management from the University of Tennessee in 1961. He is a graduate of the Army C&GSC.

Among his awards are the Distinguished Flying Cross with OLC, Bronze Star, Air Medal, Army Commendation Medal, and Purple Heart.

LT COL DELBRIDGE was assigned to the Mid-Range Plans Branch, Plans Division following graduation from the Army War College. Graduated from the United States Military Academy in 1953 with a degree in military engineering, he received an MS degree in civil engineering from Iowa State University in 1957 and graduated from C&GSC (1966).

Col Delbridge served in 1967-68 as chief of officer assignments, Engineer Branch, Office of Personnel Operations, Washington, D.C., after a tour in Vietnam.

He was with the 937th Engineer Group (Combat) at Fort Campbell, Ky. (1963-65), following a 3-year tour as chief of construction/assistant area engineer, U.S. Engineer Group, Ankara, Turkey.

His decorations include the Legion of Merit, Bronze Star with OLC, AM w/2 OLC and ARCOM w/3 OLC.

LT COL COOK was assigned as a staff officer, Standardization Branch, International Office after graduating from the Army Command and General Staff College. He has a BA from Pennsylvania Military College.

Prior to a 3-year tour as a tactical officer at the United States Military Academy, he served three years with the 82d Airborne Division at Fort Bragg, N.C., as a battery commander and then as assistant G3 Operations. He was an artillery adviser in Vietnam in 1961-62.

LT COL BAUSLER was assigned to OCRD as Army member of the Navigation Satellite Management Office after attending the Test Pilot School at the Naval Air Test Center and graduating from C&GSC (1968).

In 1966-67 he was a flight operations officer with the 4th Aviation Battalion, 4th Infantry Division in Vietnam, and from 1965 to 1967 was assigned as commander of the 19th Aviation Co. in Korea.

Under the Army's advanced education program, he attended the University of Arizona from 1963 to 1965 and received a master's degree in aerospace engineering.

LT COL ROBERTSON served 18 months as commander of the 2d Bn, 70th Armor at Fort Riley, Kans., prior to his recent assignment as a staff officer, Mid-Range Plans Branch, Plans Division, OCRD. He has an MS degree in Mechanical Engineering (1960) from the University of Southern California.

An assignment with the Plans and Policies Directorate, J5, HQ European Command in Germany followed his graduation from the C&GSC in 1965. Earlier he served as executive officer, 1st Bn, 13th Armor and as an operations officer, HQ 1st Armored Division at Fort Hood, Tex.

He has received the Bronze Star, ARCOM (1963 and 1969) and the Joint Services Commendation Medal.

LT COL AGUANNO is a staff officer in the Air Mobility Division and a 1969 graduate from the CGSC. He has a BS degree from the United States Military Academy and an MS degree in aerospace engineering from the University of Arizona.

In 1967-68 he served in Vietnam as CO, 540th Transportation Co. (General Support Maintenance), following assignment (1965-67) as a student at the U. of Arizona. His first tour in Vietnam (1963-64) was followed by a year at U.S. Army Electronics Proving Ground, Ariz.

Col Aguanno has been awarded the Distinguished Flying Cross with OLC, Air Medal (Valor), Bronze Star with OLC, Air Medal with 20 OLC, ARCOM, and Purple Heart.

LT COL NEWTON became a staff officer, Air Movement Branch, Air Mobility Division, following graduation from C&GSC. Graduated from the United States Military Academy with a BS degree in 1955, he earned bachelor's and master's degrees in aerospace engineering from Georgia Institute of Technology in 1963.

Assigned to Vietnam in 1967-68, he served as a battery commander and then as battalion executive officer, 1st Cavalry Division. From June 1963 to July 1967, he was an aerospace engineer with the U.S. Army Board for Aviation Accident Research at Fort Rucker, Ala. In Iran (1959-62), he was a member of a MAAG.

Col Newton has been honored with the Legion of Merit, Distinguished Flying Cross, Bronze Star, Air Medal with 6 OLC and with "V", ARCOM, and Vietnam Cross for Gallantry.

Advanced Helicopter Goals Outlined at ECOM Meet

Goals of the military services in advanced helicopter technology were outlined by top leaders at a Technical Symposium on Navigation and Positioning Sept. 23-25 at HQ Army Electronics Command, Ft. Monmouth, N.J.

Sponsored jointly by the Electronics Command, the Monmouth chapter of the Army Aviation Association of America and the Institute of Navigation, the symposium dealt with classified technical papers.

Acting Assistant Secretary of the Army (R&D) Charles L. Poor presented the principal address at a luncheon preliminary to the keynote session on the afternoon of Sept. 23.

Dr. Charles S. Draper, Instrumentation Laboratory director and head of the Department of Aeronautical and Astronautical Engineering, MIT, chaired at Inertial System session.

Other session chairmen included Dr. Andrew Longacre, professor of engineering at Syracuse University; Theodore J. Sueta, deputy director, ECOM Avionics Laboratory and symposium director; Maj Fred Feldman, U.S. Air Force Reserve; Nathan Marchand, Marchand Electronic Labs.

William Kenneally, ECOM Avionics Laboratory; Jack Bragdon, Naval Research Laboratory; Dr. Harold A. Zahl, former ECOM Laboratory Director of Research; Murray Miller, Army Satellite Communications Agency; James O'Day, University of Michigan; and Lester C. Van Atta, Electronics Research Center, NASA.

Lt Col F. L. Jensen Jr., Communications-Electronics Directorate, Department of Defense, gave a featured report on "Joint Chiefs of Staff Navigation Study." Other major presentations were made by Lt Col F. L. Treece, special assistant to the CG, ECOM, for aviation and aviation electronics; R. J. Doran, USAF Avionics Laboratory; and Cmdr A. P. Manning, HQ U.S. Coast Guard.

Army Major RDT&E, Procurement Contracts Exceed $280 Million

Contracts totaling $92,177,914 to Western Electric Co. (WECO) topped the total of $280,343,292 awarded for Army RDT&E and procurement orders each exceeding $1 million from July 21 to Sept. 1.

WECO gained three contracts for continued research and development of the Safeguard Ballistic Missile Defense System, training aids engineering for the system, and installation of kits for the Nike Hercules weapon system at overseas locations.

Bell Helicopter Co. and Aerospace Corp. received five contracts totaling $51,613,400 for OH-58A and UH-IN helicopters, for rotor hub assemblies, fuel cell modification kits for helicopters, and for services required for continuous operation, maintenance, future development and modernization of the Electromagnetic Environmental Test Facility at Fort Huachuca, Ariz.

LTV Aerospace Corp. received an $11,135,000 modification to a contract for operation, maintenance and development of Kwajalein Missile Range technical facilities for 12 months.

Two contracts totaling $10,351,250 with Pace Corp. are for ground illumination signals. Raytheon Co. was awarded $10,034,489 for magnetron tubes for the Nike Missile System, parts for M905 bomb tail fuzes, and for engineering services for the Improved Hawk Missile System.

Contracts under $10 million. Dynaelectron Corp., $9,139,380 to provide maintenance support, and to perform modifications and crash battle damage repairs on aircraft in Vietnam; Batesville Manufacturing Co., $8,098,200 for metal parts for bomb nose fuzes; and

Lear Siegler, Inc., $7,682,573 to provide maintenance support and perform modifications and crash/battle damage repairs on aircraft in Vietnam; White Motor Corp., $7,151,803 (two contracts) for engineering services and for 2½-ton trucks; and

AVCO Corp., $6,787,500 (two contracts) to design, develop, test and fabricate AGT-1500 turbine engines, and to overhaul and repair T53-L-13/13A turbine engines; Continental Motors Corp., $4,561,729 for engine cylinder assemblies for M-60 tanks; and

Lockheed Aircraft Corp., $4,498,713 (two contracts) for AN/VPS-2 radars and XM163 installation kits for the Vulcan Air Defense System, and for maintenance support and modifications and crash/battle damage repairs on aircraft in Vietnam; Eureka Williams Co., $4,367,436 for parts for M902 bomb nose fuzes; Ford Motor Co., $4,024,975 (two contracts), engineering support; and

Weatherhead Co., $3,573,300 for 105mm projectile parts; Litton Systems, Inc., $3,100,000 for scientific and technical effort to support experimentation for the Combat Developments Command, Experimental Command, Fort Ord, Calif.; Pacific Car and Foundry Co., $3,045,500 for amphibious cargo carriers and assault vehicles; and

Flinchbaugh Products, Inc., $2,933,400 for 152mm projectile parts; Philco Ford Corp., $2,700,000 for Phase II of the Fair Measurement Program; Chrysler Motors Corp., $2,307,338 for cargo trucks and ambulances; Donovan Construction Co., $2,247,200 for projectile parts.

Contracts under $2 million. Bethlehem Steel Corp., $1,959,966 for 175mm gun tube forgings; Motorola, Inc., $1,900,000 for fuzes for 40mm shells; Electro-Optical Systems, Inc., $1,899,630 for AN/TVS-4 night-vision sights; Stewart-Warner Corp., $1,818,750 for M148 booster adapter parts; and

Stevens Manufacturing Co., $1,726,674 for potable water tank trailers; Holt Brothers, $1,661,652 for general-purpose generator sets; Radio Corp. of America, $1,653,019 for signal adapters and test sets for the AN/ASH voice warning system; and

Lasko Metal Products, Inc., $1,639,512 for SUU-14A/A bomb dispensers; Hughes Tool Co., $1,598,000 to tear-down, inspect and repair of 47 crash-damaged OH-6A aircraft; Case Western Reserve University, $1,500,000 for computer research and development; and

Honeywell, Inc., $1,497,500 for Phase I component development of a 3-phase program covering design and development of an Area Denial Artillery Munitions Program; Martin Marietta Corp., $1,493,800 for system component test stations for the Pershing missile; Boeing Co., $1,455,651 for ground support equipment for CH-47 helicopters; and

Logistics Management Institute, Washington, D.C., $1,300,000 for furnishing a 24 professional man-year effort in fact-finding analytical studies in logistics management; Sperry Rand Corp., $1,267,302 for AN/ASN-43 gyro-magnetic compass sets; and

Varo, Inc., $1,179,604 for 40mm image intensifier assemblies; U.S. Components Corp., $1,102,500 for M148 booster adapter parts; Baldwin-Lima-Hamilton Corp., $1,093,098 for design, manufacture, delivery and installation of a 98,000-hp. hydraulic turbine; and J. I. Case Co., Racine, Wis., $1,065,534.

Picatinny Suggestor Earns $335

A suggestion that metal foil strain gauges and bonding materials be made available as standard stock items earned Gary E. Bubb an Army Incentive Awards Program check for $335, and facilitated technical measurements in the Feltman Research Labs, Picatinny (N.J.) Arsenal, where he is employed as a mechanical engineer.

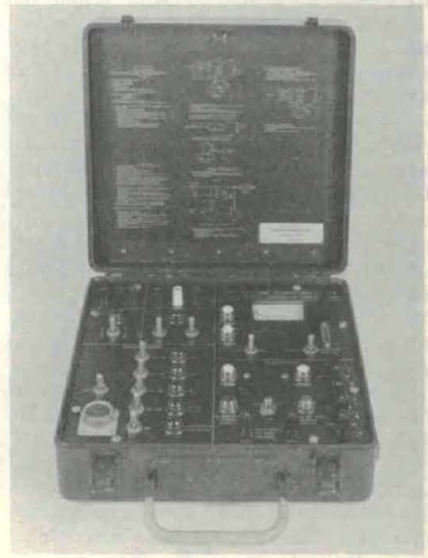
Army, Marines Evaluate Test Set for Xenon Light

The Army and Marine Corps are evaluating a lightweight AN/GSM-219 test set developed to troubleshoot the 2.2 kw. Xenon searchlight, mounted on a tank, an M-151 1¼-ton truck, a helicopter or a repair bench.

Designed by the U.S. Army Electronics Command, Night Vision and Illumination Branch at Fort Belvoir, Va., the new test set weighs 14 pounds, compared to the 110-pound AN/GSM-182 it is expected to replace.

Components of the Xenon light can be checked in minutes, making repair much faster, by isolating and exchanging inoperable elements.

The Army has been evaluating four of the test sets at three Continental U.S. bases, while the Marines are evaluating three sets in Southeast Asia. It is anticipated the new sets will be type classified Standard A in the near future.



AN/GSM-219 Test Set

Scientists Seek to Ease Discomfort of Body Armor

Body armor developed for U.S. Army use is vastly improved over the steel suits worn by knights in medieval days, but researchers are still considerably short of their obejctive of maximum protection with minimum weight and discomfort.

Some U.S. soldiers in the Vietnam war are being supplied an experimental lightweight "variable armor vest," offering a range of protection from low-velocity shells, grenades or mortar fragments to small-arms fire, including 30-caliber bullets.

Depending upon the situation, the battlefield commander can choose the type of protection his troops need. The vest is made of felt, weighs 5½ pounds, and is covered by a ballistic nylon cloth. Ceramic-fiberglass plates capable of stopping small-arms fire can be inserted in pouches in the front and back of the vest for a total weight of 22 pounds.

Developed by U.S. Army Natick Laboratories (NLABS) at Natick, Mass., the variable armor vest is the first effective chest and back protection for the fighting man against small-arms fire. But it is uncomfortably warm in Vietnam's climate.

NLABS scientists are studying the physical strain caused by the increased weight of body armor—and added heat—on the soldier. Dr. Ralph F. Goldman, director, Military Ergonomics Laboratory, U.S. Army Research Institute of Environmental Medicine (USARIEM) at Natick, says one problem of today's body armor is its impermeability.

Man produces heat even while resting. Exercise increases the soldier's heat production 5 to 10 times; to compensate, he sweats. While the sweat evaporates it cools the skin and blood near the surface to keep the body temperature at a safe level. Unevaporated sweat, on the other hand, does not cool and results in body water waste.

"As more weight is added to the soldier's load," Dr. Goldman says, "heat production increases. If he walks at about 3½ mph, his energy expenditure will go up about 10 percent when he wears 20 pounds of body armor."

The bigger problem is the armor's impermeability—it does not permit sweat to pass through and evaporate. That makes the soldier feel even hotter. In a typical Vietnam environment of 85 degrees F. with 75 percent relative humidity, a soldier wearing armor loses about 20 percent of his ability to eliminate heat, resulting in heat casualties.

Researchers at USARIEM seeking to avoid these losses have investigated several possible solutions to the impermeability of body armor. They discovered, for example, that small holes in the armor do not significantly increase evaporation. Another proposal, that of allowing the armor to flap and billow away from the soldier's body, does not seem practical. Addition of a chimney-like space between the skin surface and the armor to expose more skin to the air is being studied.

Army scientists have greatly improved body armor, but its heat and load effects are still problems for the soldier in the field, and so the search for the ultimate in materials and design continues.

COPPER MANIKINS are being used at USARIEM to study the effects of air motion on evaporative cooling. The cables entering the manikins' eyes carry power to heating wires beneath the "skin" and researchers can measure skin temperatures at 19 sites on the body. Wearing only underwear, the manikin on the left is evaporating from his cotton skin. Sweat from man on right must pass through his uniform.

Hodges Assigned as TECOM Chief of Staff

Chief of staff responsibilities at HQ U.S. Army Test and Evaluation Command, Aberdeen (Md.) Proving Ground, were transferred to Col Warren D. Hodges when Col David B. Goodwin retired recently after more than 30 years service.

Col Hodges joined the HQ TECOM staff in mid-July following a tour of duty in Washington with the Office of the Assistant Chief of Staff for Force Development (ASCFOR), HQ DA. He commanded the 2d Brigade, 4th Infantry Divison in Vietnam from December 1967 until the following June, when he was named division chief of staff.

Commissioned in the Coast Artillery Corps in 1943 at the Officer Candidate School, Camp Davis, N.C., he served in Europe during World War II as a company commander with the 35th Infantry Division.

Col Hodges commanded General MacArthur's Honor Guard in Japan from 1946 to 1949 and then joined the 2d Infantry Division at Fort Lewis, Wash. He accompanied the division's 38th Infantry to Korea, where he served from July 1950 through December 1951 as regimental operations officer and commanding officer of the 2d Battalion.

Subsequent assignments took him to Fort Monroe, Va., for duty in the Office of the Chief of Army Field Forces; to Athens, Greece, as chief of the Infantry Team of the Joint U.S. Military Advisory Assistance Group; and to Fort Knox, Ky., as commander of the 2d Armored Rifle Battalion, 54th Infantry.

Col Warren D. Hodges

Masonry Structures Conference Scheduled Mar. 16-18 at NBS

"Performance of Masonry Structures" is the theme of a conference to be held at the National Bureau of Standards, Gaithersburg, Md., Mar. 16–18, 1970, jointly sponsored by NBS, the National Concrete Masonry Association, and the Structural Clay Products Institute.

Sessions will be devoted to Creativity in Masonry; Material Properties and Specifications; Current Research Programs, Codes and Standards; Case Studies of Bearing Wall Buildings; Miscellaneous Structures, Construction and Prefabrication. The program will also include a tour of NBS laboratories.

The conference is open to all interested persons. Further information can be obtained from Robert Dikkers, Room B–160, Building 226, National Bureau of Standards, Washington, D.C. 20234.

Arctic Test Center's Mission Traced on 20th Anniversary

In the Alaskan winter of 1951, an M–47 tank rumbled 100 miles from HQ U.S. Army Arctic Test Branch, established near Delta Junction two years earlier, over a winding dirt road through the wilderness to Fairbanks.

The Arctic Test Branch was the first permanent U.S. Army test mission in the Arctic and armor test officer Capt Edwin M. Rhoads was in the commander's hatch of the M–47. Thus it was appropriate, when the Arctic Test Center recently celebrated its 20th anniversary, that Col Rhoads should be present as commanding officer.

Today massive Heavy Equipment Transporter 70s haul armored vehicles over the same route, now paved with concrete. From a small group of officers living in Quonset huts, the Arctic Test Center has grown to a full Class II activity under the U.S. Army Test and Evaluation Command.

As the U.S. Army's most northern environmental test facility, the ATC is responsible for testing all Army equipment, from tanks to boots, in the arctic winter environment. Test activities, once simple in nature, include fully instrumented experiments designed to tell precisely how and why equipment works as it does under severe environmental stress.

Other considerations are how equipment can be made more efficient, more durable, and more effective in combating both the enemy and the climatic extremes of the arctic. Experience in arctic operations gained at the center is a source of information for all other military agencies concerned with moving men and equipment and fighting in the northern portions of the world.

"Our goal," Col Rhoads said on the ATC's 20th anniversary, "is to continue to raise the standards, experience and expertise in arctic operations. The growing complexity of Army equipment places more demands on those who test equipment.

CO of the Arctic Test Center (ATC), Col Edwin M. Rhoads, (inset) directs testing of all Army equipment at the U.S. Army's most northern environmental test facility. In the foreground, the ATC lies under a blanket of snow, while a CH-54 Flying Crane maneuvers above the cold, rugged peaks of the Alaskan range during tests in 1968-69.

"To meet this challenge, we now have better facilities, more instrumentation capability, better maintenance shops, better firing ranges. The result is high-quality information about the arctic, leading to better equipment for the Army."

The Arctic Test Branch, located in 1949 at Big Delta Air Force Base, now Fort Greely, was formed to answer questions raised during World War II and future wars about capabilities for fighting in extreme cold.

Task Forces Williwaw and Frigid had been dispatched to the arctic in 1946 and 1947, but were disbanded when their mission was accomplished. The questions persisted as more new equipment entered the Army's inventory. Arctic operational capability previously was essential for new materiel to be a fully effective addition to the modern Army.

Vulcan Air Defense Weapon was tested last winter at the Arctic Test Center.

Under the new CONARC organization in 1957, the Arctic Test Branch became the Arctic Test Board. With the establishment of the Test and Evaluation Command in 1962, all Army testing activities in the northern latitudes were transferred to Fort Greely. In 1964, this operation became the Arctic Test Center.

The center now has five test divisions: Armor and Combat Vehicles; Aviation; Infantry, Airborne and Individual Equipment; Artillery and Communications; Nuclear, Biological, Chemical and Special Projects.

In addition, the Instrumentation and Test Methodology Division provides engineering support and conducts basic research on testing in the arctic environment. A meteorological team is attached to the center to support test activities.

All major Army equipment in use today on a worldwide mission has been tested at the center. The basic arctic winter uniform, developed by the Army Quartermaster Corps in 1949 and modified after testing by the ATC is still worn today. Automotive and weapons systems, in particular, are given thorough checks in the extreme cold.

The basic principle applied to all ATC testing is that equipment must have a reliable capability to move, shoot, communicate or fly in the arctic environment before it is cleared for use by troops in the north.

Items sent to the ATC, from helicopters to ballpoint pens, are put through extensive mission-oriented tests in the most extreme combinations of weather and terrain before the center makes recommendations on suitability for deployment. The center also is frequently called upon to comment on factors that influence mobility and living in the Arctic.

Most U.S. Army equipment is designed to operate in all climatic extremes. The Arctic, however, is one of the most difficult for which to plan and design. Few developers of materiel have spent time in arctic regions, which impose demands vastly different from any experimental cold room. Consequently, a large amount of R&D relating to winterization of Army equipment is required.

The ATC must often act as a catalyst to the research efforts of developers and Army agencies controlling production of new items for the military. The center points out additional areas where improvements are necessary to make the Army truly global in its capability.

During the next 20 years, Col Rhoads stated, the ATC looks for further improvement in clothing insulation, including a new form of winter hand gear. Effective winterization kits for vehicles have still not been fully developed. Growing emphasis on speed and flexibility as a part of strategy requires more knowledge of mobility and airmobile operations in the Arctic. Complexity of weapons sytems must be matched by greater knowledge of their potential in the areas of extreme cold.

New questions will continue to arise regarding the Arctic and the Army's role in it. The ATC will rely on experience gained over the past 20 years and on continually updated ability to respond to challenges presented by new equipment operating in one of the world's extreme climatic zones.

Army Nurse Turns Secondary Talents to Ice Follies

One of the best little morale boosters serving patients in U.S. Army hospitals, Capt Karen L. Prior of the Nurse Corps, has decided to turn her secondary talents to a glamorous area of professional entertainment.

When she handed in her resignation to accept an invitation to join the world-famed group of professional skaters known as the Ice Follies, effective Aug. 22, the U.S. Army lost a nurse whose beauty, charm and TLC (tender, loving care) were appreciated by many male patients.

In addition to performing with the Ice Follies, she will be their professional nurse attendant. The Florida-born Karen had never skated until she was assigned to Europe in May 1966, three months after she volunteered for the Army Nurse Corps.

While serving as a medical-surgical nurse with the 33d Field Hospital in Germany, she performed so efficiently that she was promoted to head nurse of the Out-Patient Clinic and the Hospital Clinic.

When she became interested in skating during her leisure time, her zest mounted rapidly. She found time to practice skating a minimum of three hours a day, until she felt she had improved her skill to the point where she could confidently apply for a job with the big-time Ice Follies.

Last fall she was assigned to the Valley Forge General Hospital at Phoenixville, Pa., but the graduate of the Charity Hospital School of Nursing in New Orleans, La., continued to cherish her Ice Follies dream.

When the good news of selection came to her, the slender 5' 6" beauty was exuberant as she informed working associates. Understandably less exuberant were her patients with mixed emotions—happy about her success in another field "but mighty, mighty sorry to see her leave."

Karen L. Prior

Pyrotechnic Devices Prove Dependable on Moon Flight

Forty-seven pyrotechnic devices on Apollo 11's moon-landing flight functioned perfectly, international pyrotechnics expert Dr. Joseph H. McLain stated by way of emphasizing the importance of this field at a Pine Bluff (Ark.) Arsenal conference.

Attendance was limited to scientific and engineering personnel whose job responsibilities are related to pyrotechnics. Dr. McLain discussed some devices used on the Apollo 11 flight and gave a review of the historical development of the art of pyrotechnics.

His presentation covered civilian and military applications of pyrotechnics, including the sophisticated requirements for rocketry, propulsion systems and components miniaturization.

During five years with the U.S. Army Chemical Corps during World War II, Dr. McLain served as chief, Smoke Branch, Pyrotechnic Division, CWS Command, Edgewood (Md.) Arsenal. He received his doctorate from Johns Hopkins University in 1946 and for the next eight years was associate professor in chemistry at Washington College and technical director, Kent Manufacturing Corp. He also performed research for Olin Mathieson Co. during this period.

Maj Gen Lotz Scheduled To Speak at EASCON '69

Maj Gen Walter E. Lotz, CG of the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J., will be opening session speaker at the Institute of Electrical and Electronics Engineers (IEEE) EASCON '69, Oct. 27–29, at the Sheraton Park Hotel, Washington, D.C.

Military, government and industrial displays at the Electronics and Aerospace Systems Convention and Exposition (EASCON) will cover a wide scope of the latest developments and applications of military and space electronic systems and equipment.

Technical sessions will include communication, navigation and exploration by satellite, aircraft navigation and landing systems, pattern recognition, terrestrial communication, exotic power sources, urban problems and aerospace technology and electronics in transportation.

Picatinny Suggestor Earns Cash

Edward D. Gabel, a digital computer systems analyst, saved the government $2,600 and earned $130 when he recommended a multiweb decollator that replaced a single-type unit that resulted in a more efficient and rapid computing system at Picatinny Arsenal, Dover, N.J.

CRREL Recognized for Support of Northwest Passage

Scientific support by the U.S. Army Cold Regions Research and Engineering Laboratory to the Northwest Passage expedition sponsored by oil companies seeking an ocean route around the top of North America to the new Alaskan oil fields has been receiving considerable publicity.

Preliminary articles were featured in the *Army Research and Development Newsmagazine* (June-July and August-September editions). Several nationally known news media have since described the significance of the expedition that started a 9,000-mile round-trip voyage in mid-August.

Humble Oil and Refining Co., Atlantic Richfield Co. and British Petroleum are gambling $30 million in the effort to open an all-weather Northwest Passage, the *Washington Post* reported Aug. 11 in an article written by Thomas Ginda. The envisioned objective is a saving in shipping costs that could total $1 million a day.

The prize to be won is an economical route to the largest single oil field in North America at Prudhoe Bay on the north slope of Alaska. To achieve this goal, the largest vessel flying the U.S. flag, the *USS Manhattan*, 151,500 tons and 1,005 feet from stem to stern, has been modified with a special 125-foot ice-breaking prow.

The *Washington Post* article by Ginda looks back into history 472 years to the first attempt to find a Northwest Passage to the Pacific, made in 1497 by John and Sebastian Cabot in a tiny ship called the Matthew. They and dozens of other expeditions failed until a Northwest Passage to Alaska was negotiated in 1906. Perils of the route include ice floes as thick as 100 feet or more.

Four U.S. Army Cold Regions Research and Engineering Laboratory scientists are providing the *USS Manhattan* expedition with scientific knowledge gained during CRREL's numerous research activities in the Far North. Secretary of the Army Stanley R. Resor approved the request for CRREL assistance on a cost-reimbursable basis.

Benet Lab Links With NRC In Post-Doctoral Program

Initiation of a post-doctoral research associateship program, in cooperation with the National Research Council of the National Academy of Sciences, was announced in August by the Benet Research and Engineering Laboratories, Watervliet (N.Y) Arsenal.

Solicitation of candidates for the associateships was started in September and the program is expected to get under way in Janaury.

Visiting research scientists will be accommodated at the arsenal on a yearly basis to pursue research interests in areas of concern to the Department of the Army. Candidates will be recommended by the National Research Council and final selection will be made by the appropriate laboratory at the arsenal.

Dr. Robert E. Weigle, chief scientist at the arsenal, announced the research associateship program following a visit to Watervliet by a team headed by Dr. J. C. Boyce, deputy director, Office of Scientific Personnel, National Research Council.

The visit was made to ensure that the arsenal would provide for maintenance of the high level of scientific effort required by the National Research Council. General research areas were agreed upon and principal arsenal program advisers selected.

Advisers and areas of scientific specialty are: Dr. Thomas E. Davidson, Dr. Richards Harrington and Dr. Joseph Pepe, mechanical metallurgy; Dr. Fritz Sautter, alloy metallurgy; Joseph Throop, fracture mechanics; and Dr. Weigle, fatigue in metals.

Dr. Sautter is chairman of an advisory committee that includes Dr. Iqbal Ahmad and Dr. Moayyed Hussain to administer the program.

NASA Appoints Army Members to Advisory Committee

Appointments of Army members of advisory committees to the National Aeronautics and Space Administration for FY 1970, as announced recently, retained two who served in FY 1969 and honored four newcomers.

Acting Assistant Secretary of the Army (R&D) Charles L. Poor was chosen for another term on the Committee on Aeronautics, and Director Paul Yaggy of the Army Aeronautical Research Laboratory, Moffett Field, Calif., was reappointed to the Subcommittee on Aircraft Aerodynamics.

Richard L. Ballard, Physical and Engineering Sciences Division, U.S. Army Research Office, Office of the Chief of Research and Development, was selected to serve on the Subcommittee on Aircraft Structures.

Richard T. Alpaugh, chief of the Aircraft Power Section, U.S. Army Materiel Command (AMC), is a new appointee to the Subcommittee on Airbreathing Propulsion. Col Harry L. Jones, chief of the AMC Air Mobility Division, is a member of the Subcommittee on Aircraft Operating Problems. Hyman Rosenthal, adviser, Metallurgy Research Laboratory, Frankford Arsenal, is on the Panel on Materials for Aircraft Engines.

Col Anderson Heads STRATCOM Support Command

Col Ben L. Anderson, who began his Army career in 1941 as a second lieutenant in the 368th Infantry Regiment at Fort Huachuca, Ariz., returned recently to head the Support Command, U.S. Army Strategic Communications Command (STRATCOM).

As a faculty member of the National War College in Washington, D.C., since 1965, he traveled widely with Congressional fact-finding delegations and went to more than 50 countries as a member of military-civilian study groups.

Col Anderson has served as chief of the Congressional Liaison Division, Secretary of the Army Office of Legislative Liaison; General Staff and military assistant to the Assistant Secretary of the Army; and assistant G3, HQ Fifth U.S. Army, Chicago, Ill.

He was assistant chief of staff for Intelligence of I Corps (Group) in Korea, and commanded the 13th Infantry, 1st Battle Group, 8th Infantry Division in West Germany.

In 1955–56 he was CO of the 3d Battalion, 6th Infantry Regiment in Berlin, Germany, followed by two years as CO of the U.S. Army Europe (USAREUR) Special Troops in Heidelberg. During this assignment, he also served as commandant, HQ NATO, Central Army Group HQ, and of HQ USAREUR.

During World War II, he served in the Solomon Islands and New Guinea, and he returned to Japan in 1947 as chief of the Repatriation Branch, G–3.

Col Anderson graduated from Washington and Lee University and attended the Harvard Graduate School of Business before entering the Army. He is a graduate of the Command and General Staff College and the National War College.

Col Ben L. Anderson

Defense Secretary Discusses Budget Cuts

Publication of a detailed analysis of the ensuing fiscal year budget of the Office of the Chief of Research and Development normally is an *Army R&D Newsmagazine* feature in May or June, but Congressional decision this year is delayed.

Secretary of Defense Melvin R. Laird presented the probabilities of budgetary constraints Aug. 21 as follows:

I believe it is important that the public be informed of our preparations for cuts of up to $3 billion in FY 1970 defense expenditures.

The budget cutbacks which I am announcing today, and actions which will be announced subsequently are required:

(1) By Congressional action in imposing a limitation on federal expenditures for the fiscal year which ends June 30, 1970;

(2) By anticipated budget cuts by the Congress; and

(3) By the economic needs in our country.

Our problem is compounded by the fact that it now appears likely that the Defense Department budget will not be voted by the Congress before late this year—roughly halfway into FY 1970, which began on July 1, 1969. Prudence requires that we act in a responsive, timely and orderly manner.

We must respond, for example, to the federal expenditure ceilings imposed by Congress. We are also on notice that significant budget cuts in defense expenditures are in prospect.

As an example, the distinguished Chairman of the House Appropriations Committee has stated that his committee will cut at least $5 billion from the appropriations request now pending before Congress. The Chairman has alerted me to the fact how the current fiscal year is running and that action should be taken now to cut back defense programs.

I am taking that action. In doing this, I shall strive to insure that the cuts have the least possible impact on our readiness, but I want the American people to know that there will be an inevitable weakening of our worldwide military posture.

The reductions now being processed are in addition to cuts of $1.1 billion in expenditures and $3.1 billion in appropriations requests which are reflected in the revised budget for FY 1970.

Reductions being outlined today do include previously announced reductions attributable to the Cheyenne and MOL [Manned Orbital Laboratory] cancellations as well as the announced initial redeployments from South Vietnam.

We will be required, in order to make these savings, to lay up ships, reduce flying hours, close some bases, and reduce military and civilian manpower.

It is necessary that we take action now. If we were to wait until Congress completed action on the budget, a chaotic situation could develop during the last half of the fiscal year when it could be necessary, assuming a $5 billion appropriations cut, to reduce defense programs at a rate of $10 billion a year.

Deputy Secretary of Defense David Packard and I have been meeting with the Secretaries of the Services, with General Earle G. Wheeler, Chairman of the Joint Chiefs of Staff, and with the Service Chiefs, to try as best we can to assure that the reductions will have the least adverse effect on our present and long-range requirements.

As an example of the spending cuts which are required, I have today approved new expenditure reductions which will reduce defense spending this fiscal year by more than $1.5 billion. This, again, is in addition to the $1.1 billion expenditure cuts previously announced.

The Armed Forces fiscal year-end strength will be reduced by more than 100,000 military and more than 50,000 civilian personnel. As these reductions are taken, the funds will be reserved pending final Congressional action.

The proposed actions, by Service, are as follows:

1. The Army will reduce FY 1970 non-Southeast Asia operations, maintenance and training by approximately $500 million. The Army, as part of this program, previously announced plans to inactivate the 9th Infantry Division.

2. The Navy will inactivate, beginning immediately, more than 100 ships, including the battleship *USS New Jersey.*

3. The Air Force will reduce its non-Southeast Asia training by 300,000 flying hours for the remainder of this fiscal year.

I wish it were possible for me to state that these cuts could be made without impairing our defense readiness. Regrettably, I must say that these cuts will reduce our capability to meet current commitments.

These actions come at a time when Soviet military strength is increasing. In this connection, I believe it is important that the American public be informed about stepped-up Soviet activities in the strategic offensive and defensive fields. Also, the Soviet Navy, with about 125 Soviet Navy ships at sea today, has more ships deployed away from the Soviet Union than ever before.

In summary, we are going to make major cuts in military spending. We will strive to alleviate to the maximum extent possible the adverse impact of these reductions. But it is clear that our defense readiness will be weakened.

Andreoli Heads Fort McClellan CBR Agency

Leadership of the Chemical, Biological, Radiological Agency at Fort McClellan, Ala., was transferred recently from Col George W. Connell to Col Robert L. Andreoli, whose Chemical Corps career began in 1943.

Until reassigned upon completion of a tour of duty at Edgewood (Md.) Arsenal, Col Andreoli was director, Weapons Development and Engineering Laboratories. Col Connell was reassigned to HQ DA, Washington, D.C.

Col Andreoli entered the Army after graduating with a BS degree in chemistry from Michigan State College. In 1949 he obtained a master's degree in mechanical engineering from the University of Wisconsin. He is a graduate of the U.S Army Command and General Staff College, and also the Air University, Montgomery, Ala.

Lt Col John M. Longstreet was assigned as executive officer to Col Andreoli, and made the move with him from Edgewood Arsenal. He hss a BS degree in economics from Swarthmore (Pa.) College and a master's degree in business administration from Syracuse (N.Y.) University.

Prior to a 3-year tour at Edgwood, Col Longstreet commanded the 7th Maintenance Battalion in Thailand (1965–66). He was graduated from the Army Command and General Staff College in 1962, following an assignment at Edgewood as chief, Management Office, Army Chemical Center.

Col Robert N. Andreoli

Article Cites Army CBR Research Benefits to Civilian Population

Interest of Congress in Army chemical, biological and radiological (CBR) research activities at Edgewood (Md.) Arsenal and Fort Detrick, Md., as evidenced in inquiries in recent months, has redirected attention to many civilian population benefits.

Over the past nine years the *Army Research and Development Newsmagazine* has repeatedly published articles citing the various civilian applications resulting from research discoveries at these Army installations. The *Army Digest*, likewise, has stressed the byproduct benefits of such research in a series of recent articles.

Permission has been granted to excerpt from an *Army Digest* August 1969 edition summation of benefits, as follows:

* * *

Click Click Click goes the Geiger counter. It is being activated by a tiny radioactive insect flying past.

Why should anybody want to be using a counter to trace the flight of a vinegar fly way up in the northern wilds?

The answer to this and related questions provides an introduction to the vast and complex advantages in health, economics and social betterment that are accruing to the entire nation from research and development carried on by the U.S. Army in chemical and biological warfare.

This is an area where the Bunsen burner and retort of the chemical laboratory are providing not only defensive chemical-biological capability for our military forces—but where sometimes even the weapons themselves turn out to be of value in fields of medicine, agriculture or manufacturing.

THE MEDICAL RESEARCH LABORATORY has developed a method of identifying the nature of single protein molecule visualized with the electron microscope at Edgewood Arsenal. Antibody is chelated with an extensive amount of uranium under specific protection, followed by specific protection, followed by specific purification. The antibody chelate is applied to electron microscopic material after sectioning. Antigens within bacteria and viruses within mamlian cells are being identified at the lab.

Sometimes by accidental discovery, more often by continuing and relentless scientific invenstigation, the work of the U.S. Army Chemical and Biological R&D transcends national defense to bring incalculable benefits to the civilian economy and to personal well-being.

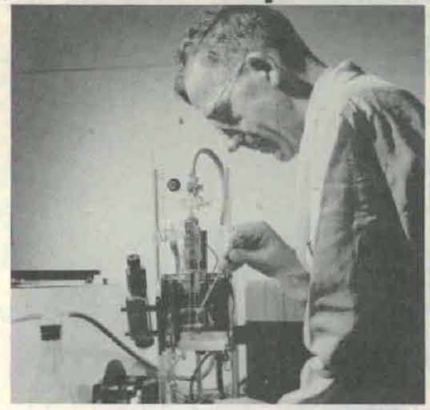
Just a few of those benefits, taken at random include: use of mustard gas for treating cancer; use of nerve gas types to relieve glaucoma (the eye disease so often the cause of blindness); application of various toxic compounds in fire extinguishants; improved methods for detecting minute quantities of cyanide in industrial use.

They also would include—again taken at random—many devices developed to protect soldiers in the field which now are being adapted for surgical uses in hospitals or in industrial plants. . . .

A quick list of chemical research and development [products] would include vaccines; compounds for weed control; studies predicting behavior of plant disease epidemics; development of building designs, equipment and working procedures to protect against chemical hazards; and many others.

Paradoxically, commercial products in everyday use around the house for control of lawn and garden insect pests are very closely related to some of the more toxic agents developed for warfare. Antidotes such as atropine and others, which were developed by the Chemical Corps for nerve agents, today are used by doctors and rescue squads for victims of commercially produced poisons.

The antidote is PAM Chloride (2 PAM-C1), which was clinically tested and developed at Edgewood Arsenal after eight years of intensive research by Army and civilian agencies. The white, odorless nonhygroscopic crystalline powder now is produced by a number of drug manufacturers, and is stockpiled by the military for use in the event nerve agents are used against U.S. troops.



EDGEWOOD ARSENAL researcher conducts experiments in which cardiac cells are subjected to various substances to test effects upon different enzymatic and energetic systems within the cells. Such work may lead to ways of preventing effects of toxic agents on cells of the heart.

While fairly common among farmers and crop dusters, a recent dramatic case involved an insecticide that in some way permeated a shipment of bread in Tijuana, Mexico. Seventeen persons died and hundreds were hospitalized. Dr. Van M. Sim, chief scientist at the Medical Research Laboratory at Edgewood, determined the cause and prescribed treatment. Researchers emphasize that, when properly used, insecticides are useful in combating disease-carrying and crop-destroying insects. Most poisonings are caused by accident and human error, they point out.

Insects Assist. As for the radioactive insects and the Geiger counter, and what it all means to the ordinary citizen, the story demonstrates the way in which unexpected results may lead to new experiments in unrelated areas that in turn will bring added benefits.

Originally, studies were being made to determine effects of certain toxics on carbohydrate metabolism. Biochchemists at the Army Chemical Corps Medical Laboratories at Edgewood Arsenal wished to use C_{14}—labeled glucose in these studies. But the immediate problem was to locate a sufficient source of radioactive glucose for the metabolism experiments.

Army scientists sought to obtain the radioactive compound in an atmosphere of C_{14} but the process was slow and costly. Coincidentally, other scientists in the laboratory were reporting on a study of insects, establishing that five percent of the weight of some insects was glycogen, a compound that is easily converted into glucose. It was just a step from there to put the insects to work for the biochemists in synthesizing radioactive glycogen.

Because vinegar flies are common, reproduce abundantly, and are widely used in various biological experiments they were employed in the project. When they were rendered radioactive, the glycogen extracted from them was found to be radioactive. This fact led to an idea for marking insects in order to study their flight range and dispersal patterns—important factors in control of insect-borne diseases. Previously used methods of marking insects with metal powder or a dye had obvious disadvantages. The sprays decreased the insect's flight capability; actual collection and examination of each insect under a lens was both difficult and tedious.

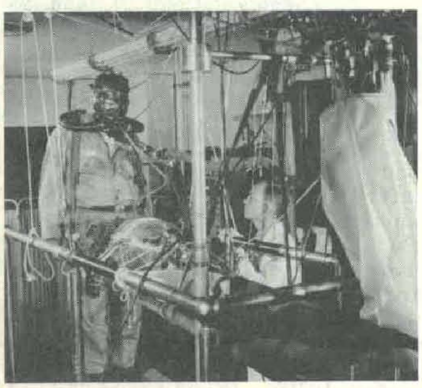
But by adding a radioactive substance to the diet of the insects while in larval stage, it was found that the radioactive adults could easily be detected by the ordinary Geiger counter.

When the method was tested by field laboratories in the northern environment, it proved so successful that it now is generally used for tracing insect movements. All of this is contributing materially to study of insectborne disease—of vast military importance in such areas as Vietnam, and obviously to the whole field of civilian medicine.

Lab Centers. In the fields of chemical and biological research, the Army maintains two main laboratories—Edgewood Arsenal for chemical research, and Fort Detrick for biological research.

At Edgewood, much of the research is performed in its own laboratories. Often, however, it is performed in conjunction with other branches of the military services, other governmental agencies, or civilian enterprise.

At Fort Detrick is maintained one of the world's largest and most advanced animal farms and facilities for conducting research with pathogenic organisms (germs that cause disease). Many of the facilities are unique. The wide scope of the research provides a body of new information, much of which has been published in scientific journals or presented at meetings of professional societies.



ARTIFICIAL RESPIRATION is practiced on a dummy victim as rescuer carries stretcher while walking on the treadmill at Edgewood Arsenal.

Medical Aids. Many of the benefits from research at these laboratories have come about in the field of medicine, often by circuitous means akin to the radioactive fly experiments. One of these is an antidote for poisoning by heavy metals—antimony, arsenic, bismuth, cadmium chromium, cobalt, gold, mercury and nickel.

Early in World War II intensive investigations were being made both in the United States and in Britain to find antidotes to the poisonous action of lewisite, the potent compound that contains arsenic. British scientists established that BAL (2, 3 dimercaptopropanol) was effective in ointment form for decontamination of skin against lewisite.

That set investigators at the Chemical Corps Medical Laboratories to studying various related chemicals. Now it has been established that BAL in peanut oil solution can be injected intramuscularly in treatment of human poisonings by the heavy metals—but it is not effective in poisonings from lead, selenium, silver, tellurium, thallium and uranium.

At any rate, the research started to solve Chemical Corps problems has resulted in treatment of tremendous value in preventing deaths due to industrial poisoning.

Still another type of lethal gas has contributed to medical advance—this one the nitrogren mustard widely used in World War I which through a tragic wartime accident of World War II finally led to its application in treatment of cancer.

During World War II a boat loaded with liquid mustard blew up in the harbor of Bari, Italy. The released liquid became mixed with fuel oil floating on the water. Those who were immersed in the mixture went into a state of shock, accompanied by a severe reduction in white blood corpuscles.

Tests showed that the mixture produced similar effects in animals. This gave Chemical Corps scientists the clue that the agent developed as a weapon of war might beneficially be used in treatment of diseases in which there was an abnormal increase in white blood cells. Mustard type agents were tried in cancer-related cases of

PUPIL SIZE OF EYE, sometimes a threshold effect of a drug under test, is measured by closed-circuit TV.

Hodgkins disease, lymphosarcoma and leukemia.

It should be emphasized that the nitrogen mustards are not regarded as a cure for any form of cancer—but they have prolonged life in many instances. Today hospitals, clinics and laboratories throughout the country are studying those compounds as a possible treatment for some forms of cancer.

Other medical developments have resulted from the Army's interest in controlling convulsions that may result from nerve gas poisoning. Many drugs, developed by chemists and pharmacologists, have been tested to facilitate greater understanding of the way the nervous system functions—

- Work in laboratories of Edgewood Arsenal and in universities has led to use of DFP (di-isopropyl fluorophosphate), a chemical compound similar to nerve gas, in relieving pressure of glaucoma, the serious eye disease.
- DFP also has proved effective in overcoming partial paralysis of the urinary bladder and the intestines that sometimes occurs after operations or following debilitating diseases that confine the patient to bed.
- The chronic, fatal disease, myasthenia gravis (characterized by weakness of the muscles), has frequently been helped by use of TEPP (tetraethylpyrophosphate) and OMPA (octamethylpyrophosphoramide) which can be used in combination with other drugs.
- In still other research in connection with Tabun, a nerve gas containing the cyanide radical, an existing spot test for cyanide ion and cyanogen chloride was converted into a sensitive method for estimating minute concentrations of the compounds. The method has been adapted

(Continued on page 30)

Article Cites Benefits of CBR Research to Civilians

(*Continued from page 29*)

for determining amounts of cyanides in seeds, water, waste samples, and manufacture of vitamins (Cyanide is used in manufacture of vitamin B12 for example).

At the U.S. Army Medical Research Institute of Infectious Diseases at Frederick, Md., studies in medical defense against biological warfare resulted in vaccines against a number of communicable diseases for which prophylactic agents were previously unavailable—inuluding anthrax botulism, Rift Valley fever, Venezuelan equine encephalitis, and tularemia.

Monochloromonobromomethan — difluorodibromomethan—these and other fire extinguishants have been investigated by an Army chemical and biological technical committee in studies of health hazards of various military chemicals.

Several technical agencies in the Army, Navy and Air Force requested such studies and assisted with financial support. The committee also studied propellant fuels, various types of alcohols, nitrates and boron hydrides among others, and such lubricating oils as sebacate, azelate, adipate, various esters and jet-assist takeoff exhausts.

Experiments and research have served as basis for substitution of less toxic substances for many highly toxic compounds used in fire fighting, propellants and lubricating agents. As a result, the military services and commercial firms have been able to minimize toxic injury to men who handle these chemicals daily.

Other medical benefits resulting from Chemical Corps research include—

- An improved catheter for use in treatment of "blue babies."
- Development of carbon monoxide and civilian protective masks, as well as a more effective type of mask (one that covers nose and mouth of the wearer) which is 10 to 15 times more effective in filtering out airborne bacteria than existing conventional surgical masks.

Tests of safety glasses and goggles in cooperation with the Air Force demonstrated that particles smaller than one millimeter in diameter will penetrate hardened glass at lower speeds than are required to penetrate unhardened glass.

Protecting Crops. Little known to the public, but of vast import, are the benefits to agriculture that have resulted from investigation of protective methods against lethal agents.

There is, for instance, chloropicrin, a chemical agent that has proved effective in controlling nematodes—soilborn fungi and bacteria—that have been the bane of potato growers for many years.

It now is being used to keep down weeds in greenhouses and in the fields. It also serves as a fumigant in mills, warehouses, grain storage facilities and ships where insects and rodents have costly nuisances.

Recent reports indicate that chloropicrin increases crop yields following partial soil sterilization. Root rots are reduced in virulence, and damping off fungi are eliminated.

Still other research proiects adapted by industry include DDT, insect repellants, aerosol insecticides, rodenticides that counteract rats and ratborne diseases, defoliants such as those used in South Vietnam to reduce threat of ambush to U.S. forces

Other vegetation control includes early work at Fort Detrick with2,4-D (for dichlorophenoxyceric acid) and 2,4,5-T (for trichlorophenoxyaceric acid) undertaken in conjunction with the Department of Agriculture. Many home gardeners use these products in one form or another for weed control in lawns and garden today.

In the early biological research program at Fort Detrick, the first highly effective vaccine for rinderpest was developed. This vaccine has saved many cattle from the highly contagious and fatal disease, and its use has been extended to many other countries where rinderpest was an endemic problem.

Now widely used in agriculture also is the commercial flamethrower, which is a direct outgrowth of the devices developed by the Army and used effectively in World War II. The commercial versions are used to burn out weeds growing between rows of young cane and cotton, or in beet and onion fields, in removing packed ice and snow from airfield runways, or to eradicate water hyacinths that clogged the Mississippi River Delta and were encroaching on lakes and waterways throughout the South. Today a small flamethrower is even available for the home gardener.

Still another device now used for disseminating agricultural chemicals are "smoke ginnies"—mechanical smoke generators originally developed by the Army and used for screening combat areas. Today they dispense fogs of insecticides fungicides and plant growth regulators.

The very fine particle size that can be created with this device makes it ideal for orchardists especially.

Detection Devices. Since the Chemical Corps has been largely interested in providing for defensive uses of various chemicals in warfare, the Corps of necessity has been interested in detecting the colorless, odorless agents that might be used against U.S. troops in the field—and here again this research has proved of value commercially. "Lopair," so called for Long Path Infrared, is an infrared "eye" that flashes a warning light and sounds a horn when even a minute amount of contamination is in the air as far as a quarter mile off. The device can be used in air pollution studies and for control of stack gases from industrial establishments. It can detect and measure practically any substance by its characteristic infrared spectrum. When properly set to detect one specific substance, it normally will not be triggered by other materials. Even if the beam between the two units that make up the device should be interrupted, it won't sound an alarm.

Another recently perfected device is a halogen alarm that detects a fraction of a part per million of chlorine in the atmosphere. The simple unit consists of a small pump, a plastic cell containing a silver nitrate cell to provide elctrical energy, an electronic amplifier system and alarm lights and bells. It is expected to have wide application in industry wherever chlorine is used on a large scale.

Thus in many ways Army chemical and biological *R&D* contributes to the national welfare—in a wide range of fields, including medicine, agriculture and commerce.

McCullough Named Assistant to Assistant SecDef (I&L)

Hugh McCullough, director of Long Range Planning of Grumman Aerospace Corp., Bethpage, N.Y., has been appointed special assistant to the Assistant Secretary of Defense (Installations and Logistics).

Prior to association with Grumman six years ago, McCullough had 29 years of government service in Washington, D.C., most of it in planning, programing and budgeting in the Department of the Navy and Office of the Secretary of Defense.

In 1959 he directed the planning and programing for the Navy's Polaris Weapon System. In 1961 he was appointed the first Deputy Assistant Secretary of Defense (Programing) and developed the Department of Defense Five-Year Programing System.

During World War II he served on active duty in the Navy Department from 1942 to 1946. He has served as National Vice President of Armed Forces Management Association and President of the Washington Chapter of the Society of Military Comptrollers.

CofS Westmoreland Speaks in Support of Army ROTC Program

Army Chief of Staff General William C. Westmoreland spoke strongly in support of the Army ROTC Program, acclaiming it as the source of about two-thirds of newly commissioned officers, in addressing participants in the basic ROTC summer camp at Fort Benning, Ga.

Without making either direct or indirect reference to the dissent that has been evidenced on college campuses during the past year about the ROTC Program, General Westmoreland said his views regarding its results in three wars "has been reinforced by my observations this summer." He has visited all ROTC summer camps throughout the Nation and "talked with hundreds of ROTC Cadets."

Suggestions made by these participants, he said, "will be considered in any future changes the Army makes in the ROTC Program. My conviction that our younger generation is capable and serious, motivated and dedicated has been reaffirmed."

With respect to the ROTC training of those who enroll in Military Science III at colleges and universities throughout the United States this fall, General Westmoreland stated:

"In this part of your campus life, you will be preparing yourselves to share in the most serious responsibility of citizenship—service to country—a tradition in our citizen Army that is almost two centuries old and a tradition that lives today.

"You will be preparing yourselves to become junior leaders in a modern, dynamic, complex organization. Our Army is complex not only because it deals with sophisticated technical equipment, but also because it plays an integral role in national policy.

"Our national policy is to work toward achieving peace. But we must continue to face the harsh realities of life. So long as nations continue to use violence or threat of violence in their relations with each other, our country must maintain a strong defense. ROTC is our major source of officers to provide this defense.

"Today, the maintenance of peace and our relations on the international scene are highly involved equations containing many unknowns—unknowns that involve the coordination and integration of our Nation's political, social, economic, psychological and military resources.

"To operate our Army, numerous complex skills must be mastered. Our officers must manage both small funds and big businesses; they must master the machines of war and the machines of peace; and they must be experts in logistics and personnel administration. They must be able to look to the future needs of our Nation in research and development. And they must be able to handle the personal and often very emotional problems found in every organization—indeed, in society itself. . . .

"The military service and our government, like business, need young men who want to assume responsibility for what happens next, because only through shouldering responsibility can leadership develop. But equally important, our young soldiers deserve to be led by the best—the best that our country and education system can produce. No mother or father—no responsible citizen—would want it any other way.

"In order for our officers to master the complexities of the modern Army, they must have a firm foundation—a foundation that comes only from a liberal education. To meet the challenges of technology and leadership demanded by our sophisticated modern-day Army, we seek men schooled in a variety of disciplines:

- Men who possess a wide range of academic experience.
- Men who are eager and interested in different things.
- Men who want to play a meaningful role in the future.
- And men who want to serve their country.

". . . Your Commission in two years will come only through application and dedication—dedication to a belief that what you are doing is right—that your course is noble and worthy."

Harvard, Dartmouth End ROTC

Termination of ROTC contracts at Harvard University and Dartmouth College at the end of the 1969-70 academic year was announced recently by Acting Secretary of the Army Thaddeus R. Beal. ROTC enrollment at Harvard is 154 and at Dartmouth is 200.

Contracts in force between the Army and those colleges and universities that host ROTC programs provide that either party may terminate the agreement upon one year's notice.

WSMR Employes Pursue Advanced Studies at NMSU

Fellowships in the Public Science Policy and Administration Program are enabling two White Sands (N. Mex.) Missile Range employees to pursue advanced studies at the University of New Mexico.

Will E. DeBusk

Juanito V. Carrillo

Will E. DeBusk and Juanito V. Carrillo are among 10 men selected from U.S. Government agencies to take the 9-month course. Training under the joint university-government program is designed to prepare scientists as top echelon administrators for scientific, research and development fields.

The university provides tuition, books and related expenses while the employe's agency pays his salary. A nominee must have a bachelor's degree in engineering, science, technology or the social sciences; be employed as a middle-management or scientific staff member; and be nominated by the head of his directorate. Final selection is made by the university.

DeBusk is a missile engineer with the Projects Directorate, Army Missile Test and Evaluation (ARMTE). He received his BS degree in mechanical engineering from New Mexico State University in 1958 through the WSMR-NMSU Cooperative Training Program, and began work at WSMR in 1954 with the Environmental Division, Applied Mechanics Directorate, ARMTE.

Carrillo joined WSMR in 1961 and worked five years with the Pershing Project, ARMTE, until he transferred as a physical scientist supervisor to Analysis and Computation, National Range Operations.

He received his bachelor's degree in mathematics from Sul Ross State College (Alphine, Tex.) and his MA in mathematics from the University of Texas. Under the fellowship, he is working toward a master's degree in business administration.

Laird Discusses Future R&D Programs With College Student Interns

Questions directed to Secretary of Defense Melvin R. Laird by some 50 college students selected for the President's Executive Intern Program drew responses relating to future research and development, particularly policy on chemical/biological weapons.

The temporary employes of the U.S. Government met with Secretary Laird for an orientation on the Department of Defense organization and programs. Many of their questions evidenced a knowledgeable concern with current controversial issues, such as:

Q—Mr. Secretary, the Defense Department said that because of the Vietnamese war a lot of money that would have gone into research and development is now going into war and that we are behind in research and development. When the war is over with and the amount of money spent on the war is decreased substantially, do you think that the condition of this country internally will permit a great amount of money to be spent on research and development for defense?

A—I'd like to say yes, but I don't believe that that would be the proper answer factually as far as research and development is concerned. I look for a period of the next 24 months for research and development programs to be in real jeopardy. Not only as far as defense is concerned but as far as the National Science Foundation, the Department of Health, Education, and Welfare—all of the research programs are in for some trouble at this time.

I am sure you are familiar with the fact that the Congress has already cut the research and development budget for the National Science Foundation by a very substantial amount. The budget for the National Science Foundation was $500 million, and it was reduced to $420 million. The budget of the National Institute of Health, which gives the basic research and development money for our college campuses, particularly our medical schools, has been substantially reduced.

The budget of the Department of Defense has been reduced in the research and development area, particularly as it applies to basic research that is carried on by our universities and our colleges. It's in the basic research areas where we are having the greatest reductions made at the present time.

I think that this is a very grave error—a bad mistake. I think we should be putting more money into the basic research areas, whether it be in the Defense budget, the HEW budget, the National Science budget or the AEC budget, because there are so many things that can be learned from this kind of research and development supported by our Federal Government.

We have a manpower shortage, a shortage of technicians, a shortage of scientists—a real shortage in this area—as compared with the Soviet Union, and as compared with the Chinese. A much greater emphasis is being given to these research areas in those two countries. So I would like to say yes that we would be going up in our support of research and development activities, particularly in the basic research areas. But I would say that what's happening right now, is that a kind of coalition has come together here, of people who want to reduce budgets and people who feel that things are out of hand on the college campuses and one way to show the displeasure of the Congress is to reduce this kind of support as far as higher education is concerned.

I personnally believe that it is a mistake. I'd like to say, "Yes, we would be increasing those areas," but I don't believe as a practical matter that in the research and development area we will be making large increases.

Q—Mr. Secretary, recently there has been some difficulty in the Defense Department in the deployment of chemical weapons and nerve gas. There have been incidents—in Utah, Okinawa, as near as Baltimore—which have aroused some public discomfort and anger. I was wondering whether you foresee a major policy change in the use and deployment of chemical weapons in the Defense Department. Do you think it would be possible within the next five years or so to actually do away with the chemical development and research programs within the Defense Department?

A—First I want you to know that one of my first acts was to request that the National Security Council make a complete and thorough review of chemical and biological warfare activities carried on by our government. I made a request that the National Security Council make such a study, and it was ordered by the President of the United States.

In addition to that, we have established two scientific committees to look into the transportation of chemical warfare materials and to look into the safety of the research that's going on in this particular area.

I would like to say that we could do away with the development and research in this area. But I cannot say that and it would not be fair to the American people or fair to our Allies throughout the world if we were just to do away with that program.

I think you have to understand the history of chemical warfare, and it

Brig Gen Guthrie Directs RD&E for AMC

Brig Gen John R. Guthrie, Army Materiel Command (AMC) deputy director of Research, Development and Engineering, moved up to director upon assignment of Maj Gen Richard H. Free as South Atlantic Division Engineer, U.S. Army Corps of Engineers.

Before reporting to AMC in November 1968, General Guthrie served as assistant commander, 2d Infantry Division, U.S. Army Pacific-Korea.

The general served from 1956–58 with the Missiles and Space Division, Office of the Chief of R&D (OCRD). He was Army staff project officer for launching of Explorer I, the Free World's first artificial earth satellite, and in 1966–67 headed the OCRD Developments Directorate.

Other major assignments have included military assistant and assistant executive to the Secretary of the Army; commander of the 25th Infantry Division Artillery, Schofield Barracks, Hawaii; and J-5 Directorate, Joint Chiefs of Staff, Washington, D.C.

General Guthrie is a graduate of the National War College (1961) and has received the Legion of Merit with two Oak Leaf Clusters, the Bronze Star with two Oak Leaf Clusters, and the Presidential Unit Citation (Republic of Korea). He began his military career in 1942 following graduation from Princeton University.

Brig Gen John R. Guthrie

might be well for us just to review that briefly. There have been three significant occasions when gases have been used by various nations in this world.

Of course, the first occasion was in World War I, at the time the Germans used it. The next occasion was when the Italians used it in Ethiopia and the next occasion was when the Egyptians used it in Yemen.

Now on all three of those occasions, it so happens that the other side did not have a deterrent capability and did not have a gas available to use. Whenever both sides have had possession of this kind of a weapon, it has never been used. We do not have the capability of the Soviet Union in this area. They have much greater stocks than are possessed by the United States. But it is very important, if we are going to see that it is not used at any time, for us to have the capability of using it. This deterrent is important if we want to see that these gases—these particular weapons—are never used in our time.

So I think it is important for us to look at the history of the use of military gases. As much as we deplore this kind of a weapon, if we want to make sure that it is never used, there should be one lesson that we've learned from history and that is to have the capability ourselves. This capability should be understood clearly —that we will never use it first, but we will only use it as a deterrent should some other nation be foolish enough to do it.

I believe that this will prevent the use of this kind of a weapon in the future. I think it is most important for us in the Department of Defense and for this country to see that this kind of a weapon is never used.

Q—You mentioned that the need for the CBW research and development is as a deterrent. But why do you need an identical weapon to deter? In other words, why do we need chemical and particularly biological weapons to deter against the use of a weapon against us? Why don't we deter with a large nuclear stockpile and even a conventional capability? I can see the need for developing defenses against chemical and biological warfare against us, but I don't see the need by our saying, "Well, we have it and we can use it against you," when we have other weapons that we will use against you if you use chemical and biological warfare against us.

A—Well, personally I would not want to use the nuclear deterrent in this area because the nuclear deterrent I believe would engage us in a much larger exchange, if we were to use that as our only deterrent against the, say, limited use of biological or chemical agents.

Now, I believe—and I think that this is certainly in the record of the hearings that we have had over the years up in the Congress—that the best way to deter the use of gases is to have that capability yourself. I think if you will read over the report of the congressional committees of 1959 and 1961, when we got into this area and found that the United States was not going forward in this area, the committees of the Congress directed the Department of Defense to move forward in this area at a much more rapid rate than it had. This is congressional direction which was received in the Department of Defense.

I read a story the other day about how this hadn't been discussed in the Congress. Well, I sat there for days and weeks going over this whole program and it was the House Appropriations Committee that directed the Department of Defense to go forward and to develop this capability so we would have this kind of a deterrent.

I would just like to say that as far as the safety is concerned I think this is a matter that has to be looked at very carefully. As far as the uses and the management of this program, I am not satisfied with that and that's why I asked the President to direct the National Security Council to make this thorough and complete review.

I would like to point out that there hasn't been a review made by the Executive Branch of our government of chemical or biological warfare since 1959. I think this is one of the most significant actions that I've taken, to make this complete review, bringing in the State Department, the Arms Control Agency, and the other important agencies of our national government through the National Security Council function, to study this whole area.

I am not pre-judging that study, but I did want to fill you in a little bit on the history of the use of these gases, because many people fail to realize that in this century, in the use of these gases, we've had three very significant uses. It so happened that each time they were used the other side did not have the capability. I think that that may have encouraged or lent some credibility to the recommendation of the military commander who was making that recommendation to his government for the use of that kind of a weapon.

But I think that this review is a significant review and one which I am very pleased is going forward.

Pellets Protect Grain Products From Weevils' Damage

A white pellet that looks like an ordinary aspirin tablet, is helping to keep weevils out of flour and other grain products. The idea was developed by Maj Ronald D. Anderson of the Army Veterinary Unit at Norfolk Naval Station.

Placed in use in the First Army area, it is expected to save more than $20,000 in the first year of a battle against weevil infestation of flour and grain products shipments.

Food products are stacked and covered with a clear plastic sheet. The edges are weighted down and the pellets are placed in a small aluminum tray under the covering. The pellets release a gas that kills the insects and their eggs but is harmless to humans.

Maj Anderson said food products processed by the method have been approved by the Federal Food and Drug Administration.

APG Honors Brown as Only 50-Year Club Member

Claude E. Brown

More than 50 years service at Aberdeen (Md.) Proving Ground ended for Claude E. Brown, popularly known as "Mr. APG," when he retired after friends and coworkers honored him at a testimonial dinner.

Numerous gifts presented to Brown and his wife included a console stereo phonograph and a plaque recognizing him as the first and only member of the APG 50-Year Club. Maj Gen Frank M. Izenour, CG of the U.S. Army Test and Evaluation Command, sent congratulations.

Hundreds of well-wishers assembled at the Officers Club to pay respects to the guest of honor and Mrs. Brown. Guests at the banquet included Brig Gen and Mrs. Michael Paulick and Col and Mrs. George C. Clowes. General Paulick is deputy CG of the Test and Evaluation Command. Col Clowes is APG commander.

Chesarek Acclaims AOA Logistic Support Role

Challenges inherent to an Integrated Logistic Support System (ILSS) for the Army Materiel Command, (AMC), effectively incorporating reliability, maintainability and human engineering of equipment, were blended with "a real pat on the back" for the American Ordnance Association (AOA) in an address by General F. J. Chesarek.

Speaking to an ILSS Symposium in Washington, D.C., sponsored jointly by the AOA and the AMC, the commander of the Materiel Command acclaimed the "untiring 50-year effort of the AOA to improve the effectiveness and efficiency of the government-science-industry relationship in the development and production of weapons and weapon systems. . . ."

ILSS is a new name for a function that "has a long history, most of it unhappy," General Chesarek said, citing a 1919 War Department report that recognized problems existing today:

"The immense size of modern armies entails more complicated systems of supply and requires a broader basis of industrial support at home, as well as the application of all the most modern elements of transportation, both for the mobility of the Army itself, and for the maintenance in the field."

Rejuvenation of the ILSS function, he said, "is long overdue, for upon its success may well hinge the success of future Army operations and our ability to use our scarce resources fully in a period of shrinking manpower and funds."

In pointing to the requirement for "team play between government, science and industry" in attempts to provide the modern Army with the best possible weapons and equipment, General Chesarek said the "assistance and support of the 44,000 members of the American Ordnance Association are particularly welcome."

Attempts at integrated logistic support have foundered in the past, General Chesark said, in pushing the state-of-the-art to improve firepower, mobility, protection and communications, because:

"In the process of development and engineering, however, reliability, maintainability and human engineering have, all too frequently, been sacrificed in attempts to obtain the best operational characteristics. Following this road practically guarantees that we will produce something considerably less than the best possible weapons and equipment.

"We are gathered here to address the problem of how to insure that we design into our materiel the all-important reliability, maintainability, and human engineering so essential in life-cycle systems operations and management. The membership is impressive in experience and knowledge—you have all traveled this route before.

"In a complex situation, he who has traveled the route is in a much better position to assess the course of events. By and large, we have done a fair-to-middling job in giving the soldiers in the field the equipment with the operational characteristics and reliability it should have

"Fair-to-middling is no longer good enough. To insure that our equipment will stand up under stress in the field, we have to start at the beginning. It is a design requirement to build reliability and maintainability into our equipment.

"Specified reliability goals are becoming contractual requirements that must be met along with other functional performance requirements. The AMC now insists that the design requirement formally predicts what the reliability will be; that it be measured during development; and that it be validated during test and operations.

"We will then have an audited trail of what we have intended to do and what we actually did in the way of performance. In the past, we have missed the boat in this area. We have had standards that were pretty much "against sin"—or they were so unrealistic that they could not be attained."

General Chesarek said the importance of verification and demonstration is too frequently overlooked "in our zeal to compress time, save dollars, and meet schedules. Every time a project runs into a little trouble in its time or money budget, the temptation is to recover by cutting down on testing.

"We must have project managers who demand that testing is adequate to locate all problem areas and demonstrate the achievement of the pre-established reliability requirements."

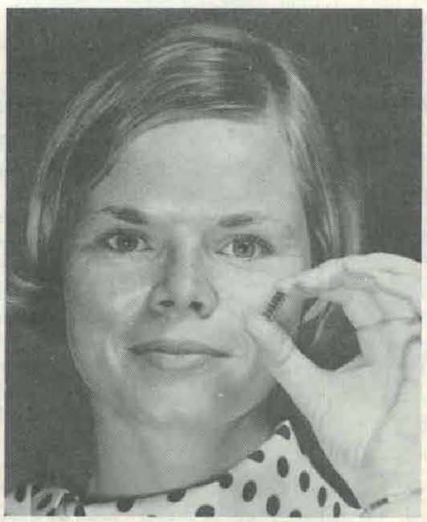
In stressing that project reliability and quality must be carefully built into the planning phase, General Chesarek said that, on the average, the AMC has seven major in-process reviews during the development and testing cycle of a new piece of equipment. Despite this seemingly adequate procedure, "important elements do slip through the cracks."

More attention must be directed toward caulking up even the smallest of these cracks, it was emphasized. "The item that comes off the production line must be watched under the same carefully planned, organized and implemented program that it had during

'Mute/Demute Module' Developed for STRATCOM

A tiny "Mute/Demute Module" has been developed for the U.S. Army Strategic Communications Command (STRATCOM).

Containing 276 transistors and 10 diodes, the module represents the current state-of-the-art in large-scale integrated circuits. It is used in a developmental civil defense warning program called the Decision Information Distribution System (DIDS), which is being conducted by STRATCOM for the Office of Civil Defense.



SIZING UP "Mute/Demute Module" is STRATCOM's Alice Boogher.

DIDS provides attack warning and other civil defense information to selected federal, state and local agencies by means of low frequency radio. It also ties the nation's major civil defense warning centers to tens of thousands of individual receiving points through 10 regional transmitters.

STRATCOM, as part of its worldwide telecommunications network for the Army, also provides communications and electronic support to the nation's civil defense program.

In its natural environment, the module interprets a complex coded signal from a civil defense warning center and initiates a series of timed actions that result in the activation of the audio channel of the receiver and/or civil defense warning devices.

General Instruments Co. developed the module under a subcontract from the Bendix Radio Corp.

development engineering and testing.

"The finished product, in the hands of troops, must give the same quality performance and with the same reliability as the prototype. Hopefully, it works even better."

Commenting that the Army last year spent $8 billion to operate and maintain its materiel, General Chesarek said the dollar yardstick tells only part of the story. Another measure is to consider the mean time between failures (MTBF) and mean time to repair (MTTR). He explained:

"If we look at power generators in use by all services, for instance, we find little or no improvement in MTBF and MTTR between 5 to 10 years ago and today. During the same period, requirements for generators have more than doubled. The current 200-hour MTBF in a peacetime environment, is bad enough; but when you put this generator to use in a combat zone 24 hours a day, you have an intolerable situation.

"Our current average repair time exceeds three hours. This is much too high. For most systems, we need rapid, inexpensive modular repair capability built into the design so that quick maintenance can be effected by semiskilled personnel—which, by the way, are all we have and are likely to get. The closer we get to a system of maintenance using throwaway modules, the better."

Intelligence data truly indicative of module usage factors is the basis of field maintainability, the general contended, including intelligence for provisioning and procuring modules.

". . . In order to justify the module system of maintenance in the field, we must get cost comparisons proving that piece part repair with the necessary skills, parts and so forth is more costly than the module replacement, system.

"The Army demands that greater emphasis be placed on the reliability of entire systems. Recall, if you will, the early model electric refrigerators that were constantly breaking down. After some years of putting up with this, the consumers forced industry to develop new models that have a built-in reliability of about 90 percent over their life cycles.

"I am also impressed with new model air conditioners. They just run on and on—no maintenance; just 100 percent reliability. So this greater reliability for military equipment is not a pipe dream. Of course, these are comparatively simple machines, but the components of much of our Army materiel can also be made simple and reliable if we give industry the requirement to make them that way and if we—together with industry—insure that the requirement stands."

After citing an example of an exercise that "met with disaster because the engineer, in his zeal to meet the qualitative requirements, totally subverted the effort of his ILSS engineers," General Chesarek continued:

"Industry was not at fault. We were. We love to dream of tanks that fly, airplanes that swim, and trucks that do both. Where is the glamor in the—ility league—reliability, maintainability, serviceability, supportability, and the rest?

"The glamor is there, all right, but so camouflaged as to be almost unrecognizable. Imagine a tank, aircraft or truck that requires no maintenance for at least several thousand hours. Ridiculous? Not at all. Not if we put our minds to it. In this symposium, keep uppermost in your minds the glamor of total reliability, for that is our ultimate goal. Awaiting that great day, how close to it can we come?

"Secretary Shillito [Barry J., Assistant Secretary of Defense for Ir stallations and Logistics], in a recent address, listed the following guidance for future maintenance management:

- A more disciplined approach to management on a total cost basis by weapon system.
- Cost consciousness by management at each level of command in the evaluation of alternatives and support decisions.
- Improved planning and programing of maintenance requirements.
- Greater precision in estimating and pricing maintenance needs.
- Increased participation in the budget and apportionment process.
- Improved data base for life-cycle costing.
- More timely initiation of corrective measures.
- More emphasis on equipment support demand and technical criteria in order to influence reliability and maintainability of both current and future systems . . . all of this aimed, of course, at improving readiness of our weapons and equipment and producing our maintenance requirements at the most economical cost.

General Chesarek closed with: "Our job is to organize and to develop the procedures and controls necessary to achieve these objectives. You gentlemen have traveled this route before. You are in a position to assess its strengths and weaknesses. The talent assembled here is more than sufficient to set the right course. I am confident that this jointly sponsored symposium will provide many of the answers to our problems and the teamwork so essential to our mission."

Col Axelson Takes Command of Army LWL

Command of the U.S. Army Limited War Laboratory, Aberdeen (Md.) Proving Ground, passed from Col Robert W. McEvoy to Col Rudolph A. Axelson at recent ceremonies. Col Axelson came from Vietnam, where he was chief, Ordnance Advisory Division, J46, Military Assistance Command.

Col McEvoy, commander of the LWL for the past four years, has been assigned to the U.S. Army Ordnance Center and School at Aberdeen.

Col Axelson has 27 years military service, having entered the Army as a second lieutenant in the Ordnance Corps following graduation as an ROTC student from the School of Engineering, Universty of Michigan.

Prior to his assignment to Vietnam in 1968, he was chief of the Environmental Effects Division, Office of the Project Manager for Selected Ammunition, Army Materiel Command. Assigned to the U.S. Army Standardization Group, Canada (1964–66), he served as ordnance representative.

From 1961 to 1962, he was a staff officer, Office of the Chief of Ordnance until assigned to HQ U.S. Army Materiel Command when it was activated as part of the Army-wide reorganization in 1962.

Col Axelson served during World War II with the Iceland Base Command, European Theater of Operations, and during the Korean War was assigned in 1951–52 to HQ U.S. Eighth Army.

Graduated from the Command and General Staff College and the Armed Forces Staff College, he has been honored with the Legion of Merit, Bronze Star Medal, and the Army Commendation Medal (with OLC).

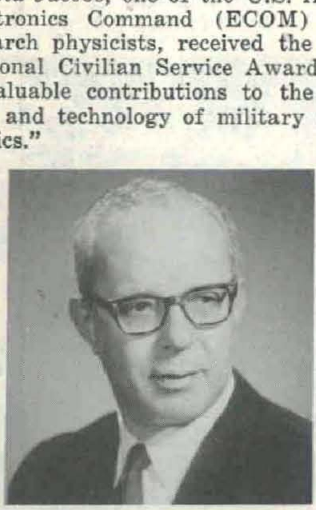
Col Rudolph A. Axelson

Kudos

DISTINGUISHED SERVICE MEDAL. Award of the Distinguished Service Medal (DSM) featured ceremones for *Brig Gen Frederick C. Roecker Jr.* when he retired from active duty as CG of the U.S. Army Combat Developments Command Experimentation Command (CDCEC).

Lt Gen Harry W. O. Kinnard, CG of the U.S. Army Combat Developments Command (CDC), CDCEC's parent unit, presented the award. An accompaning citation lauded General Roecker for more than 27 years of distinguished military service, including recent assignments as deputy CG of Fort Ord, and assistant division commander (Support Operations), 7th Infantry Division, U.S. Army Pacific.

EXCEPTIONAL SERVICE. *Dr. Harold Jacobs,* one of the U.S. Army Electronics Command (ECOM) top research physicists, received the Exceptional Civilian Service Award for "invaluable contributions to the science and technology of military electronics."



Dr. Harold Jacobs

Maj Gen William B. Latta presented the award on behalf of Secretary of the Army Stanley R. Resor. Dr. Jacobs was cited for "exceptional progress by the Command in the field of millimeter wave semiconductor devices, in opening up of new research horizons involving submillimeter concepts, and in the invention and development of an entirely new system of quasioptical radar imaging."

Dr. Jacobs is senior scientist and research consultant in the Solid State and Frequency Control Division of Electronic Components Laboratory.

MERITORIOUS SERVICE. Two key staff members of the Waterways Experiment Station (WES) at Vicksburg, Miss., *E. P. Fortson Jr.* and *F. P. Hanes,* are recent recipients of the Meritorious Civilian Service Award (MCSA). Col Levi A. Brown, WES director, presented the awards.

Fortson is chief of the Hydraulics Division and was cited for "outstanding contributions to the advancement of knowledge in hydraulic engineering and to the management of the largest and most diverse hydraulics laboratory in the nation. Under his technical giudance, the small-scale hydraulic model has been developed into a technically authoritative means of solving problems in the navigation, flood control, and harbor development projects of the U.S. Army Corps o Engineers.

Fortson has participated in the hydraulic design of many major engineering projects for flood control and river and harbor improvements, beginning with Mississippi River flood control plans of the 1930s and continuing through the planning of the great Missouri River dams of the 1940s. More recently he has contributed extensively to hurricane protection of Hawaii and the West Coast of the United States.

His comprehensive knowledge and expertise, it was stated, "have contributed significantly to the world renown accomplishments of the Waterways Experiment Station in the hydraulic engineering field."

HANES was cited for "contributing outstandingly to the advancement of technical missions through application of his electronics competency in devising improved and advanced instrumentation techniques and devices."

Since the inception of the program of scale testing of nuclear effects in 1950, and including recent high explosive field tests, Hanes has been devising measuring and recording apparatus to meet more sophisticated and complex requirements.

Neil K. Dickinson received the MCSA in recognition of service at the U.S. Army Mobility Equipment R&D Center (MERDC), Fort Belvoir, Va., where he retired after more than 25 years service. The award was presented belatedly by Lt Col Jess E. Baldwin, deputy CO of the center.

As chief of the Military Technology Laboratory at the time of his retirement in February, Dickinson was concerned with research, development and testing of military bridges, marine equipment, buildings and structures, water supply and sanitation, fire suppression, explosives research, mine warfare, barrier-counterbarriers, obstacles, demolitions, countersurveillance, camouflage, nuclear effects and materials research.

Frank T. Elliot Jr., chief of the Manpower Division, Army Materiel Command (AMC), Washington, D.C., received the MCSA from Maj Gen R. C. Forbes, acting AMC chief of staff.

Elliot is concerned with the careers of more than 170,000 AMC military and civilian personnel. His citation reads in part: "Mr. Elliot has displayed rare skills in organizing his staff, committees and projected groups to insure maximum output. He has gained for himself widespread recognition as one of the outstanding staff officers of the Army Materiel Command."

LEGION OF MERIT. *Col Earl I. Seekins,* special assistant to Brig Gen Wilson, CG, U.S. Army Computer Systems Command (CSC), received the Legion of Merit when he retired after more than 28 years of military service.

The citation paid tribute to Col Seekins' "distinguished and exceptionally meritorious service during the period June 1968 to July 1969, during which time he displayed exceptional organizational and managerial ability, vast knowledge of all facets of automatic data processing systems and functions, and was a driving force in the establishment of the U.S. Army Computer Systems Command."

Col George R. O'Neal received the LOM prior to retirement in July. He was cited for meritorious service as chief of the Communications-Electronics Division, Office of the Chief of R&D (OCRD), June 1967 to July 1969.

His responsibilities during this time included DA General Staff monitorship of exploratory, advanced, and engineering research and development activity in areas of communications, tactical automatic data processing, surveillance, electronic warfare, and Army aviation electronics.

Col Orvill L. Tobiason, director of field artillery materiel testing since 1967, was awarded the first Oak Leaf Cluster to the LOM for outstanding achievement with the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, Md.

The citation reads, in part: ". . . He occupied a key position with respect to the testing and evaluation phase of the RDT&E cycle and, in a truly outstanding manner, influenced decisions affecting the future of the Field Artillery Materiel Program."

Col Tibiason is now director of the Tactics and Combined Arms Department at the U.S. Army Field Artillery School, Fort Sill, Okla.

Lt Col Harry Skinker, acting chief, Program Management Office, Advanced Ballistic Missile Defense Agency (ABMDA), received the LOM for a preceding assignment as CO, U.S. Army Maintenance Plant, Schwaebisch Gmuend, Germany, from February 1967 to March 1969. He served as executive officer for ABMDA from Apr. 16 to August.

Lt Col William C. Heistand received the LOM for exceptionally meritorious service with the Combat Materiel Division, OCRD, from Sept. 1, 1967 to retirement from active duty July 31, 1969.

He was responsible for coordinating and supervising development of the Army's wheeled vehicle program, the M551 Sheridan system, the Shillelagh system, the M60A1E2 tank, propulsion systems, power converters, suspension systems and armor protective systems.

Lt Col Christopher Wheeler displayed "unusual initiative, professional knowledge, and untiring zeal," to earn him the LOM for service as plans staff officer, Plans Division, OCRD, from September 1967 to September 1969 when he retired from active military duty.

He directed the processing of all requirements and objectives for development in the areas of land and amphibious warfare, field artillery, air defense, communications and electronics, special warfare, personnel, intelligence and logistics support.

Lt Col Elwood A. Lloyd received the LOM for exceptionally meritorious service as deputy commander, Fort Detrick, Md., from June 1967 to May 1969.

"Through his consummate ability, sound managerial judgment, exceptional leadership and administrative knowledge," the citation states, "Col Lloyd was responsible, in large part, for establishing an exceptionally high state of administrative, financial, personnel and logistical efficiency at Fort Detrick."

Maj Charles M. Adams received the LOM for service as project officer of several programs while he was executive officer of the Army Materiel Systems Analysis Agency, U.S. Army Aberdeen (Md.) R&D Center. He is now an instructor in the Department of Engineering, U.S. Military Academy, West Point, N.Y.

Three sergeant majors with more than 60 years of combined military service, including more than 30 years with the Army Nuclear Power Program, were awarded the LOM for service with the U.S. Army Engineers Reactors Group (USAERG) at Fort Belvoir, Va.

Col Robert L. Ednie, group director, made the presentation to *SGM Thomas J. Kirk, SGM Robert F.* Heishman and *SGM James B. Cecil* prior to their retirement.

SGM Kirk received the medal for meritorious service from January 1960 through July 1969 while serving in a succession of instructional, operational, supervisory and administrative positions in the Training Division at Fort Belvoir and at nuclear power plants at Belvoir, Greenland and Alaska.

SGM Heishman distinguished himself during the period from May 1967 to July 1969 by serving in the Panama Canal Zone as supervisor of the "Sturgis," the Army's first floating nuclear power plant.

SGM Cecil served as operator, shift supervisor, mechanical maintenance supervisor, and plant supervisor of a nuclear power plant which operated at Camp Century on the Greenland Icecap. He also was chief instructor of the Training Department, head of the Maintenance Team and operations sergeant of the research and development plant at Fort Belvoir.

BRONZE STAR MEDAL. *Capt Robert E. Donovan*, now assigned to the USAERG, received the Bronze Star Medal for service as a logistics coordinator in Vietnam where ". . . his total dedication and professional competence resulted in numerous major improvements and accomplishments within the logistical support operation in the I Corps Tactical Zone."

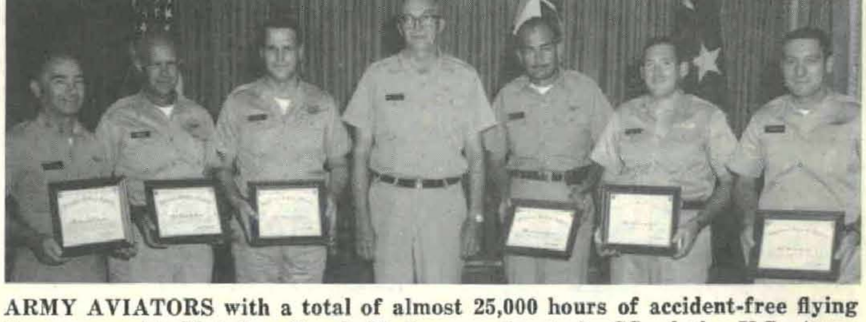
MERITORIOUS SERVICE. *Maj James A. Boyle Jr.* received the Meritorious Service Medal (MSM) for services while assigned as Project Team III operations officer, U.S. Army Combat Developments Command Experimentation Command, Fort Ord, Calif.

Reassigned recently to duty with the Command and General Staff College, Fort Leavenworth, Kans., he was cited for his part in conducting night vision and ground observer probabilities acquisition/adjustment experiments.

JOINT SERVICES. *Col Russel J. Lamp*, CO of the U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va., received the JSCOM for his previous tour of duty as a military analyst in the Southeast Asia Resources Division, Office of the Assistant Secretary of Defense, from June 1967 to May 1969.

ARMY COMMENDATION MEDAL. *Lt Col Richard Webb III* received the second Oak Leaf Cluster to the ARCOM for exceptional competency as an instructor at the Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Tex. He recently was assigned to the Medical Service Corps-Warrant Officer Assignment Branch, Directorate of Personnel and Training, Office of the Surgeon General, U.S. Army, Washington, D.C.

M/Sgt Thomas A. Butler Jr., assigned recently to the USAERG, was awarded the ARCOM for service as maintenance supervisor of the SM-1A Nuclear Power Plant at Fort Greely, Alaska, from June 1967 through June 1969.



ARMY AVIATORS with a total of almost 25,000 hours of accident-free flying time pose with Maj Gen Frank M. Izenour (center), CG of the U.S. Army Test and Evaluation Command, following ceremonies in which they received Aviation Safety Awards in recognition of individual achievements of 2,000 or more hours of accident-free flying time. From left are Col Raymond E. Johnson (6,700 hours), Lt Col Robert W. Wood (3,300 hours), Lt Col Thomas G. Ziek (2,700 hours), General Izenour, Lt Col Richard A. Humes (2,700 hours), Lt Col Bertram G. Leach (3,700 hours), Lt Col Marvin H. Dorr (3,100 hours). Maj Richard L. Eakley (2,700 hours) was not available when picture was taken.

Army Developing 155mm Systems to Meet Field Artillery Requirements

Project manager responsibility for the 155mm Close Support Artillery Weapon System, involving the standard self-propelled M109 155mm and the future self-propelled and towed 155mm weapons, is assigned to Col James K. Hoey at Rock Island (Ill.) Arsenal, HQ U.S. Army Weapons Command.

Concepts of the Army of today and the future place increased emphasis on ground and air mobility, and on greater firepower. The M109 howitzer has provided the Army with current requirements for ground mobility and firepower.

The M109 has mobility to support armored and mechanized divisions in high-intensity warfare. Capable of crossing inland waterways, with the installation of an approved flotation device, it can be fired while floating, if required, and also can be used to support Phase III airborne operations.

The M109 is an aluminum-armored combat artillery weapon system weighing less than 26 tons when carrying a full combat load. Main armament consists of a 155mm M126E1 cannon mounted in a turret capable of 360 degrees traverse on 100-inch turret ring, the largest ever developed for use with artillery systems.

The system also has a .50-caliber M2 machinegun capable of 360 degrees traverse. The 6-man crew is armed with 7.62mm M14 rifles and one M20 series 3.5-inch rocket launcher.

Howitzer, 155mm S.P. M109 (U)

Powered by a 450–horsepower V8 diesel engine, the M109 has a maximum road speed of 35 miles an hour, with a cruising range of 220 miles, and a water-crossing speed of four miles an hour. It can cross trenches 72 inches wide and climb obstacles 21 inches high.

Since the initial delivery of production models in 1963, the M109 has become a primary artillery system for the United States and its NATO allies, with a total of 1,535 systems sold to 13 foreign governments resulting in a reverse gold flow in excess of $213 million.

Howitzer, 155mm XM198

The Federal Republic of Germany has purchased 592 systems while Italy, Norway and Switzerland have acquired in excess of 100 each.

Combat commanders report that the M109 howitzer has become the most useful and dependable artillery system in use in Southeast Asia. The U.S. Army and the Marine Corps depend on the M109 for offensive support and defensive fire from the Southern Delta to the Northern Highlands.

When strategically placed to fire harassing missions along the trails used by the Viet Cong, the M109 has been highly successful. In many instances, movement of Viet Cong in the area of M109 positions has halted within a few days after placement.

The M109 howitzer was fielded with a maximum range of 14,600 meters—considered less than optimum by the Army Ground Forces. After various approaches to increase the range, it was decided that the best approach would be a longer cannon. Designated the XM185, the new cannon is currently in the engineering and service test phase. The maximum range is approximately 18,000 meters.

A new 155mm artillery weapon is in early development. The new towed system, the XM198, is being developed to meet the projected Army field artillery requirements in the 1980 time frame on range, deployment and mobility.

A Memorandum of Understanding to insure ballistic interchangeability of 155mm ammunition has been ratified by the United States, United Kingdom and the Federal Republic of Germany. Operational characteristics for a 155mm howitzer also have been approved. Technical characteristics have been discussed at several Tripartite meetings, but no overall agreement has been consummated.

The design-for-support attitude of today's Army will be of prime importance during the development and production phases of the XM198. Design for support is the new disciplined concept of integrated logistic support; new systems must include maintenance support planning early in the development phase.

The Army's Maintenance Engineering Analysis Data System (MEADS) will be used at the beginning of engineering design of the XM198 and will be carried through the production cycle into the early operational phase. This data system will be automated to obtain optimal integration of maintenance engineering and analysis data.

The XM198 system is being developed to provide the Army with a towed 155mm weapon that will have a greater range and effectiveness than the current standard M114A1. Airdroppable and helicopter-transportable, it will have the capability of firing the 155mm ammunition in the Army inventory plus rocket-assisted ammunition being developed.

Fielding of the XM198 artillery weapon system is planned to provide the U.S. Army Field Forces with an artillery weapon that will assure continued superiority in performance during the 1980 time frame over comparable systems developed by any aggressor.

Donley to Succeed Eifler as MICOM Commander

Brig Gen Edwin I. Donley, recently selected for promotion to major general, will succeed Lt Col Charles W. Eifler in the Army's top missile post at the U.S. Army Missile Command, Redstone Arsenal, Ala., effective Nov. 17.

This will be General Donley's second tour at Redstone, having served more than two years as project manager for the Pershing ballistic missile system (1963-66). He then was named deputy for Land Combat Systems and was serving in that post when promoted to brigadier general in April 1966.

Brig Gen Edwin I. Donley

Later that year he took command of the U.S. Army Mobility Equipment Command in St. Louis, Mo., until February 1968 when he was assigned as CG of the U.S. Army Materiel Command, Europe, with headquarters in Zweibrucken, Germany.

A 1940 graduate of the U.S. Military Academy, General Donley earned a master's degree in industrial management from the University of Michigan in 1949 and is a graduate of the Command and General Staff College and the Industrial College of the Armed Forces.

Since World War II he served major tours with the U.S. Army, Caribbean Area; State Department; Office, Chief of Ordnance; Picatinny Arsenal; and Korea.

AMMRC Applies Field Ion Microscope to Metal Studies

By Capt R. D. French

Observations of metal structure beyond the electron microscope's resolving power are being made at the U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, Mass., with the Field Ion Microscope (FIM).

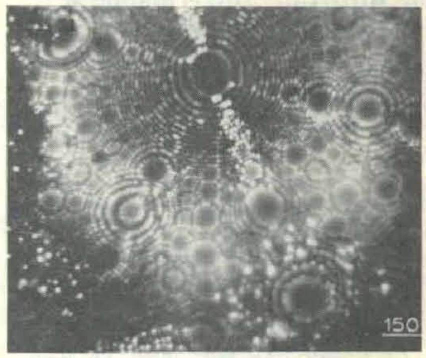
Invented by E. W. Muller in 1951, the FIM provides an image magnification of approximately one million diameters for studies of impurity atoms and planar defects such as grain boundaries in metals.

Significant mechanical deformation of metals under stress at high temperatures is attributable to the defect structure at grain boundaries and an attraction for impurity atoms, both affecting the strength of a polycrystalline metal.

Width of the structural break at a grain boundary is of the order of separation distance between atoms in structurally similar positions in the perfect crystal ($\sim 3 \times 10^{-8}$ cm).

Plotting a concentration profile of impurity atoms across a grain boundary in dilute solutions requires a determination of the presence of individual impurity atoms, now an impossible measurement without the FIM.

Significant changes in the lattice parameter and recrystallization temperature with impurity concentration, however, hint of a departure from theoretical random arrangement of solute atoms in dilute transition metal solutions. Changes are sizeable, offering control of the grain size and thereby the mechanical strength of alloys.



DEFECT in structure of tungsten crystal creates heart-shaped facet, upper left (magnification 1,000,000x).

Regarded as a relatively new laboratory research tool, the FIM offers many promising applications in metallurgy. Accurate characterization of the grain boundary and adjacent areas has important potential applications to Army problems involving metal strengthening, corrosion and failure.

Image interpretation, however, remains the most difficult problem. AMMRC programs using the FIM are coupled with parallel programs of quantitative metallography, electron miscroscopy, and computer modeling of real crystal structures. Information generated from the total effort is then the least controversial.

Capt Robert D. French is assistant to the acting chief of the U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, Mass., where he has been stationed since February 1968.

He has BS (1962) and MS (1964) degrees in mechanical engineering from Northeastern University and a PhD (1967) from Brown University.

During his graduate studies, he was a research associate and instructor in engineering at Brown and a research assistant in the Engineering Department at Northeastern. Affiliated with numerous professional and honorary scientific societies, he has contributed frequently to professional journals with articles on field ion microscopy and on transmission electron microscopy.

Army Engineers Publish Water Resources Journal

Water Spectrum, a quarterly periodical published by the Office of the Chief of Engineers, U.S. Army, made its first appearance this past month.

Stimulation of interest nationwide in carefully planned utilization of water requirements is mounting with the rapid increase in population, is the announced purpose of the journal.

In a statement issued the day before his retirement from the Army, Aug. 1, Chief of Engineers Lt Gen William F. Cassidy said 100 million more people are anticipated in the United States by the year 2,000, that "the competition for water uses is increasing and choices are becoming more difficult.

"Informed choices, however, must be made in a cooperative fashion. Therefore, effective communication on central issues is essential. The magazine will contribute to this communication by drawing its articles from many sources, both from within and without the Federal Government."

Water Spectrum is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402 for $2.50 a year or 65 cents a copy.

2 Surveys Compare Salaries of Scientists, Engineers

Compensation paid to scientists and engineers in research and development is compared in an analysis of two survey reports, one published Jan. 31, 1969 by Battelle Memorial Institute under contract and the other by the Department of Defense.

Sponsored by the Atomic Energy Commission, National Aeronautics and Space Administration and the Department of Defense, the BMI survey included industry, nonprofit and educational institutions, federally funded R&D centers, and U.S. Government agencies.

The Department of Defense survey, made by the Office of Laboratory Management, Office of the Director of Defense Research and Engineering, was limited to scientists and engineers in research, development, test and evaluation activities.

The ratio of engineers to scientists is significantly higher in the BMI survey than in the DoD survey, and the proportion of advance degree (MS, PhD) professionals is higher: 37.6 versus 27.5 percent.

The more limited sampling of the federal sector of the BMI survey reflects 43.2 percent of DoD scientists and engineers with advanced degrees. This is believed to account for the significantly higher BMI salary range as compared to the DoD survey.

Industry sector compensation of those with advanced degrees in the BMI study is well above the DoD scales, both for supervisory and nonsupervisory personnel. This varies from 5.8 percent for bachelor degree assistant unit heads to 16.7 percent for middle management personnel with master degrees.

Salaries for DoD scientists and engineers ranged lower than those of employes in federal contract research centers - from minus 9.6 percent for bachelor engineers to minus 15.1 percent for doctorate engineers.

In all cases, compensation of supervisory professionals in the BMI findings exceeded those of comparable DoD personnel, varying from PhD chemists at 2.8 percent higher to bachelor degree social and behavioral scientists at 13.7 percent.

By way of contrast, salaries of nonsupervisory chemists in the DoD survey exceeded the BMI average by 4.5 percent for bachelor degree personnel and 3.2 for those with master's degrees. Other DoD nonsupervisory personnel were paid from .9 percent less (for bachelor degree physicists) to 21.4 percent (for doctorate level social and behavioral scientists).

Doctorate level salaries in the DoD survey were below the level of the BMI survey in all occupations compared, varying from 2.7 percent for chemists to 16.2 percent for mathematicians, statisticians and scientists engaged in computer operations.

In most cases, the DoD report noted, DoD bachelor degree professionals are approaching salary comparability with nongovernment employes. Major salary differences were found in the advanced degree professionals and various levels of supervision.

American Machinist Reports On Rotating Die Technique

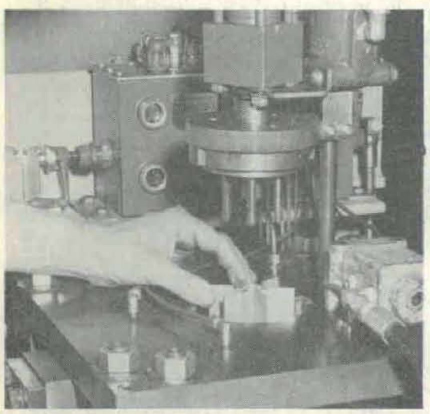
Processing speed of die-cutting radial fins on the tailpiece of 81 mm mortar ammunition is almost tripled by a rotating die developed by John Lepore, industrial specialist at the Army's Picatinny Arsenal.

The technique is described in the *American Machinist* (July 14, 1969 edition). Production speed of the conventional flat die formerly used was about 1,600 parts during a work shift, as compared to 4,300 parts processed by the rotary die.

Each tailpiece still must be manually fed to and removed from the rotary die, which is installed in a 60 x 36 x 26-inch metal table that rolls on casters. As segments of the die rotate, they automatically shear the six fins to contour.

The air-hydraulic control valve prevents mis-feeding and jamming of the tailpiece. The air supply is oriented to sweep machined chips into a scrap tray to avoid jamming the next piece.

The *American Machinist* reports that die construction is fairly complex, due to the many individiual parts bolted into the die, but the shearing problems are minimum. Production cost savings are proportional to the speed-up in the processing rate.



ROTARY DIE is powered by two opposite hydraulic cylinders under top plate of a specially designed table. Rods on plate above die opening provide pressure to hold the tailpiece.

Maj Gen Izenour Inspects Facilities at Panama CZ

Maj Gen Frank M. Izenour, CG of the U.S. Army Test and Evaluation Command, inspected Panama Canal Zone facilities of the U.S. Army during a visit to the Army Tropic Test Center.

Headquartered at the Aberdeen (Md.) Proving Ground, he directs the Army's principal materiel testing effort. Most military hardware that finds its way into Army inventories first comes under the critical scrutiny of the Test and Evaluation Command at one or more times during its life cycle.

TECOM's mission is accomplished by a close-knit network of 15 proving grounds, service test boards, special test activities and environmental test centers in the continental United States, Alaska and the Canal Zone.

General Izenour paid a courtesy call on Maj Gen Chester L. Johnson, commander, U.S. Army Forces Southern Command, and was briefed on TTC operations by Col John Zakel Jr., TTC commander, and members of his staff who escorted him on a tour of center facilities that have been improved or constructed since 1968.

YOUNG MATHEMATICIAN Thomas M. Brennan operates Hitachi electron microscope (magnification up to 200,000 times) at U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, Mass. Now a senior at Liberty H.S., Bedford, Va., Brennan spent part of the summer at AMMRC as one of 10 International Science Fair (ISF) winners awarded an opportunity to work at the U.S. Army installation of his choice. His prize-winning project, "Minkowskian Trigonometry," was displayed at ISF.

AMMRC Aims at Improving Materials by Atomic Mechanism Study

By Capt Howard B. Aaron

Improving materials for numerous military applications, requires an understanding of the origin of the desired properties and the atomic mechanisms involved in deterioration of these properties during service. The processing variables then can be modified, hopefully to optimize the desired properties.

With respect to the problem of material stability under high-temperature service, the following simplified picture suffices to define the problem. Dissolve something in a liquid until the liquid is saturated. Then freeze the liquid. The solid can generally accommodate less "something" in solution than can the liquid. Furthermore, like the liquid solution, the amount of "something" which can be dissolved in the solid solution decreases with decreasing temperature.

After solidification one will start to precipitate out a second phase (excess "something") from the parent solid solution. If we make the correspondence, albeit crudely, that the liquid is iron and the "something" is carbon, we have a steel. Or, if the liquid is aluminum and the "something" is copper, we have essentially an alloy which finds extensive use in both military and commercial aircraft.

Properties of a given alloy depend, among other things, on the morphology, amount, and distribution of the precipitates. The presence of the second phase generally results in high strength. Should precipitates dissolve or alter morphology during service, these properties may deteriorate.

In high-temperature service, more of the second phase can be dissolved in the solid solution, with an attendant deterioration of properties (e.g., strength). To improve alloy design, it is necessary to understand the atomic mechanisms involved in the growth and dissolution of precipitates.

Internal boundaries act as preferential sites for nucleation. It is especially important to study this particular class to determine the role of the interfaces in material stability. The first phase of a study of precipitate growth was undertaken in conjunction with Drs. Aaronson and Brailsford of the Ford Motor Co., with unexpectedly exciting results.

Growth rates of eight precipitates that nucleate at grain boundaries and grow preferentially along them were studied in Al–4% Cu, using high-magnification transmission electron microscopy. Orders of magnitude were found too rapid to be controlled by the diffusion of solute directly to

A graduate of the Brooklyn Technical High School, Cornell University (BME, 1962) and the University of Illinois, Urbana (MS, 1963), Capt Howard B. Aaron received his PhD from the University of Illinois in 1967.

After a brief appointment as a research associate at the University of Illinois, he worked as a scientist in the Metallurgy Department, Scientific Laboratory, Ford Motor Co., Dearborn, Mich., until called to active duty in July 1967.

In September 1967, he became a staff member of the Metals Laboratory, AMMRC and has been the principal investigator in a study of the Role of Interfaces in Materials Stability. Capt Aaron has authored numerous publications, made presentations, and prepared internal reports in such diverse fields of materials research as X-ray topology studies of strain fields, strain aging, quantitative metallography, and the kinetics of precipitate growth and dissolution.

the growing precipitate, as proposed by earlier theories.

Analyses of these kinetic data indicate that the sequential processes during growth are volume diffusion (D_V) of solute to the grain boundary which acts as a collector plate, followed by transport along the grain boundary (D_B) to the advancing edge of the precipitate, and finally interfacial diffusion (D_I) and deposition over the surface of the growing precipitate (Figure 1).

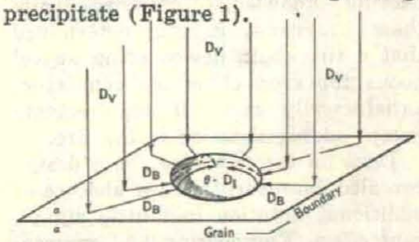


Figure 1. Schematic of right-angled "collector plate" mechanism for growth of grain boundary preciptates.

Given the diffusion data (D_V, D_B and D_I), one has the theoretical basis to accurately predict growth kinetics, or, conversely, one can use the measured growth kinetics to obtain D_B and D_I. In as much as no known data exist on D_I, the latter approach provides the first opportunity to assess this parameter.

Along Al-Al_2Cu interfaces in Al-4% Cu alloys

$$D_I - 0.6 \exp\left(\frac{-12800}{RT}\right)$$

and along Al grain boundaries in the same alloy

$$D_B - 0.1 \exp\left(\frac{-18500}{RT}\right)$$

where D_I and D_B are in square centimeters per second, R (the gas constant) in calories per mole, and T the absolute temperature.

Armed with this new insight into growth kinetics, Army Materials and Mechanics Research Center (AMMRC) investigators entered the second part of the study (precipitate dissolution).

An analytical model was derived for dissolution of a precipitate in which solute transfer occurs by volume diffusion of material away from the precipitate in the matrix. Predicted dependence of dissolution kinetics on growth mode is based on the fact that the concentration profile ahead of a growing precipitate is a function of the diffusion path.

The derived dissolution kinetics indicate a precipitate that grew by volume diffusion of solute directly to the growing precipitate will generally dissolve faster than a precipitate that grew by interfacial diffusion.

The dissolution kinetics, as characterized by the time dependence of S (The amount by which the precipitate half-thickness has been reduced), is found to have three general regions: $S=\sqrt{2K\ t}$ during early stages of dissolution; a brief transition region with variable time dependence; and finally $S=\sqrt{2K_0 t}$. The interval during which each stage applies is determined by the growth mode.

Results of a brief study of the dissolution kinetics of Y precipitates in Al–18% Ag support the analytical model and demonstrate that it may be possible to use dissolution experiments to obtain information about precipitate growth and to obtain approximate values of volume interdiffusion coefficients in alloy systems.

The observations concerning the mechanisms of growth and dissolution appear to be quite general and not peculiar to the alloys discussed herein. While much work needs to be done before this research realizes any practical application, indications are that service life of 2-phase alloys at elevated temperatures is strongly dependent on the growth mode of the precipitates, which in turn is dependent upon material processing.

Tire Traction Device Improves Vehicle Mobility

By Alex Hayes

Tactical wheeled vehicles developed by the U.S. Army Tank Automotive Command until the early 1960s used a conventional traction device developed more than 40 years ago, and it is still in limited use by the Army. Development of new and sophisticated Army weaponry, however, sharply increased the demand for rapid logistical support and transportation of Army materiel.

The Automotive Components Division of USATACOM's Vehicular Components and Materials Laboratory anticipated these requirements. Accordingly, a development program was launched in 1962 with the objective of providing an optimum traction device for tactical wheeled vehicles.

Extensive design studies and engineering programs have been conducted, including investigation of many military and commercial concepts of traction devices and tire tread designs.

From the results of these investigations, as well as information collected from tactical field operations, it was concluded that an improved tire design was not the sole answer for improving vehicle mobility characteristics when operating over adverse terrain, such as mud, snow and swamps.

A review of all of the test and engineering data indicated that an optimum traction device should provide added flotation and grouser action to the tire. Most importantly, it should have the inherent design capability of being self-cleaning.

Many concepts of track, endless belt, clamp-on and chain devices were tested and evaluated. Only one unique tire chain design, which featured swivel hooks as end connectors for the cross chain, looked promising.

Other devices examined were considered unsatisfactory for several reasons. Some were found to be extremely heavy and bulky, presenting serious on-vehicle stowage problems and payload loss. Others were too costly and required special tools to perform field maintenance.

Service life of many of the devices tested was very limited; failures occurred within 30 to 40 miles of operation. Tire chains with swivel hook end-connectors for their cross-chains, however, did not fail before 150 to 160 miles of operation.

Some devices interfered with vehicle components to such an extent that serious safety hazards were generated. Besides these drawbacks, mobility often was limited because the traction device tended to roll off the tire, especially when negotiating side-slopes.

In almost every design that failed to meet the requirements, the attractive capabilities of the traction devices were defeated because of mud and snow buildup. Many of them failed because of the severe mud and snow buildup during endurance and drawbar testing.

Based upon the workable engineering knowledge obtained from these programs, it was determined that a tire chain device using swivel hooks for cross-chain end-connectors satisfactorily met all requirements except adding flotation to the tire.

Tests on the new tire chain design revealed, however, that the absence of additional flotation had little significant effect. Engineering and environmental experiments were conducted at the Aberdeen (Md.) Proving Ground, the Army Tropic Test Center at Fort Clayton in the Canal Zone, and the Arctic Test Center at Fort Greeley, Alaska.

Based on this extensive program of test and evaluation, the tire chain design was approved and released in early 1969 for Army use. (See Fig. 1.)

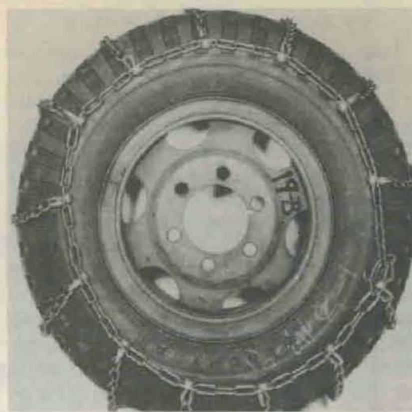


Figure 1. Standard tire chain with swivel hooks for attachment to circumferential links.

The new standard tire chain has several advantages over other traction devices. Service life of the cross chain is more than 3½ times greater than the previous standard. The circumferential chain life has been extended to more than 20 times that of the old standard.

In addition, self-cleaning capability is excellent since the cross chains rotate. Drawbar tests in deep snow (42 inches) resulted in a 7.5 percent increase in drawbar pull over the previous Army standard tire chains. No tools are required to maintain these tire chains in the field under any tactical condition where chains are used.

The tire chain assembly can be completely rebuilt by hand and without special tools for a small fraction of the initial cost of the assembly. In spite of these benefits, the new chain has only a negligible weight increase over its conventional counterpart.

An additional economic benefit to be realized by the Army is that the present stock pile of cross chains can be utilized as spare parts after removal of clinch hooks.

Based upon a cost study conducted by USATACOM, savings of approximately $1.75 million should be realized by use of the new chains Army-wide over a 5-year period as a result of increased service life and ease of maintenance.

Alex Hays has been with the U.S. Army Tank-Automotive Command for 23½ years and has been directly associated with the research and development of automotive components and kits since 1952. Many items he has developed or re-designed have been approved and released for Army application.

Hayes has been issued a patent for a cargo tie-down kit, which he assigned to the Army, and has applied for his second patent, an electric fuel cell power source to be used in firefighting apparatus in tanks and personnel vehicles.

Fischer Heads Program Committee

Konrad H. Fischer served as chairman of a 37-man Interservice Technical Program Committee for the Government Microcircuit Applications Conference held in Washington, D.C., Sept. 17-18, with more than 1,000 representatives from government and industry in attendance. Fischer is chief of the Integrated Circuits Branch, Electronics Components Laboratory, U.S. Army Electronics Command, Fort Monmouth, N.J.

945 OTSG Employes Complete Move to Forrestal Building

Twenty years of occupancy of the "temporary" Main Navy Building on Constitution Avenue ended for 945 civilian and military employes of the Office of the Surgeon General, HQ U.S. Army, with a move late in August to the new Forrestal Building in redeveloped southwest Washington, D.C.

Described fully in a page 1 article in the March 1969 edition of the *Army Research and Development Newsmagazine*, the $36 million gleaming white structure named after former Secretary of Defense James C. Forrestal is one of the most modern office buildings in the nation's capital. In size among federal buildings in Washington, it is surpassed only by the Pentagon Building.

In addition to the change from the rather unpretentious accommodations in the Main Navy Building to the ultramodern and brightly decorated atmosphere of the Forrestal Building, OTSG employes will have the highly impressive surroundings of the L'Enfant Plaza area. Employes are inclined to call this development "fantastic"; some call that a gross understatement.

Parking and bus transportation facilities are still problems to be corrected for Forrestal Building occupants. Otherwise, accommodations leave little to be desired in the way of convenience and a beautiful area.

Nearby also are the resplendent new Smithsonian Institute, the Mellon Art Gallery (a quarter century ago called "One of the Seven Marvels of the World"), the new Air and Space Museum, Joseph H. Hirshhorn Museum, and many other attractions in the heart of the nation's capital.

OTSG employes also have some 27,000 square feet of additional floor space to alleviate crowded conditions that existed in the Main Navy Building. Most of the U.S. Army Medical Research and Development Command HQ employes will be moved into the Forrestal Building by the end of October. By that time the structure is expected to accommodate about 6,500 federal employes.

Only the Medical Statistics element of the OTSG will continue to operate in the Main Navy Building. Except for a new zip code—20314—mail will be addressed to the Forrestal Building the same way: Office of the Surgeon General, Washington, D.C. Correspondents also should use an office symbol as part of the "attention" in the second line.

Graphic Comparator Aids Picatinny Arsenal Engineers

Changes in engineering drawings and specifications are easily identified with a new graphic comparator that uses a color coding system.

Installed in the Nuclear Engineering Directorate at Picatinny Arsenal, Dover, N.J., the machine denotes additions or deletions instantly by a show of red or green when drawings are projected on an 18 x 24-inch screen.

One of the directorate's tasks is to convert to 35mm aperture cards the complicated data found on engineering drawings or specifications, thereby enabling any detail to be studied and reviewed by projection on a screen.

Changes may be made by engineers in these drawings and until the graphic comparator was installed, hundreds of documents with thousands of dimensions and words had to be checked manually. Sometimes a check required two to three hours for each document by comparison with records and prior revision files.

The graphic comparator does the job simply. An operator drops two cards into the machine, superimposing one over the other. The first is the master file card and the other a revised copy being returned. An addition shows up on the screen as change. A deletion is displayed in red. If no changes have been made, the screen registers white.

MERDC Reports Progress in Water Purification Program

Research to permit reuse of water from Army field laundry, shower and kitchen facilities is reported by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

The project is part of the water purification program of the Sanitary Sciences Division. Proven in extensive pilot plant studies, the system is very flexible, provides any desired degree of purification, and holds promise of two immediate benefits.

First, it can produce renovated water meeting U.S. Public Health Service drinking water standards, thereby reducing the water transportation requirements to remote bases in water-short areas. Second, part of the system can be used as a pollution control device to curtail the volume of waste discharged to the environment.

A prototype unit now being built utilizes the following processes: chemical coagulation, sedimentation, filtration, demineralization by reverse osmosis, granular activated carbon adsorption and chlorination.

Employing standard Army collapsible rubber-nylon tanks and skid-mounted components, the lightweight, compact unit is air-transportable.

Administration Power Meets Unnegotiable Student Demands

Students who, in the spirit of dissent that has caused great turmoil on University campuses in many nations, presented a list of unnegotiable demands to the warden and Fellows of Wadham College, Oxford, England, received the following letter:

"Dear Gentlemen: We note your threat to take what you call 'direct action' unless your demands are immediately met. We feel that it is only sporting to let you know that our governing body includes three experts in chemical warfare, two ex-commandos skilled with dynamite and torturing prisoners, four qualified marksmen in both small arms and rifles, two ex-artillerymen, one holder of the Victoria Cross, four Karate experts, and a chaplain. The governing body has authorized me to tell you that we look forward with confidence to what you call a 'confrontation', and I may say even with anticipation."

MERDC Awards $999,378 For Tactical Floating Bridge

Award of a $999,378 contract for a "ribbon" bridge has been announced by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

The bridge will be fabricated by the Pacific Car and Foundry Company, Renton, Wash.

Scheduled for delivery in January 1971, this improved tactical floating bridge is designed as a continuous cellular aluminum "ribbon." Made up of 22-foot segments connected to form a bridge for specific requirements, it is designed to carry 60-ton loads.

Sixteen interiors bays and two ramp elements each will incorporate lifting points for movement and placement by helicopter, but normally the bridge will be moved and launched by truck. It is expected to achieve a 5-fold decrease in erection time as compared to present Standard A floating bridges.

R&D Activities Traced in Life Cycle of Army Military Vehicles

By Lt Col William C. Hiestand

Lt Col William C. Hiestand, who retired recently, was the Department of the Army staff officer for automotive components and wheeled vehicles within the Office of the Chief of Research and Development. His responsibilities included information and advice on R&D projects within his scope of duty.

Following a tour of duty in Europe as commander of the 1st Battalion, 32d Armor, 3d Armored Division, he was assigned to the OCRD Combat Materiel Division, Directorate of Developments, Sept. 1, 1967.

Graduated from the United States Military Academy in 1949, he received a master's degree in mechanical engineering from the University of Michigan in 1964.

The military vehicle path from system conception through hardware development to troop issue is long and torturous. My purpose is to explain some of the methods used to produce an item of hardware based on an established and approved requirement reflecting an Army need.

Since my interest is focused upon tactical wheeled vehicles, this article will provide a brief general summation of a vehicular system's life cycle. The R&D activity involved will be illustrated by the only wheeled vehicle now under development, the XM705 1¼-ton truck.

R&D activities are not necessarily sequential to the development of requirements activity. At any point in time, the needs of the Army and the availability of technology may combine to initiate the development of a system. The life cycle then begins and is divided into four major categories: concept formulation; contract definition; development and procurement; operation and disposal.

During the concept formulation stage of the life cycle, the organizations representing the user (Combat Developments Command and the Continental Army Command) combine with the developer (the Army Materiel Command) to accomplish the following essential objectives:

- Determine that the project is primarily engineering, not experimentation.
- Insure that the mission and performance of the system is defined.
- Insure that the best technical approach has been selected.
- Establish the cost effectiveness of the system.
- Determine development costs and insure they are credible and acceptable.

Performance requirements are transformed during this life cycle phase into measurable standards, user desires are refined and adjusted by technological capability, and the value of the system is assessed in terms of cost.

Contract definition is the first step in the development phase. The goal is a statement of achievable performance specifications, backed by a firm fixed price or fully structured incentive proposal for full-scale development.

Other objectives include: (a) define the relationships between and the responsibilities of the government and the contractor, (b) verify technical approaches and engineering capability, (c) identify high risk areas, and (d) establish realistic schedules and cost estimates for engineering development or operational system development.

Engineering or operational system development is not necessarily limited to an assembly of off-the-shelf components, nor is it intended to include concurrent development of large numbers of components whose reliable functioning has not been fully proved.

A system development is intended to be the product of an operational need and a technological capability. A new item should provide significant improvement over the item that it replaces; however, extension of technology must be balanced by effective and reliable operation.

In the automotive field, the current emphasis is on effective performance and reliability. Of the many policies that govern R&D, elimination of unnecessary features, value engineering, cost effectiveness and, above all, reliable performance are receiving more management attention than before.

Proof of performance is expected to extend, to a great degree, into the Army component development activity. Whenever commercial componentry will provide adequate performance, the availability of extensive test and operational experience will make commercial componentry attractive.

Fig. 1. Gamma Goat

Army component development efforts will support primarily those requirements for which there is no commercial counterpart.

To provide further understanding of the life cycle, with particular reference to R&D activity, a development effort will be followed from its inception to its present point.

Since the early 1960s the Army has been moving toward the concept that maximum achievable cross-country mobility is not required in all organizations. The high-mobility, limited-mobility idea was proposed by three separate logistics studies.

First, the concept was suggested by the U.S. Continental Army Command 1960 mover study. Then it was adopted in the U.S. Army Combat Developments Command/Army Materiel Command 1964/1965 Tactical Vehicle Study. Finally, it was confirmed by the Department of the Army 1968 Reval Wheels Study.

The essence of the high-mobility, limited-mobility concept is that it makes sense to pay for the exact mobility needed to keep up with combat vehicles and troops to which logistics vehicles are assigned.

In accordance with the high-mobility, an articulated 1¼-ton truck called the Gamma Goat (Figure 1), was designed and built to provide excellent mobility characteristics. As indicated by the design, it is a high-cost vehicle as well.

With respect to the austere counterpart in the 1¼-ton truck fleet, the Army found itself in an unusual situation. The normal impetus for development of a major system is either a specific functional need or the appearance of a significant technical improvement that makes the standard item obsolete.

Neither of these reasons is valid in the case of the austere version of the

1¼-ton truck. The primary reason for the initiation of XM705 development was the deterioration of the ¾-ton truck inventory as a result of termination of M37B1 procurement after FY 1964.

During the development of the materiel requirement for the XM705 1¼-ton truck, it became apparent that the operational performance required of a rear-area vehicle did not provide the increment of improvement desired for a new development, nor did the performance needed provide cause for a major R&D program.

A large measure of improvement, however, was urgently needed and established as a requirement in the critical areas of reliability, maintainability and durability, which did not necessitate extensive engineering development.

The system description, based on the materiel requirement, technically describes what is for all practical purposes a box on wheels. An artist's conception is shown in Figure 2.

The vehicle is not comparable to the articulated Gamma Goat though it has some characteristics that enable it to fulfill its primary function as a tactical vehicle. Among these are large angles of approach and departure, large tires, high power-to-weight ratio, side slope ability and low ground pressure. None of these characteristics significantly extends the state-of-the-art.

In February 1965, the Department of the Army approved the Qualitative Materiel Requirement (QMR) for the 1¼-ton truck, the first QMR in response to a limited-mobility tactical vehicle requirement.

Major areas of improvement established within the concept formulation phase and articulated in the QMR were the areas of reliability, maintainability, availability and durability. Listed below are the established requirements for these areas in terms of the system description:

a. Mean time between mission failure (miles)	7880
b. Mission reliability (percent)	98.79
c. Maintenance index (percent)	10.6
d. Availability (percent)	90.4

XM705

Fig. 2. *XM705*

The mean time between mission failure is directly correlated to reliability. Reliability, in this case, is defined as the chance that the vehicle will complete a 75-mile mission without failure.

A 90 percent confidence level allows reliability to be associated with a test program and translates the requirement into a specific maximum number of allowable test failures during a test course.

For example, if the Army tests eight vehicles for 30,000 miles each, and if the vehicles suffer 30 mission failures or less in that 240,000 cumulative miles, it achieves a mean time between failure of approximately 8,000 miles and a reliability of approximately 98.79 percent.

The trick, as you will see, is for a contractor to design a vehicle that meets the requirement and have sufficient confidence in the design to guarantee it.

The Maintenance Index is defined as maintenance manhours divided by operating hours. Availability is defined as total operational hours less nonoperational hours divided by total operational hours.

Essentially, concept formulation for the XM705 was completed without much difficulty and reasonably close to the prescribed method. The birth was normal; infancy was confused.

The Army then entered the contract definition phase of the XM705. When the government called for bids, it asked industry to exhibit confidence in engineering ability by guaranteeing that the system description would be met within a ceiling cost.

The implications of this requirement to the government are very important. Reliability and durability of the system constitute a substantive matter in the development effort. The government is in a position to determine the cost trade-offs between a system with a high initial investment cost and low operating costs versus a system with low investment costs and higher operating costs and with a shorter operational life.

From a prediction point of view, the high investment plus low operating costs can only be quantified if the system description reliability numbers are credible. These numbers become credible when they are associated with a contractor guarantee based on a serious engineering effort.

Implications to the contractor of the requirement to guarantee compliance with the provisions of reliability, durability, and maintainability within a ceiling cost are clear—he must deliver the product at the risk of his profit and possibly his own money. He must have complete confidence that the technical development is reasonable and the engineering problems surmountable.

Based on an engineering design, the contractor is asked to guarantee, and be held legally liable, that he can fulfill specified conditions for reliability, maintainability and availability within a price ceiling. Importance of reliability engineering in the contractor's decision becomes clearly understood.

Only one organization responded to our Request for Proposal for the XM705. Members of the automotive industry, at the time for submission of bids, had not achieved complete confidence in their ability for mechanical reliability prediction.

Special efforts were made to assure that the single response was submitted in a competitive atmosphere. The program was close to infant mortality. After much soul-searching, the government decided to enter the contract definition stage with only one contractor.

During the negotiations, the government's purpose was to develop a legal document which would achieve the objective of the development of a highly reliable vehicle guaranteed to meet system requirements within a ceiling cost.

The contractor's objective was to develop a legal document that would adequately establish his responsibility and insure that the final test was a valid indicator of compliance—agreeable to both sides.

The contractor compliance test was established as the final test. It is generically a laboratory test rather than a field test, and the contract rules eliminate the major share of indeterminate factors.

Unavoidably, the automotive industry would take risks in entering into this program. The government therefore offered the inducement of Total Package Procurement (TPP), with its attendant production profit, to encourage participation. TPP means one contract for development, advanced production engineering, and first production.

Throughout XM705 development, TPP has been an important aspect. The key point, sometimes missed when considering TPP, is that development effort must be entirely within the state-of-the-art before TPP is ac-

(Continued on page 46)

R&D Activities Traced in Army Vehicles' Life Cycle

(Continued from page 45)

ceptable to the contractor. Before he can make the decisions required to enter into this kind of a contract, he must know exactly what he is expected to do.

From the Army point of view, the XM705 program seemed to be the perfect opportunity for TPP. However, the guaranteed reliability prediction considerations, as here discussed, limited contractor enthusiasm for the contract definition proposal.

TPP for the XM705 is a buyer's contract. It provides for a product that meets the Army's requirements, with the major risk assumed by the contractor. The Army provides money only up to a specified price ceiling. Fulfillment of the contract is at the risk of the contractor.

Whether he makes money or not depends on how well he manages the program and how well he has done his engineering. On the other hand, the contractor has full design authority for the first time, a much coveted contract aspect.

Among contractor advantages of the TPP is that indiscriminate changes are prohibited after the contract is signed. The user must be satisfied with the vehicle described in the original requirements document. The test agency is not burdened with a continuous set of changing test requirements.

Disadvantages of TPP to the Army include the higher than expected initial procurement cost, which is the result of the inherent contractor risk; also, there is the moral obligation or allocation of production funds on the basis of a paper design, and the credibility of the contractor to produce as the contract specifies.

The real crux of a TPP program for the Army is the credibility of the contractor to fulfill his commitment. The Army must be prepared to insure that the contractor satisfies every requirement—that the production line vehicle is what the Army really wants. Checks and tests that must be established during contract definition (CD) are crucial.

For the XM705, the CD negotiations extended through the better part of a year. They were complicated by not only the problem of one bidder; the Army also had to be assured that the program as negotiated would provide the optimum balance between cost and reliable performance over the life cycle of the vehicle.

Figure 3 shows a brief summary of the plan for the vehicle development. The truck will be raised to maturity

	Months From Contract Award
Completion of R&D	0–7
Advanced production engineering	7–27
Production leadtime	12–27
Prototype completage	21
Check point	26
Production	27
Testing	27–40
Contractor compliance test	27–33

Fig. 3. XM705 Development Plan

by the contractor under the watchful eye and familial interest of the Army.

During the entire period of development and advanced production engineering, the Army will be provided access to contractor component test results. The government thus will have adequate assurance that the manufacturer has a good chance of fulfilling the development goals.

When the prototype is complete, the government will be afforded the opportunity to conduct tests to gain additional insight as to the capability of the vehicle and to develop sufficient confidence it will perform as desired.

Twenty-six months after start of the program, a decision point is established. This provides an opportunity for the Army to look closely at the development and, using all data provided up to that time, to make a judgment on whether continuation of the program can be justified, with or without adjustment.

The check point occurs before extensive allocation of production funds, offering the government the opportunity to withdraw from the program without a large commitment.

In the contractor compliance test, 16 vehicles will be chosen at random from approximately the first 150 production vehicles and each will be driven over a specific test course for 30,000 miles.

Complete data for failures and maintenance will be kept and test results will be compared to the system requirements for a determination of contract compliance.

Depending upon the innate quality of the vehicles, as represented by test performance, XM705 trucks will get their chance for a full life cycle.

Development of the XM705 is unusual in four essential ways:

- The design specification includes only performance requirements, and does not specify any internal componentry or hardware configuration. This is the prerogative of the designer.
- The contractor has full engineering design authority. The government will oversee and suggest, but changes will be made only by industry.
- Compliance with contract specifications will depend upon a mutually agreeable performance test.
- TPP assures compression and concurrency of the development and production schedule.

Shown in Figure 4 is the program schedule as it now stands. Note the concurrency of the development, advanced production engineering, and production lead time. TPP shortens development time extensively, because the contractor can concurrently conduct parallel efforts of development,

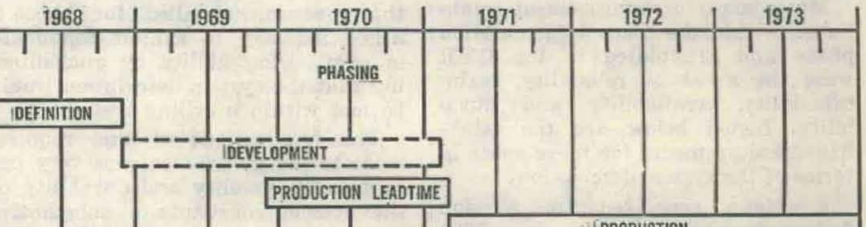


Fig. 4. XM705 Program Schedule

advanced production engineering, and production.

The Army believes the XM705 program is a good one and provides a representative illustration of the major actions included in the Army's R&D management system. The contractor has accomplished an extensive design effort to fulfill the reliability, maintainability, and availability requirements established in the QMR during concept formulation.

During contract definition the contractor, in conjunction with the Army, has assessed the cost effectiveness of the vehicle and recommended areas wherein the value received was not worth the expenditure. Together, the Army and the contractor have done the value engineering necessary for a cost-effective system.

The XM705 is being designed in accordance with a philosophy long recognized but never executed—that the Army's unusually stringent environment calls for development of equipment that will withstand great abuse from the elements, as well as from those who drive and maintain it.

The problem is not so much the durability of the vehicle, as represented by high-mileage, long-haul commercial trucks; it is short-term survival of the equipment operated and maintained by highly transient drivers and mechanics in an abrasive environment.

The Army's Reval Wheels Study has substantiated the fact that the big money of the life-cycle cost for wheeled transport vehicles is for maintenance. That makes it good business to spend a few more dollars for initial investment and expect to reap many more in maintenance cost reduction for the life cycle.

The Army expects the XM705, as an austere 1¼-ton truck, to confirm that proposition. It can be developed and produced without risk of heavy loss of funds or failure to achieve desired performance. Thus far, the development program has followed the desired R&D management life cycle. Hopefully, it will continue to do so.

Picatinny Samples Safeguard Propellant Storage

Picatinny Arsenal, Dover, N.J., has around 20,000 samples of U.S. Army propellants and more than half of them get a "hard look" every day.

If any "fail," word is flashed throughout the United States and to all parts of the world where the U.S. stores propellants.

The arsenal is the surveillance center for propellants—the Army's only depot for samples used in all rockets, artillery and small arms. Eight circular chambers, 18 feet in diameter, hold the samples, each weighing around an ounce and a half. Heat-absorbing concrete was used in construction, with huge reinforced metal doors.

Powder and explosive inspectors who keep a close watch on the propellants are paid to see red. What they are on the watch for are the red fumes (oxides of nitrogen) which a propellant gives off shortly before it fires spontaneously.

Characteristic gaseous by-products of the chemical break-down of such highly nitrated materials as propellants, the red fumes usually are the only visible sign that a propellant should be destroyed before it triggers an accident in some storage area.

The small samples at Picatinny represent millions of pounds of propellants stored throughout the United States and in various parts of the world. They are kept at a temperature of 150 degrees F. and heat may not rise above that point more than two degrees. If it should, an automatic control cuts it off immediately.

This heat is about 15 degrees above the highest recorded surface storage temperature anywhere in the world, and ages the propellant faster than normal temperatures.

A considerable safe-time margin between the appearance of fumes in the hot sample and the possible breakdown of the propellant in field storage allows ample time for the suspect lot to be located and subjected to more exhaustive tests.

When a sample fumes in less than 20 days from the time it is placed in the hot chamber, the surveillance team goes into action. Immediately it notifies the Ammunition Procurement and Suoply Agency (APSA) at Joliet, Ill., which is responsible for storing Army artillery ammunition propellants.

APSA transmits orders to their storage facilities throughout the United States, directing the immediate special testing or destruction of the potentially hazardous propellant before it deflagrates of its own accord.

Dr. J. P. Picard heads Picatinny's propellants lab, and Norris Garman is chief, Stability Testing and Evaluation Section.

When Helen Whalen speaks of "powder, ovens, and seeing red," she is not just conversing with the girls about everyday household chores, but is discussing her job as a powder and explosives inspector at the Feltman Research Labs, Picatinny Arsenal. Here she is operating one of the temperature control units that regulate heat in chambers where thousands of propellant samples are under watch.

XM-19 Flare Dispenser Passes USAASTA Tests

Test objectives were satisfied in a recent experimental jettisoning of an 835-pound XM-19 Flare Dispenser for the UH-1 Iroquois-type helicopter at Edwards AFB, Calif.

Designed by Picatinny Arsenal (Dover, N.Y.) engineers, the jettisoning system was tested by the U.S. Army Aviation Systems Test Activity (USAASTA), which reported no significant problems. Test pilot Maj Donald P. Wray, USAASTA, said all ejections were successfully completed.

The new dispenser eliminates the lanyard previously required in manually launched systems, and also stores the flare prior to launching. Test objectives were to determine clearance of the system past the aircraft skids, and to gauge controllability during the jettison.

The system leaves the helicopter at 7 to 14 feet a second, depending upon the speed of the aircraft. The pilot activates a jettison switch, which fires a nitrogen bottle charged to 2,500 pounds a square inch. Two pins are released that secure the flare rack to rails on the floor, and a piston forces the entire system out of the aircraft.

NBS Sets Image Storage Meet

A conference on problems and prospects for image storage and transmission systems for library applications will be held Dec. 1–3, at the National Bureau of Standards (NBS), Gaithersburg, Md.

Cosponsors are the Federal Library Committee's Task Force on Automation, the Lister Hill National Center for Biomedical Communication, the Panel on Information Sciences Technology of the Committee on Scientific and Technical Information (COSATI), and NBS.

Secretary of Defense and Army Staff Chiefs Brief ASAP

Secretary of Defense Melvin R. Laird, Secretary of the Army Stanley R. Resor and Army Chief of Staff William C. Westmoreland addressed the Army Scientific Advisory Panel (ASAP) Fall meeting, Sept. 18–19, at HQ Department of the Army.

Programed to acquaint ASAP members with operations of the Army at both the Army Secretariat and General Staff level, the meeting was the most impressive gathering of dignitaries in the Panel's history dating to 1954. Available records indicate that Secretary Laird became the first man holding this title to make a formal presentation to members.

Secretary Laird spoke mainly about the necessity for the U.S. to maintain a superiority in Defense technology, the pressures for budget reductions coming from Congress, and the requirement for over-all Defense Department improvement in the management of R&D programs.

Secretary Resor and Chief of Staff Westmoreland similarly stressed the essentiality of a strong and well-balanced R&D program for the future production of sophisticated weapons systems superior to those of any potential enemy, as well as to advance the technological base for economic welfare of the nation.

Briefings on Army operations and problem areas in which the ASAP can provide assistance were given by Deputy Under Secretary of the Army (Operations Research) Dr. Wilbur Payne, Assistant Secretary of the Army (Manpower and Reserve Affairs) William K. Brehm, Acting Assistant Secretary of the Army (R&D) Charles L. Poor, Assistant Secretary of the Army (Installations and Logistics) J. Ronald Fox, Assistant Secretary of the Army (Financial Management) Eugene M. Becker and Deputy Director of Civil Defense W. E. Strope.

SECRETARY OF DEFENSE Melvin R. Laird address ASAP at Pentagon. Seated at table, to his right, is Acting ASA (R&D) Charles L. Poor. To his left (at outside of table) are ASAP Chairman Dr. Harold M. Agnew, Secretary of the Army Stanley R. Resor, AMC Deputy for Laboratories Dr. Robert B. Dillaway and Chief of R&D Lt Gen A. W. Betts. In background (from left) are Chief of the Office of Reserve Components Lt Gen William R. Peers, ASA (M&RA) William K. Brehm, executive and senior aide to the Chief of Staff Lt Col William Steele (partially obscured) and Assistant Deputy Chief of Staff for Personnel Maj Gen Walter E. Brinker. Behind Dr. Agnew are Assistant Chief of Staff for Force Development Lt Gen Arthur S. Collins Jr.; Assistant for Research Dr. K.C. Emerson, Office, ASA (R&D); and Deputy Chief of R&D Maj Gen Edward L. Rowny. Seated inside the slot (at left) are Drs. Richard A. Montgomery, Charles N. Kimball and Andrew Longacre; (at right) Professors Lawrence H. O'Neill and René H. Miller.

Principal Army General Staff speakers included Safeguard Antiballistic Missile Defense System Manager Lt Gen A. D. Starbird, Chief of Reserve Components Lt Gen W. R. Peers, Deputy Chief of Staff for Military Operations Lt Gen R. G. Stilwell, Assistant Chief of Staff for Force Development Lt Gen A. S. Collins, Deputy Chief of Staff for Logistics Lt Gen J. M. Heiser, and

Director for Civil Disturbance Planning and Operations Lt Gen William McCaffery. Chief of Research and Development Lt Gen A. W. Betts, Assistant Deputy Chief of Staff for Personnel Maj Gen W. E. Brinker. Assistant Chief of Staff for Intelligence Maj Gen J. A. McChristian, Chief of Information Maj Gen W. J. Couts, and

Surveillance, Target Acquisition and Night Observation Systems Manager Brig Gen W. B. Fulton, Director of Management Information Systems Brig Gen H. C. Schrader, Deputy Assistant Chief of Staff for Communications-Electronics Brig Gen E. M. Reynolds, Deputy Chief of Legislative Liaison Col James R. Brownell and Director of Cost Analysis T. Arthur Smith, Office, Comptroller of the Army.

ASAP Chairman Dr. Harold M. Agnew presided during the sessions.

USACSC Activates Support Group (Pacific)

Activation of the U.S. Army Computer Systems Command (USACSC) Support Group (Pacific), with a unit strength of 8 officers, 2 enlisted men and 88 civilians at Fort Shafter, Hawaii, was announced recently by Brig Gen Wilson Reed, CG of the USACSC.

Col Robert G. Hillman is commander of the unit, which initially is under operational control of the Commander-in-Chief, U.S. Army, Pacific (USARPAC), with a responsibility for continued development and maintenance of the USARPAC Standard Supply System (3S).

The Standard Supply System (3S) is operational in Hawaii, Okinawa, Japan, Korea, Vietnam and Thailand.

ADP systems for which the Army Computer Systems Command is responsible include COSMOS (Centralization of Supply Management Operations System), COCOAS (Continental Army Command Class I Automated System), TACFIRE (Tactical Fire Direction Systems), TOS (Tactical Operations System), CS3 (Combat Service Support System), DSU/GSA (Direct and General Support Unit System), and DLOGS (Division Logistics System).

Other USACSC Support Groups are in Karlsruhe and Heidelberg, Germany; Fort Lee and Fort Eustis, Va.; Fort Hood, Tex.; the Presidio of San Francisco and Van Nuys, Calif.

Col Adie Assumes Command of Aviation Materials Labs

Col John R. Adie has been assigned command of the U.S. Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va., which are involved in every phase of Army aircraft research except weapons and avionics.

His assignment follows a 3-year tour in Germany as commanding officer of the 107th Transportation Brigade and later as assistant chief of staff, Services, HQ Seventh Army, Support Command.

From 1962 to 1966, he was director of the Aviation Maintenance Training Department, U.S. Army Transportation School, Fort Eustis.

Col Adie served in the Asiatic-Pacific Theater during World War II and has since had tours in Germany and Korea. A rated pilot in both fixed- and rotary-wing aircraft, he has received more than a dozen awards and decorations, including the Legion of Merit with Oak Leaf Cluster (OLC), the Bronze Star Medal with OLC, and the Army Commendation Medal.

He has a BS degree in production management and engineering from Boston University, an MS in transportation from the University of Tennessee, and is a graduate of the U.S. Army Command and General Staff College.

Col John R. Adie

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