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CRD Announces Changes In Personnel Assignments

Army Chief of Research and Development became Lt Gen William C. Gribble Jr.'s title when he succeeded Lt Gen A. W. Betts, effective Jan. 1, and announced changes in alignment of directorate and division chiefs, including choice of Maj Gen George Sammet Jr. as Deputy CRD.

General Sammet thus succeeded to the title General Gribble assumed in July 1970, after serving as CG of the Engineer School and Fort Belvoir, Va. Brig Gen John W. Barnes stepped up to the dual responsibility General Sammet had held as Director of Plans and Programs (DP&P) and Deputy CRD for International Programs.

Brig Gen Donald D. Blackburn is the new OCRD Director of Developments after a tour of duty in the Office of the Joint Chiefs of Staff as special assistant for Counter Insurgency and Special Activities. General Blackburn served in OCRD in 1968 when he was assigned as DP&P and chief, Special Warfare Division in 1966.

Col George D. Adkisson, who was chief of the Communication-Electronics and Space Division, was assigned as acting Director, Missiles and Space, pending arrival of Brig Gen

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TACRAC I Symposium Draws DoD, Industry Leaders

Challenging complexities of modern warfare and tactical problems urgently demanding technological advances for solutions were considered by about 300 Department of Defense and industrial R&D leaders at a TACRAC I Symposium Feb. 17–19 at Fort Rucker, Ala. Deputy Secretary of Defense David Packard, banquet speaker, presented a classified address.

Deputy Director of Defense Research and Engineering Dr. John S. Foster Jr. sponsored the high-level meeting, in cooperation with chiefs of the Military Departments, and gave the keynote address.

The purpose was to acquaint industrial leaders with critical R&D problem areas of the U.S. Armed Forces related to land warfare; also, to stimulate maximum interservice and industrial cooperative effort.

The high percentage of dignitaries at the invitational symposium (presentations and discussions were classi-

(*Continued on page 4*)

Project Diana Scientist Gets GS-16 Promotion

More than 28½ years as an Army career scientist peaked prestigiously for Dr. Walter S. McAfee Jan. 15 with promotion to supergrade GS–16 as the first Negro in the U.S. Army

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AMC CG Gen H. A. Miley Jr. congratulates Dr. W. S. McAfee on his appointment as scientific adviser to the ECOM Deputy for Laboratories.

AMC Strengthens Facilities For Aeronautical Research

Strengthening of its research and development organization to advance low-speed aeronautical technology was announced by the U.S. Army Materiel Command early in January.

Changes include establishment of a laboratory that incorporates two new directorates, a reorganized directorate, and the redesignated Army Aviation Materiel Laboratories as a fourth element.

Establishment of the new U.S. Army Air Mobility Research and Development Laboratory at the NASA-Ames Research Center, Moffett Field, Calif., is an outgrowth from a November 1969 agreement between the Army Materiel Command and the National Aeronautics and Space Administration (NASA).

The agreement provided for joint

(*Continued on page 8*)

Dr. Hess Fills PL-313 Position as AMCA Director

Selection of Dr. George K. Hess Jr. as the first full-time Director of the U.S. Army Materiel Command Advanced Materiel Concepts Agency (AMCA), announced late in January, ended a 3-year recruitment effort.

The PL–313 position, requiring unusual qualifications, has been filled during the interim on a part-time acting director basis by three of the U.S. Army's most experienced and distinguished Civil Service career R&D leaders.

Dr. J. V. Richard Kaufman Jr., one of the early selectees for a Secretary of the Army Research and Study (SARS) Fellowship, has been acting director almost two years as an additional duty. He will resume full-time his PL–313 position as Deputy Director for Plans, Research, Development and Engineering Directorate, HQ Army Materiel Command.

Dr. Ralph G. H. Siu, who preceded Dr. Kaufman in that position and also doubled as acting director of AMCA, resigned to accept an appointment by the President as Associate

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Dr. George K. Hess Jr.

Featured in This Issue . . .

Army R&D Newsmagazine

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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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Procurement Procedural Progress Noted

Materiel Command Views PROMAP-70 First-Year Gains

Milestone accomplishments of Project PROMAP–70 (Program for Refinement of the Materiel Acquisition Process), a command-wide effort of the Army Materiel Command initiated by direction of Deputy Secretary of Defense David Packard, were listed on its recent first anniversary.

The Military Services were directed to improve management of materiel acquisition in five problem areas: excessive optimism in cost estimating; control of changes in ongoing programs; comprehensive assessment of risk before system development; use of competitive prototypes in developments; and excessive concurrency in development, test and production.

Acting in its functional role as the Army's major developing command, the Army Materiel Command (AMC) assumed responsibility for a majority of Deputy Secretary Packard's improvement suggestions through PROMAP–70.

The primary task was to assess improvement opportunities throughout the materiel acquisition cycle. AMC analysts and planners structured 50 objectives of PROMAP–70, each termed a task. Maj Gen Paul A. Feyereisen was designated Deputy CG for Materiel Acquisition and given full authority to accomplish these tasks.

Formal training, orientation and actual application of improved procedures to hardware systems were stressed to *insure concrete payoffs*—to insure that AMC personnel at all levels would perform assigned duties better and more economically.

Task directors were designated at HQ AMC and each of its eight major subordinate commands, along with 42 product/project managers, to direct maximum effort toward listed objectives. More than 5,000 individuals became directly responsible for improvement efforts involving about 50,000 AMC employes.

General Feyereisen recognized that success of the over-all effort would be basically dependent upon the qualifications and the dedication of the 42 project/product managers. Accordingly, selection criteria were upgraded by adding seven requirements to the original four.

The standards admittedly are difficult to satisfy completely, but as of this writing 12 PMs had been chosen who fulfilled all 11 criteria. The recruitment effort to find the best available talent is continuing.

Another primary improvement action was to increase the capabilities for more effective cost analysis and cost estimating. Seven Cost Data Centers were established at the commodity commands and 250 personnel spaces were reallocated to HQ AMC, commodity commands and PM offices.

Four new training courses were established to meet a requirement for 2,400 man-weeks of specialized training in materiel acquisition procedures. Life-cycle cost-estimating teams

(*Continued on page 36*)

ARMY MATERIEL COMMAND CG General Henry A. Miley reviews fuze prototypes developed at the Harry Diamond Laboratories (HDL), Washington, D.C., during recent orientation visit to some of the 80 installations under his command. Others (from left) are Billy M. Horton, HDL technical director; Brig Gen Mahlon E. Gates, deputy director for Operations, RD&E Directorate, AMC; Dr. Robert B. Dillaway, AMC Deputy for Laboratories; Col David W. Einsel Jr., commanding officer of the HDL; and Ira Marcus, HDL physicist.

Top Army R&D Leaders to Meet With Reorganized TARC March 18

Assistant Secretary of the Army (R&D) Robert L. Johnson and Army Chief of Research and Development Lt Gen William C. Gribble Jr. will participate when The Army Research Council (TARC) meets Mar. 18 with a new chairman and 8 new members.

During a 2-day session over which Dr. J. Post Hallowes will preside for the first time, as successor to Dr. I. R. Hershner Jr. (chairman since Jan. 1, 1969), TARC will take the initial approach to resolving three questions of primary concern:

- Why should the Army support research and exploratory development?
- How can the image of U.S. Army in-house laboratories be improved?
- What is the flow of information related to Army R&D programs and is that flow appropriate?

Established in January 1964, TARC has the primary mission of assisting the Assistant Secretary of the Army (R&D) and the Chief of Research and Development in formulating plans, policy and programs for research and Army exploratory development.

TARC normally is reorganized annually with five members retiring each year on the basis of a 2-year tenure, thereby providing a continuity of experience to meet Army long-range research planning objectives.

Army Director of Research Brig Gen George M. Snead Jr. is TARC coordinator. Maj George L. Richardson, Research Technology Division, OCRD, is the TARC executive secretary, having recently replaced James W. Sterling, in the same division.

Dr. Hallowes, chief scientist, U.S. Army Missile Command at Redstone (Ala.) Arsenal, is one of three holdovers from the 1969–70 TARC.

Others are Dr. Herman Robl, deputy chief scientist of the U.S. Army Research Office-Durham (ARO–D) in Durham, N.C., and Col Donald L. Howie, chief of the Life Sciences Division, U.S. Army Research Office, Office of the Chief of R&D.

Newly elected members are Richard L. Ballard, Physical and Engineering Sciences Division, OCRD, and Billy M. Horton, technical directory, Harry Diamond Laboratories, Washington, D.C.; Dr. Alvin E. Gorum, director, U.S. Army Materials and Mechanics Research Center, Watertown, Mass.; Dr. Desmond O'Connor, director, U.S. Army Research Institute, Army Topographic Command, Fort Belvoir, Va.; Jacob L. Barber, Behavioral Sciences Division, Army Research Office, Washington, D.C.; Marvin Diamond, Atmospheric Sciences Laboratory, Army Electronics Command, White Sands (N. Mex.) Missile Range; Col Kenneth R. Dirks, deputy commander, U.S. Army Medical R&D Command; and Dr. Joseph Zeidner, deputy director, Manned Systems Research, U.S. Army Behavioral and Systems Research Laboratory, Washington.

In their respective areas of specialization, TARC members (2 each) serve on the five Joint Discussion Forums that assist the Director of Defense Research and Engineering. On this basis, the TARC assignments are:

Engineering Sciences, Richard Ballard and Billy Horton; *Environmental Sciences*, Dr. O'Connor and Marvin Diamond; *Physical and Mathematical Sciences*, Dr. Robl and Dr. Gorum; *Life Sciences*, Col Howie and Col Dirks; *Social Sciences*, Jacob Barber and Dr. Zeidner.

Outgoing members are Dr. Thomas E. Sullivan, Physical and Engineering Sciences Division, OCRD; Dr. Robert E. Weigle, chief scientist, Watervliet (N.Y.) Arsenal; Dr. Fernand P. de Percin, Environmental Sciences Division, OCRD; Dr. Lester W. Trueblood, director, Earth Sciences Laboratory, Natick (Mass.) Laboratories;

Dr. John P. Hallowes Jr.

Brig Gen William H. Meroney, who served while assigned as director of Walter Reed Army Institute of Research and was promoted and reassigned Feb. 1 as commanding general, Walter Reed General Hospital; Dr. E. Kenneth Karcher Jr. (deceased), Behavioral Sciences Division, OCRD; and Dr. Leon T. Katchmar, deputy director, Human Engineering Laboratories, Aberdeen (Md.) R&D Center.

Army Transfers STANSO Functions to OACSFOR

Transfer of Surveillance, Target Acquisition, and Night Observance Systems Manager (STANSM) functional responsibility from the Office of the Chief of Staff to the Office of the Assistant Chief of Staff for Force Development (OACSFOR) was effected Feb. 1.

The change in management of one of the U.S. Army's current highest priority areas of research and development effort was undertaken to provide for centralized management of the doctrine and systems being developed for the Army's Integrated Battlefield Control System and to provide a focal point at HQ DA for Project MASSTER TRICAP activities.

Involved in the action—as part of the over-all reorganization of OACSFOR—is the realignment of the Doctrine and Systems Directorate (DSD) into the Doctrine and Command Systems (DCS) Directorate and a Systems Directorate (SD). This is in accordance with provisions of CSM (Chief of Staff Memorandum) 70–398.

That memorandum transferred to ACSFOR General Staff responsibility for tactical automatic data processing systems, and directed staff agencies to request approval for required changes to their organization and functions. One of the earlier actions established within the DSD a Tactical Command and Control Office.

Under the organizational realignment effected Feb. 1, the Surveillance, Target Acquisition and Night Observation Systems Manager (STANSM) became the head of the DCS Directorate. Maj Gen William B. Fulton, with his charter, mission, functions, spaces and personnel, was thus transferred to OACSFOR.

Authorized also is the expansion of the STANO Steering Group mission. This encompasses all Project MASSTER (Mobile Army Sensor System Test, Evaluation and Review) and IBCS/TRICAP (Integrated Battlefield Communication Systems/Triple Capability—Armored, Infantry and Air Cavalry) actions, tests and related activities.

Approval by the Army Chief of Staff of the reorganization plan also sanctions expansion of the mission of the Army-wide STANO Management Structure and STANO Executive Committee, under CSM 69–316.

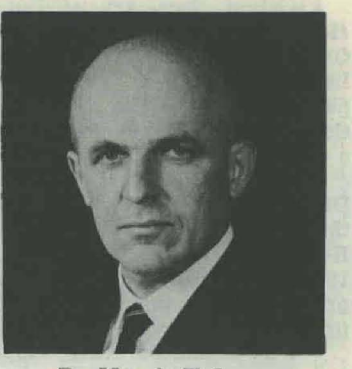
The realignment assimilates STANSO personnel, tactical ADP and appropriate OACSFOR functions (communications-electronics integration, electronics warfare, STANO, doctrine and concepts, and user testing) into a new Doctrine and Command Systems Directorate (DCSD). It provides for systems analysis at the lowest possible level.

Department of Defense Principals in TACRAC I Symposium

David Packard

Dr. John S. Foster Jr.

Robert L. Johnson



Dr. Marvin E. Lasser

TACRAC Meeting Draws DoD, Industrial Leaders

(*Continued from page 1*)

fied) established it as one of the most important ever held on tactical land warfare problems.

Emphasis was directed toward achieving maximum interservice and industrial cooperative effort through a thorough understanding of the problems to be surmounted within the scientific and engineering communities.

Organization of the agenda was planned to provide a "methodological framework encouraging the cross-fertilization of ideas, and the cross-application of new developments and concepts among the various mission areas of tactical warfare research, development, test and evaluation."

TACRAC I Symposium findings and recommendations will be reviewed, along with an extensive questionnaire inviting comments and suggestions relative to specific problems, over a period of about 60 days. Industrial representatives and the interested military services then will be invited to participate in working groups.

Department of Defense agencies functioning within specialized areas of expertise or cognizance will review results of TACRAC I discussions. They will develop proposals for inclusion in development of the TACRAC R&D activities, to provide a basis for implementation as determined by budgetary feasibility considerations.

Ultimately, the goal of the TACRAC Program is "creation of weapon systems effective enough to contribute to the deterrence of tactical warfare. Means will be sought through technology for reducing casualties to friendly forces in the event combat becomes unavoidable. . . ."

An important aspect of TACRAC is explained as: "American technological advances will be needed to assist Free World forces to defend themselves against a modern enemy without the aid of deployed U.S. combat troops."

Lt Gen William C. Gribble Jr./Brig Gen John W. Barnes/Lt Gen John Norton

Statements strongly supporting the TACRAC I Symposium and its stated purpose were submitted to Dr. Foster by Army Chief of R&D Lt Gen William C. Gribble Jr., Deputy Chief of Naval Operations (Development) Rear Adm E. A. Ruckner, Air Force Deputy Chief of Staff (R&D) Lt Gen Otto J. Glasser, and Marine Corps Deputy Chief of Staff (RD&S) Brig Gen Donald H. Brooks.

The symposium welcoming remarks by Maj Gen Allen M. Burdett, CG of Fort Rucker and the U.S. Army Aviation Research Center, were followed by introductory remarks by General Charles H. Bonesteel (USA, Ret.) as chairman of the TACRAC Management Group.

Director of the Defense Intelligence Agency Lt Gen Donald V. Bennett discussed "Threat, Environment and Foreign Trends" and Lt Gen Harry W. O. Kinnard (USA, Ret.) spoke on "Future Land Combat" following Dr. Foster's keynote address.

Dr. Marvin Gustavson presented "Technological Overview." A member of the Ground Warfare Panel, President's Scientific Advisory Council, he is also a consultant to the Army Scientific Advisory Panel and a division chief with Lawrence Radiation Laboratory, U. of Calfornia, Los Angeles.

An industrial "Land Combat System Overview" was given by Norman R. Augustine, director of Advanced Development, Missiles and Space Division, LTV Aerospace Corp. A veteran industrial executive, he served in 1965–70 on the staff of Defense Director of Research and Engineering Dr. Foster.

Army Chief Scientist Dr. Marvin E. Lasser spoke on "Challenge to Technology," stressing the problems of locating hostile indirect fire rapidly and accurately to respond with effective countermeasures.

Brig Gen John W. Barnes, director, Plans and Programs, Office of the Chief of R&D, HQ DA, a veteran of Southeast Asia combat, presented "Ground Forces View of Close Air Support."

Other leading Army speakers included Maj Gen William B. Fulton, systems manager of STANO (Surveillance, Target Acquisition and Night Observation) and Maj Gen Burnside E. Huffman Jr., senior Army member, Weapons Systems Evaluation Group, Office of the Secretary of Defense. General Fulton's topic was "Overview of Battlefield Surveillance." General Huffman discussed "Operational Aspects and Considerations—Surface-to-Surface."

Other featured addresses were given by Dr. Joseph Sperrazza, director, Army Materiel Systems Analysis

(*Continued on page 50*)

Navigation Satellite Management Office.

PLANS AND PROGRAMS DIRECTORATE. Brig Gen J. W. Barnes has Col Walter E. Coleman as his deputy director. Division and office chiefs are Col Lawris M. Meek Jr., Management and Evaluation; Col Robert E. Lazzell, Plans; Col Albert E. Joy, Programs and Budget; Lt Col Henry C. Evans Jr., International Office; Lt Col Robert M. Moulthrop, Primary Standardization Office.

DEVELOPMENTS DIRECTORATE. Brig Gen Donald G. Blackburn has Col Louis F. Felder as his deputy director. Division chiefs are Col Leslie H. Gilbert, Air Mobility; Col Carl M. Zilian, Combat Materiel; and Lt Col William J. Tinsley Jr., Surveillance, Target Acquisition and Night Observation.

BALLISTIC MISSILES. Dr. Jacob B. Gilstein has Col Oliver N. Esco Jr. as his assistant director of the U.S. Army Advanced Ballistic Missile Defense Agency. ABMDA is currently concerned primarily with development of Army components for the Safeguard Antiballistic Missile Defense System.

Archie Gold is deputy director of ABMDA with Lt Col (Col designate) Elwood A. Lloyd as his executive officer. Lt Col Harry J. Skinker is acting chief of the Program Management Office and Robert H. Norling heads the Hardsite Defense Program Office.

ABMDA division chiefs are Leonard I. Kopeikin (also an ABMDA assistant director), Advanced Systems Studies; Patrick Benson (also an ABMDA AD), Space Defense; Morris I. Witow, Data Processing; Capt Herbert H. Ward III (U.S. Navy), Discrimination Technology; Vahey S. Kupelian (also an ABMDA AD), Missile Development; Lt Col James H. Sloan Jr., Nuclear Effects; Dr. John A. Jamieson (also an ABMDA AD), Optical Systems; Lindsey B. Anderson (also an ABMDA AD), Radar Systems; Dr. Richard S. Ruffine (also an ABMDA AD), Reentry Physics.

Julian Davidson is director of ABMDA activities at Huntsville, Ala.

The U.S. Army Research Office-Durham (ARO–D) in Durham, N.C., on the campus of Duke University, is headed by Col William J. Lynch.

MANPOWER RESOURCES. Col Douglas W. Poage Jr. is director of the U.S. Army Manpower Resources Research and Development Center, located in the Rosslyn Circle area off Key Bridge near Washington, D.C. Dr. Julius E. Uhlaner is director of the center's major element, the Behavior and Systems Research Laboratory, with Dr. Arthur J. Drucker as his deputy.

LAND WARFARE. Dr. Russell D. Shelton is director of the U.S. Army Land Warfare Laboratory, Aberdeen (Md.) Proving Ground which is staffed with a highly specialized group of scientists, engineers and technicians to respond rapidly to the most urgent requirements of field combat forces.

STANDARDIZATION GROUPS. Col James O. Daulton is senior standardization representative of the U.S. Army Standardization Group (United Kingdom). Col Joseph D. Park serves in the same capacity with the U.S. Army Standardization Group (Canada), as does Lt Col Richard H. Sugg with the U.S. Army Standardization Group (Australia).

OCRD OVERSEAS ELEMENTS. Col Benedict L. Freund is commander of the U.S. Army Research and Development Group (Europe) in London, England. The U.S. Army R&D Group (Far East) is commanded by Col Bryce C. Walton. Heading the U.S. Army Element of the Defense Research Office, Latin America, is Harold F. Weiler.

Missile Need Leads to Space Suits

Army Engineer Originated Life-Support Concept

Space suits worn by Apollo 14 astronauts during their long walks on the moon's surface used an oxygen life-support system that had its origin in an idea developed by a U.S. Army mechanical engineer in the late 1950s for missile fueling.

Paul E. Whittington, now employed in the Ground Mobility Division, Army Materiel Command Research, Development and Engineering Directorate, has his name on the U.S. patent (one of 14 patents on his inventions) for the basic concept of the portable life-suport system.

The idea originated while he was employed with the former Army Quartermaster Research and Development Command at Natick, Mass.

Like many Army R&D concepts that have eventually found application to requirements far removed from the use initially envisioned, the idea stemmed from a need for a protective rubberized suit with an effective cooling system.

Men assigned to the hazardous work of injecting liquid fuel in the Ajax and WAC Corporal missiles then being deployed needed this protection. The Quartermaster Corps was assigned the developmental task.

Whittington's concept called for a stainless steel insulated vessel (of the type of the Dewar vessel) that would provide adequate insulation in the suits against cryogenic temperatures of liquid air (minus 312° F.) and liquid oxygen (minus 296° F.) during the fueling process.

In operation, the over-pressure forces the cryogenic liquid through a metering valve into a copper tube array where a heat gain converts the liquid to a gaseous phase. The gas is jetted into a Venturi tube, which sucks air from various parts of the suit and redistributes the total through the suit to furnish breathing air, refrigeration, dehydration and the critical suit pressure.

After what he termed "an uphill fight" to convince decision-makers that his approach to the problem was feasible, Whittington worked intensively with others on the developmental task. Within seven months after the work began, the first prototype was available.

Whittington became the guinea pig for the first real test and wore the suit for 30 minutes. He recalls that "they wouldn't let me wear it in the simulated hostile environment to test it, but I wore it in our own test facilities at Natick." Later tests proved the suit flawless for its intended use.

He remembers that the first test was in a chemical lab and that "while I was in the suit the air was fresh and clean. When I came out, the odors of the lab really hit me!"

The idea of using the vacuum-type insulation for space exploration life-support systems did not occur to Whittington. That application was the product of another creative mind, but his basic idea was developed in highly sophisticated form by scientists and engineers working on NASA's Apollo moon flight program.

Whittington's most gratifying reward for his original role—an Army portable life-support system that cost about $20,000 as compared to the NASA investment in excess of $1 million for each unit—came when he and his wife were invited to the launching of the ill-fated Apollo 13.

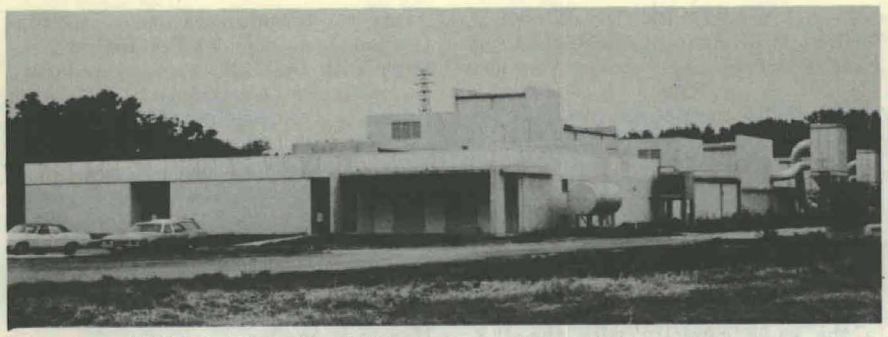
Compatibility Tests Succeed On Shillelagh, M60A1E2 Tank

Results of recent compatibility tests of the Shillelagh missile system and the M60A1E2 were described by U.S. Army Materiel Command observers as exceptionally accurate and reliable.

Three vehicles and 23 missiles were used in the tests at Fort Knox, Ky. Three moving targets were destroyed in three firings and similar success was recorded on stationary targets.

All testing involving the Shillelagh was accomplished under safety releases for firing that were completed during the earlier extensive test phase at Aberdeen (Md.) Proving Ground.

Military and industrial development personnel had agreed that the most severe test for the Shillelagh would be firing perpendicular to the line of sight, involving translating and compensating for the movement of both the missile and the vehicle. In the tests, this feat was accomplished very successfully.



Keith L. Ware Simulation and Experimental Firing Center

WECOM Dedicates $4 Million Simulation Center

Four years of intensive planning and expenditure of about $4 million are represented in the U.S. Army's first simulation and experimental firing center, dedicated recently at HQ U.S. Army Weapons Command (WECOM), Rock Island, Ill., in honor of Maj Gen Keith L. Ware.

The center gives WECOM researchers and engineers the capability of simulating tests of gun-type armament up to 40mm for tanks, self-propelled artillery, armored vehicles and helicopters, thereby saving time and money.

"This facility is an important milestone in proving a key tool to give our soldiers the kind of weapons they deserve," Army Materiel Command Deputy CG Lt Gen Woodrow W. Vaughan stated in his dedicatory address.

"Until now," he added, "we could never be sure how weapons and their mounts would function until they were tested in the outside world. Now the test can be simulated under any weather or lighting conditions, without a loss of time or costly delays."

Facilities are available for testing and evaluating aircraft and light artillery armament, computer analysis of firing data, data acquisition and recording, and data storage.

Maj Gen Keith L. Ware (1915-1968)

Environmental testing chambers are capable of temperature variances from 90° below zero to 200° above. Under construction are facilities to provide test devices capable of simulating motions of armored vehicles, self-propelled artillery and helicopters. The center has two 1,000-inch (25.4 meters) firing ranges and two 100-meter firing ranges.

Maj Gen Ware was commanding general of the 1st Infantry Division in Vietnam when he died Sept. 13, 1968, after his helicopter was downed by enemy action. He was awarded the nation's highest honor for bravery, the Medal of Honor, in 1944 while serving with the U.S. Army in France.

Maj Gen Henry A. Rasmussen, WECOM commanding general, and Col Charles P. Alter, WECOM director of research and engineering, participated in the dedicatory ceremonies. Distinguished guests included Lt Gen O. E. Hurlbut (USA, Ret.), who commanded WECOM in 1968–69.

Dr. Hess Fills PL-313 Position as AMCA Director

(*Continued from page 1*)

Administrator of a new Law Enforcement Assistance Agency and Director, National Institute of Law Enforcement and Criminal Justice.

The first acting director of AMCA was Robert R. Philippe, from December 1967 until his death in June 1968. Detailed to AMCA, his primary assignment with the Materiel Command was chief, Science and Technology Division. He was nationally recognized as one of the Army Corps of Engineers' top soils and mobility experts.

Dr. Hess accepted the AMCA appointment following a year of service as manager, Technical Planning, International Business Machines Corp., in the Gaithersburg (Md.) office. From January 1967 to October 1969, he was Deputy for Engineering to the Assistant Secretary of the Air Force for Research and Development.

Dr. Hess became chief scientist, Air Force Missile Test Center in 1962 and later was chief scientist of the National Range Division. Early in his career, as a staff member of the Los Alamos Scientific Laboratory, he contributed to the design and testing of nuclear and thermonuclear weapon systems.

In a subsequent assignment at Los Alamos, as a group leader, he developed a professional staff in nuclear reactor control systems. He also conducted nuclear reactor rocket engine tests at the U.S. Atomic Energy Commission's Nevada Test Site.

Dr. Hess specialized in engineering mechanics at the University of Michigan where he earned a BS degree in 1945, MS in 1947 and PhD in 1954. He also has completed the course of study at the Industrial College of the Armed Forces and the Air War College.

Col George A. Nabors, commanding officer and deputy director of AMCA, commented: "Dr. Hess brings to his new assignment the combination of managerial and technical skills required to blend the diverse talents of the highly professional scientific and engineering staff of AMCA to achieve the agency's maximum potential."

AMCA is a part of the Advanced Concepts Organization that includes the Institute of Land Combat (ILC) of the U.S. Army Combat Developments Command and the Intelligence Threat Analysis Detachment (ITAD) of the Army Assistant Chief of Staff for Intelligence.

The Advanced Concepts Organization mission is to develop concepts for an integrated land combat system, selecting from alternative materiel systems the best that could become available in the foreseeable future.

AMCA's role is to formulate materiel concepts. The ILC develops conceptual designs of land combat systems using these materiel systems in the environments and under the threat conditions projected by the ITAD.

AMCA was recently assigned three additional major missions: (1) preliminary systems engineering design for selected systems that cross the responsibilities of several commodity areas of AMC; (2) preparation of the Army Long-Range Technological Forecast under the direction of the Office of the Chief of R&D; (3) annual briefings of selected Army center teams on state-of-the-art advances and forecasted technology applications.

AMC Conducts 3-Phase Program to Meet Federal Pollution Abatement Standards

Pollution control problems confronting the U. S. Army Materiel Command, present the need for an abatement program encompassing a wide range of mobile equipment and a variety of fixed facilities.

In response to orders from President Richard M. Nixon and the Department of Defense, the AMC is engaged in a 3-phase program to comply with published standards for pollution abatement at federal, state and local levels.

General Henry A. Miley Jr., CG of the AMC, has directed that the Phase I study of the pollution abatement problem and possible remedial procedures include all fixed facilities as well as mobile sources in the U.S. and in U.S. Army foreign operations.

A recent survey established that 51 AMC installations have 258 uncorrected sources of pollution. Costs of correction are estimated at $118 million. Among the troublesome fixed facilities are ammunition plants, some of which date back to the World War II. A total of $10 million was applied to the effort last year and an additional $11 million has been requested for FY 71.

The AMC is conducting a searching analysis of its fleet of multifuel and gasoline-powered tactical vehicles. While there is no legal requirement for vehicles delivered prior to 1970 to meet existing engine-emission standards, AMC is exploring all practical means to reduce harmful emissions.

A preliminary analysis indicates that harmful emissions can be reduced as much as 20 percent by improved maintenance procedures. Instructions have been issued to assure this is accomplished.

Experts anticipate that pollution reductions of up to 35 percent are possible on spark-ignition engines through special tune-up and other fixes costing $25 to $50 per vehicle. Any reductions beyond that figure, however, will require add-on devices costing $150 to $300 per vehicle.

Cost-estimates total about $6 million for correction of pollution causes for the current inventory of spark-ignition, engine-powered vehicles. These fixes, it is believed, could provide emission levels comparable to the proposed 1972 Federal Standards.

Meanwhile, engineers at AMC's Tank Automotive Command, headquartered in Warren, Mich., reportedly are well advanced in development of a hybrid combustion engine expected to yield great reductions in exhaust emissions.

In addition to the tactical vehicle fleet, numbering more than 275,000, there is an existing inventory of about 138,000 engine-driven generators, 13,000 forklift trucks, 8,592 tractors and nearly 600 vessels.

The problem of water pollution linked to vessels is caused primarily by overside discharge of human waste. A program is under way to develop an acceptable means for rendering such waste harmless, with treatment by chemical and biological means under consideration.

Phase II of the AMC program, under way and scheduled for completion in December 1972, deals with the design and production of materiel to meet the increasingly stringent environmental quality standards. Research and development of fuels and lubricants will be integrated with corresponding emphasis on development of new low-emission engines.

Phase III, now under intensive study and covering the period from December 1972 to June 1975, is considered to be the environmental control portion of the AMC effort. Maximum concentration will be upon development of new power sources; development or refinement of unique and unconventional means of energy conversion; and the control of all liquid, solid and gaseous waste material from AMC-controlled facilities.

Study Compares Military, Civilian Hospitals

Medical care in U.S. Army hospitals costs about two-thirds as much per day for bed patients, when all operational expenses are computed, as is paid by the average patient in civilian hospitals, a recent comparative study indicates.

The Army Surgeon General's Office in Washington, D.C., reported that costs averaged $76.35 per patient day in 1969 for 211 large civilian hospitals included in the study. Costs in 19 Army hospitals chosen for the study showed an average of $48.86. Army dependent patients pay only $1.75 and officers $1.50 a day for room charges while hospitalized. Other results:

- Patient care in Army hospitals has become more effective since 1963, due partly to more Army medical research, which was expanded from $30 million in 1963 to $53 million in 1969.
- Over-all health of the Army was excellent during the period studied, 1963–69. By 1965, the worldwide "non-effective rate" reached a new low of only 9.4 per 1,000 strength. The rate doubled to 20.6 by 1969 because of Vietnam casualties, but the rate remained well below peak rates of any previous war.
- Total patient load in Army hospitals in the United States rose 69 percent from 1963 to more than 15,000 beds occupied in 1969. Active-duty patients increased 136 percent to 11,000. This boosted the *average bed occupancy* of Army hospitals to nearly three times (329 to 111) to civilian hospitals.
- In 1969 a "greater array" of service was available in Army hospitals in the U.S. than in civilian units.

Lee Represents MERDC in Vietnam Under VLAPA Effort

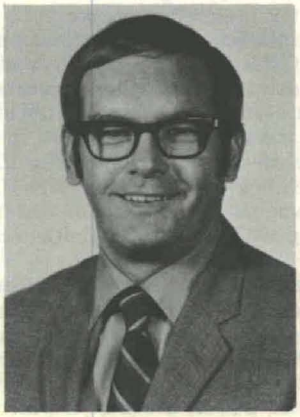
Under the Vietnam Laboratory Assistance Program (VLAPA), Jimmie Roger Lee departed in December for a 6-month tour in Vietnam as the third representative of the U.S. Army Mobility Equipment R&D Center to participate in this field research effort.

Lee succeeded Vernon Urie, who returned to the MERDC after a full year of duty in Vietnam. Jack Stevenson served six months as the MERDC's first VLAPA participant.

Working with officers and enlisted men, VLAPA representatives try to ascertain what assistance the MERDC and its parent command, the U.S. Army Mobility Equipment Command in St. Louis, Mo., can provide to improve military operations.

Areas of interest include engines and turbines, fuels handling techniques, environmental control methods, electric power generation, detectors and sensors, marine craft, barriers, camouflage and deception, sanitary engineering, materials handling, and construction requirements.

Lee received a BS degree in electrical engineering from West Virginia University in 1959. He has been employed since 1960 as an electronics engineer in the Equipment Development Division of the MERDC Intrusion Detection and Sensor Laboratory.



Jimmie Roger Lee

AMC Strengthens Facilities for Aeronautical Research

(*Continued from page 1*)

use of existing NASA wind tunnels, test chambers and other research facilities by scientists and engineers of the two agencies for conducting aeronautical research.

Estimates by key officials of the two agencies have set at more than $100 million the cost to the U.S. Government of duplicating construction of comparable facilities made available to the Army by the agreement.

Paul F. Yaggy, technical director of the U.S. Army Aeronautical Research Laboratory at Moffett Field since it was established in 1965, has been appoined director of the new Army Air Mobility R&D Laboratory.

Yaggy is a member of technical committees of the American Institute of Aeronautics and Astronautics, the Society of Automotive Engineers, the American Helicopter Society, the NASA Advisory Subcommittee for Aircraft Aerodynamics, and the Fluid Dynamics Panel of the Advisory Group for Aerospace Research and Development (AGARD), North Atlantic Treaty Organization.

The Army Air Mobility R&D Laboratory reports directly to HQ U.S. Army Aviation Systems Command (AVSCOM), St. Louis, Mo., on performance of its mission of directing and controlling the Army Air Mobility Research, Development, Test and Evaluation Program.

Components reporting to the Army Air Mobility R&D Laboratory are:

• A new Langley Directorate located at the NASA-Langley Research Center, Hampton, Va., with the mission of conducting basic research and exploratory development in low-speed aeronautics and aircraft structures.

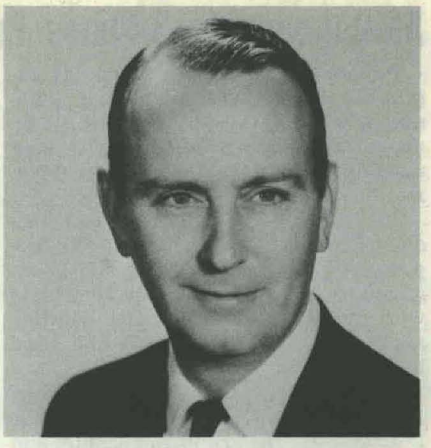
• A new Lewis Directorate at the NASA-Lewis Research Center, Cleveland, Ohio, which will conduct basic research and exploratory development in small-size aeronautical propulsion.

• A reorganized Ames Directorate at the NASA-Ames Research Center, Moffet Field, which will conduct basic research and exploratory development in low-speed aeronautics. This laboratory was established originally in 1965 as the Army Aeronautical Research Laboratory.

• The Eustis Directorate, a redesignation of the former U.S. Army Aviation Materiel Laboratories at Fort Eustis, Va., with its mission remaining essentially unchanged.

The Army Air Mobility R&D Laboratory, officials said, will utilize the unique facilities and resources available at each of its directorates to increase research on advanced rotary-wing and V/STOL aircraft that are responsive directly to Army air mobility requirements.

More specifically, it was explained, research will be performed on fluid mechanics and dynamics of rotary wings, and aerodynamics of V/STOL vehicle configurations; also, flight and simulation research of stability and control dynamics, with emphasis on terminal operations for helicopters and V/STOL aircraft.



Paul F. Yaggy

Research will be performed on noise generated by helicopters and V/STOL aircraft, systems integrations, reliability and maintainability, avoidance of detection, safety and survivability, and small-size aircraft propulsion.

The mutual research and technology working arrangement between the Army Materiel Command and NASA, a key Army official said, is expected to result in a program increasingly responsive to Army air mobility requirements, a much wider exchange of knowledge, and an increased involvement in projects among the organizations concerned with a broad range of low-speed aeronautical research and technology activities.

Watervliet Scientists Report on Small Arms R&D

Progress reports in three research projects conducted in support of the Small Arms Systems Laboratory located at the U.S. Army Weapons Command, Rock Island, Ill., were made recently by Watervliet (N.Y.) Arsenal scientists.

Specific tasks in small arms applied research were assigned to the arsenal's Benet Research and Engineering Laboratories in January 1970.

The Experimental Mechanics and Thermodynamics Laboratory, headed by Dr. John E. Zweig, has designed and constructed an apparatus that permits testing of new gun barrel materials under simulated firing conditions. Data obtained is used for the design of new weapons.

New methods of cold-working high-temperature superalloys by hydrostatic pressure are being investigated by the Physical and Mechanical Metallurgy Laboratory, supervised by Dr. Thomas F. Davidson. Improvements in yield strength and ductility of these otherwise difficult-to-process materials are reported.

Dr. Fritz J. Sautter, chief of the Advanced Research Laboratory, reports the successful application of a new erosion-resistant dispersion-hardened alloy to the interior of small-caliber weapons to be test fired soon.

Watervliet Arsenal is a U.S. Army Weapons Command agency and a part of the Army Materiel Command.

Frankford Arsenal Selects Costa 'Woman of the Year'

Accolades as Frankford Arsenal's "Woman of the Year" came to Mrs. May R. Costa at a testimonial banquet in mid-January, 33 years after she began her career at the arsenal as a machine operator in small arms work.

Nine awards for Sustained Superior Performance in her present position as chief of the Office Machines Branch and 25 letters of commendation from civilian agencies for her outside civic service activities contributed to her selection for the honor.

Mrs. May R. Costa

Responsibilities of supervising 8 to 10 employes have not weighed heavily upon Mrs. Costa, and she is known to associates for "warmth and charm" along with "sincerity, gentleness and consideration for others."

In addition to her work as a volunteer in hospitals and in church activities, she has earned the gratitude of many coworkers by helping them in filling out medical insurance claim papers.

Frankford Arsenal's Woman of the Year award includes a wall plaque, of which her husband of 22 years is reportedly prouder than she is.

DASA Parley Draws 450 to Discuss TREE Research, Development

Transient Radiation Effects on Electronics (TREE) research and development activities were discussed by about 450 participants in a recent conference sponsored by the Defense Atomic Support Agency (DASA) at the National Bureau of Standards, Gaithersburg, Md.

Representatives of U.S. Government agencies, including the Department of Defense, joined with participants from universities and the military and industrial scientific communities in exchanging information. Numerous papers were presented by scientists of the Harry Diamond Laboratories, Washington, D.C.

Peter H. Haas, scientific assistant to the DASA Deputy Director for Science and Technology, opened the meeting with a summary of research and progress in TREE programs. Dr. V.A.J. van Lint, Gulf Radiation Technology, gave the theme paper, "System Challenges to TREE Research."

Other presentations included: Guidance Electronics Hardening Costs, W. W. Willis and J. Reinheimer, Aerospace Corp.; Circumvention as a Hardening Technique, S. Berg and M. J. Taylor, TRW Systems Group;

System Hardening for a Combined EMP/Ionization Environment, D. C. Bausch, J.T. Blandford Jr. and M. L. Johnson, Autonetics of Anaheim, Calif.; Shadowing of Circumvention Detectors, H.L. Flescher, Raytheon Co.

Robert E. McCoskey of HDL presided at a session devoted to component response and circuit hardening, including deposition, transport, ionization displacement and surface effects. Papers were:

A Coupled Phton-Electron Monte Carlo Transport Code with Comparisons to Experiment, H. M. Colbert and K. W. Dolan, Sandia Laboratories; Electron Range Effects in Transistors, W. L. Shanks and D. K. Wilson, Bell Telephone Laboratories; A Procedure for Utilizing Existing Augeas Neutron Transport Code Data, J. P. Roberts, HDL; Permanent Displacement Damage Produced in PNP Silicon Transistors by Thermal Neutrons, I. Arimura and C. Rosenburg, Boeing Co.; and

Failure Analysis of a Timer Circuit with IEMP-Photocurrent Inputs, J. S. Nichols, Capt J. M. Anderson and 1/Lt R. J. Horen, Air Force Weapons Laboratory, Kirtland AFB, N. Mex.; Flexible Hardened Solar Array Power Subsystem, 1/Lt J. M. Seaman, Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio.

Jerry A. Hood of Sandia Laboratories chaired a session on quality and hardness assurance. Papers were:

Hardness Assurance for the MINUTEMAN III Guidance and Control System, S. H. Fitch and G. C. Messenger, Autonetics of Anaheim, Maj L. L. Tew, Space and Missile Systems Organization, Norton AFB, Calif., and A. A. Anderman, TRW Systems Group, Redondo Beach, Calif.; and

A Component Program for Survivability Assurance, S. Bonis, Raytheon Co.; Development and Implementation of a Hardness Assurance Program, N. G. Skinker and A. Anderman, TRW Systems Group; and A Quality Assurance Program for Semiconductors, J. McDowell, Sandia Laboratories, Albuquerque, N. Mex.

HDL's Robert B. Oswald chaired the session on component response and circuit hardening, metalization and thermochemical effects. Papers:

Proposed Mechanisms for Metalization Burnout, Capt S. B. Cox, Air Force Weapons Laboratory, Kirtland AFB, N. Mex.; Metalization Burnout Induced with a Pulsed Magnetic Field, G. H. Eggers, Gulf Radiation Technology, San Diego, Calif.; and

Radiation Induced Aluminum Interconnect Failure, D. W. Engelkrout, Boeing Co., Seattle, Wash.; Fast Recovery Circuits, G. L. Rimer, Gulf Radiation Technology, San Diego, Calif.; A Radiation-Hard High-Energy Firing Circuit, R. A. Smith, Naval Ordnance Laboratory, Silver Spring, Md.;

Transient Radiation Effects on a Radar Fuze, O. J. Mead, R. R. Palmisano, P. A. Trimmer and F. W. Balicki, HDL; Linear Integrated Circuit Design Techniques for Radiation Environments, R. A. Stehlin and H. W. Spence, Texas Instruments, Inc., Dallas, Tex.; Ultra- Hard Flip-Flop, R. M. Orndorff, Hughes Aircraft Co., Culver City, Calif.; and

State-of-the-Art in Micro-Circuit Hardening and Implications of MSI/LSI, J. L. Mullis, Air Force Weapons Laboratory, Kirtland AFB, N. Mex.; Are Field Tests of Circuits Necessary as Proof of Performance?, R. H. Dickhaut, Braddock, Dunn and McDonald, Inc., Albuquerque, N. Mex.

Robert A. Poll of Gulf Radiation Technology chaired a second session on system hardening. Papers were:

Review of Simulator Capabilities for Nuclear Vulnerability Programs, Lt Col R. P. Sullivan, DASA, and I. M. Vitkovitsky, Naval Research Laboratory, Washington, D.C.; and

Satellite Hardening, 1/Lt W. Stine, Space and Missile Systems Organization, Los Angeles, Calif.; Space System Survivability, R. H. Kingsland, TRW Systems Group; The Response of Materials, Laminates, and Transistors to Pulsed Energy Deposition, D. R. Schallhorn, R. B. Oswald and T. R. Oldham, HDL; Nanosecond Photography of Thermal-Shock Elastic Ripples, R. Holland and D. L. Weaver, Sandia Laboratories; and

The Application of Structural Analysis to Electrical Component Vulnerability, M. R. Birnbaum and D. K. Dean, Sandia Laboratories; Header Response: Shock or Vibration?, H. L. Floyd Jr., Sandia Laboratories; Neutron-Induced Stress Waves, F. N. Coppage, Sandia Laboratories; Development Status of Hardened Transistors, R. B. Oswald, D. R. Schallhorn and H. A. Eisen, HDL; Thermomechanical Damage in Semiconductor Devices, R. H. Stahl and D. J. Albert, Systems, Science and Software, La Jolla, Calif.

Papers at a session devoted to subsystem and system hardening included: MIST: A Computer Simulation for Evaluating Total Force Survivability, R. W. Choisser, Autonetics of Anaheim; Digital Simulation of MINUTEMAN III G&C Using the SECURE Code, C. T. Kleiner, M. J. Romano, J. S. Jandrosi and W. Hochwald, Autonetics; and

Hardening of a Radio Inflight Correction System, D. Doherty, General Electric Co., J. Reiheimer, Aerospace Corp., R. A. Poll, K. Davies and V. van Lint, Gulf Radiation Technology; Hardening Advanced Guidance Systems—SABRE and Beyond, W. Curtis and K. Fertig, MIT-Draper Laboratory, Cambridge, Mass., and Vulnerability Considerations for the RALF Electronics, J. P. Raymond and B. T. Ahlport, Northrop Corp.

A. W. Snyder of Sandia Laboratories chaired a session at which internal EMP effects were discussed. Papers were: Space Charge Fields and Currents in Cavities Subjected to IEMP, P. J. Hart, Lockheed Missiles and Space Co.; Summary of Special Effect Field Measurements, L. D. Singletary, G. F. Heath, B. T. Kimura and F. M. Horn, Lockheed Missiles and Space Co.; and

Radiation-Induced Electromagnetic Pulse (IEMP), J. E. Tompkins, J. A. Rosado and R. M. Gilbert, HDL; Radiation Induced Signals on Cabling, T. A. Dellin, Sandia Laboratories; Internal Electromagnetic Pulse Response in Cables, W. L. Chadsey and R. Boritz, General Electric Co.; Cable Sensitivity to Radiation, D. C. Oakley, Lawrence Radiation Laboratory; and Vulnerability of Magnetic Cores, B. C. Passenheim, K. O. Downing and J. A. Naber, Gulf Radiation Technology.

Project Diana Scientist Achieves GS-16 Promotion

(*Continued from page 1*)

Materiel Command to attain this grade.

General Henry A. Miley Jr., CG of the AMC, conferred the distinction upon Dr. McAfee with a promotion that makes him the first Electronics Command Scientific Adviser to the Deputy for Laboratories. Numerous high-ranking research and development leaders attended the ceremony.

Heading the list of dignitaries was Assistant Secretary of the Army (R&D) Robert L. Johnson, along with Deputy AMC Commander Lt Gen Woodrow W. Vaughan, and AMC Deputy CG for Materiel Acquisition Maj Gen Paul A. Feyereisen.

Deptuy and Scientific Director of Army Research Dr. Richard A. Weiss, who formerly worked with Dr. McAfee in the Fort Monmouth laboratories, represented the Office of the Chief of Research and Development.

Maj Gen Walter E. Lotz Jr., CG of ECOM and Fort Monmouth, was accompanied by ECOM Deputy for Laboratories Dr. Robert S. Wiseman and ECOM Chief Scientist Dr. Hans K. Ziegler.

Elevation to supergrade status came to Dr. McAfee only five days following the 25th anniversary and epochal success of Project Diana. To that historic transmission of a radar signal to the moon and back in 2½ seconds—presaging the feasibility of Space Age communications—Dr. McAfee contributed as astro-physicist for theoretical calculations.

Based upon his deep background of experienced expertise in quantum optics, electronics, laser holography and other scientific disciplines, Dr. McAfee will serve Dr. Wiseman in a broad staff advisory capacity.

Graduated magna cum laude in 1934 with a BS degree in mathematics from Wiley College in his native State of Texas, Dr. McAfee obtained an MS degree from Ohio Sate University in 1937.

Under a Rosenwald Fellowship in Nuclear Physics, he studied at Cornell University in 1948–49, while on leave from the Fort Monmouth Signal Corps Laboratories, to earn his doctorate in theoretical physics.

Dr. McAfee has commented on that period: "Vicariously, I take great pleasure in knowing that my physics teacher at Cornell, Hans A. Bethe, became a 1967 Nobel Prize winner." (Dr. Bethe now directs Cornell's Laboratory for Nuclear Studies and is Wendell Anderson physics professor.

President Dwight D. Eisenhower honored him at the White House in 1957 by presenting him with one of the first Secretary of the Army Research and Study (SARS) Fellowship grants. Dr. McAfee thus was enabled to pursue advanced studies in radio astronomy and ionospheric theory at Harvard University and to travel to scientific centers of Europe and Australia for further study.

In 1961, when the annual presentation of Army Research and Development Achievement Awards was initiated, Dr. McAfee became one of the first to be so honored. He was cited for important contributions to missile guidance and communications, especially the effect of high-altitude nuclear explosions on electromagnetic propagation.

Dr. McAfee has achieved recognition for his technical reports in the series published by the Defense Atomic Support Agency (DASA); also, for scientific presentations at conferences as well as technical papers in professional journals on topics such as radar cross sections, antenna theory, radio propagation and nucleonics.

As a part-time faculty member of Monmouth College since 1958, he lectures in atomic and nuclear physics, and in solid-state physics, at graduate and undergraduate level. He also is a Brookdale Community College trustee.

Current concern about smoking in public places, such as buses and even in close proximity to others in offices, as a possible menace to their health, found expression long ago where Dr. McAfee works at Fort Monmouth.

Visitors to the inner cubicle where he works, his so-called "inner sanctum," are confronted with an inescapable eyecatcher—a sign that says, in 21 languages, "NO SMOKING." On his desk the nameplate carries the admonition, in small print, "No Smoking Please."

Army Deploys TOW to Fort Benning, Fort Knox Units

TOW, the U.S. Army's newest tank killer, which can fire a missile more than a mile to destroy any known enemy armor, has gone to Infantry units at Fort Benning, Ga., and Fort Knox. Ky.

TOW is being deployed as the Army's primary antitank weapon at the battalion level. Capable of being fired from a ground emplacement or mounted on helicopters and a variety of vehicles, it is replacing the 106mm recoilless rifle as the battalion heavy antitank weapon system.

In announcing first deployment of TOW equipment, Army Missile Command officials at Redstone Arsenal, Ala., said training on the new weapon system is in progress at both Army installations.

Key instructors have been trained at the U.S. Army Infantry School at Fort Benning and have returned to their respective Army units to train other gunners and crews.

Other TOW training, meanwhile, has been under way since early September at the Army Training Center at Fort Jackson, S.C. Gunners are being trained there for eventual assignment as replacements for TOW-equipped units throughout the Army.

The TOW program is managed by the Missile Command, with Lt Col Robert W. Huntzinger as project manager. Hughes Aircraft Co. is prime contractor and Chrysler Corp. Huntsville Space Operations is an alernate producer of missiles.

Anniston (Ala.) Army depot has been given the mission for storage, supply and maintenance of the TOW.

SATCOM Assigns Cody as Deputy Director for OA

Lt Col Henry L. Cody has been assigned as deputy director of Operations Analysis at the U.S. Army Satellite Communications (SATCOM) Agency, Fort Monmouth, N.J.

His most recent assignment was commanding officer of the Southeast Asia Signal School. He has served as executive officer of the Seventh Army Communications Command in Europe and commanding officer of the American Forces Network, Europe.

Graduated in 1940 from Martin Luther Institute, Tuscaloosa, Ala., he has a BS degree in education from the Agricultural and Technical College of North Carolina, and a master's degree in radio, television and motion picture production from Ohio State University. He completed graduate studies in audio-visual education at Columbia University in 1966.

His military decorations include the Legion of Merit, the Bronze Star Medal with Oak Leaf Cluster, and the Army Commendation Medal.

Lt Col Henry L. Cody

Battelle Economists Forecast R&D Trends Based on $28.5 Billion Project in 1971

Expenditures for research and development supported by the U.S. Government will decline about 1.2 percent in CY 1971 but national R&D outlays will rise about 3.6 percent to $28.5 billion due to industrial, academic and not-for-profit agencies.

Forecasters from Battelle Memorial Institute, in making these estimates, compared the 1971 predicted increase to the 9.0 percent gain in R&D funding from 1965 to 1966, and the continuing decline in the percentage of federal R&D support since that time.

The real level of the national R&D effort in 1971 actually will decline about 2.3 percent from that in 1970, it is estimated, due to continuing impact of inflationary trends.

U.S. Government R&D spending is expected to total $14.9 billion in 1971, about $200 million below the 1970 level; industry will pay roughly $12 billion, an increase of $1 billion. Colleges and universities will spend slightly more than $1 billion, a gain of about $98 million. Not-for-profit institutions are expected to pay out $432 million, a rise of $26 million above 1970.

The forecast notes that the percentage of the national R&D effort funded by the U.S. Government has dropped steadily since 1964, when federal agencies accounted for 65 percent of the total. Industrial R&D support has increased proportionately, from 31 percent in 1964 to an estimated 40 percent in 1970 and 42.5 percent in 1971.

Private nonprofit institutions have also accounted for modest gains in R&D expenditures since 1964.

Fiscal pressures on the federal government will tend to continue constraints upon R&D expenditures as one of the "controllable" budget items, the forecast states, in view of almost certain sizeable 1971 deficits.

Under the circumstances, the prediction states, it is likely that two steps will be taken, both of which tend to reduce near-term federal R&D support:

- The Administration and the Congress will try to hold appropriations for controllable budget items, including R&D, at or below present levels.
- Even if the Congress appropriates funds for more R&D support, the Administration may impound some of those funds in order to reduce the expected deficit.

In a longer view, the forecast sees the growth of federal support of R&D not exceeding 4 percent per year before correction for inflation—this in contrast to a compounded growth rate of about 8 percent in the early 1960s. However, it points out that rate changes and absolute changes have very different implications.

For example, from 1959 to 1969, the actual total dollar increase in federal funding of R&D was about $7 billion, and the growth rate was just over 6 percent per year.

If future growth continues at 4 percent per year, the next 10 years could see an increase in dollar volume of $7 billion. In other words, a growth rate of much less than that of the earlier decade could yield an equal dollar increment.

The forecast sees industry *performing* $20.5 billion of R&D or 72 percent of the predicted 1971 national total of $28.5 billion—$11.9 billion (58 percent) from its own funds and the remainder funded by federal agencies.

Pointing up the increasing importance industrial management attaches to R&D, the forecast notes that industry supported only 44 percent of its research in 1964. Since then this ratio has averaged a gain slightly better than two percentage points per year.

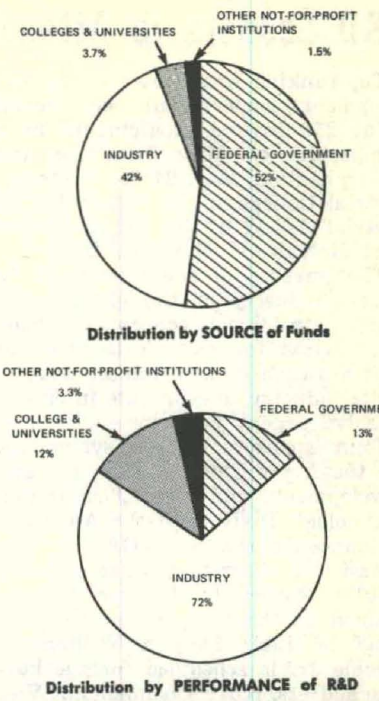
Indications of this trend, in previous forecasts, were generally within the context of industry's expectation of quick payoff. Emphasis is turning to more basic research undertaken with hopes of long-term benefit.

Industry's growing investment in R&D is attributed in part to changing federal attitudes toward military and aerospace procurement. Recent emphasis by Congress and the major R&D supporting agencies on a "try before you buy" policy also suggests higher levels of anticipatory R&D by would-be suppliers.

The prediction is made that, to qualify for federal purchase contracts in coming years, firms will finance more of their own prototype development. This could cause a noticeable rise in the ratio of industrial funding of the R&D industry performs.

In 1971, the not-for-profit institutions are expected to provide 5.2 percent of all funding, reflecting, in part, money received from foundations and state and local governments. They are expected, however, to perform about 15 percent of the nation's R&D.

The performance percentage for 1970 is 16 percent—a downward revision—reflecting, in part, a reduction of federally financed academic R&D that followed the antimilitary demonstrations of last spring.



1971 R&D Expenditures in the U.S.—The total forecast by Battelle Memorial Institute's Columbus Laboratories is $28.5 billion. Distribution, as shown above, reflects a decline in federal support and increase in industrial funds.

The 1971 forecast was prepared by Dr. W. Halder Fisher, an economist at Battelle's Columbus Laboratories. Data were drawn from various sources, including the fiscal-year figures of the U.S. Bureau of the Budget; National Science Foundation; the McGraw-Hill Survey—Business' Plans for R&D Expenditures; and analyses conducted by the Technical and Business Planning Section at Battelle-Columbus.

Inflationary forces on R&D costs continue to have a greater influence on the change in real R&D effort than do increases in total expenditures. Accurate measures of the real *output* of R&D activities have not yet been developed, the forecast states, but there is evidence that the average *input* costs have risen faster than the level of support.

The Battelle index, adapted in part from studies by others, all of which have been adjusted to a 1968 dollar base, shows R&D expenditures have risen but that, in deflated dollars, the level of real R&D effort has been declining—by 2.6 percent in 1968–69, by 1.9 percent in 1969–70, and an estimated 2.3 percent in 1970–71.

R&D Leaders to Attend Mine Detection, Neutralization Symposium at ICAF

Top-ranking Army research and development leaders will be among about 250 invited participants in a Symposium on Mine Detection and Neutralization, Mar. 24–25, at the Industrial College of the Armed Forces dustrial College of the Armed Forces, Fort McNair, Washington, D.C.

The purpose of the meeting is to inform industry of the military requirements for new concepts, methods and devices for early detection and neutralization of land mines; also, to invite industry to cooperate in efforts to solve urgent problems.

Joint sponsors of the symposium are the Army Chief of Research and Development and the Ammunition Technology Division of the American Ordnance Association (AOA).

Assistant Secretary of the Army (R&D) Robert L. Johnson is programed as the banquet speaker and Chief of R&D Lt Gen William C. Gribble Jr. is scheduled for the keynote address. ICAF Commandant Vice Adm J. V. Smith, U.S. Navy, will give the welcoming address.

Army Chief Scientist Dr. Marvin E. Lasser, program chairman, is on the agenda for introductory comments regarding the scope and the manner in which the classified discussion of the problems is arranged.

Listed first-day briefings will open with "Countermine Problem: An Historical View," by Lt Col Joseph A. Shewski, Office of the Chief of Engineers (OCE), Washington, D. C. "Countermining in Southeast Asia" is the topic of Col Donn A. Starry, Office of the Deputy Chief of Staff for Operations (DCSOPS), HQ DA.

"Marine Corps Countermine Operations" is the subject of Lt Col James M. MacKenzie, U.S. Marine Corps Development Center, Quantico, Va. Capt Wayne L. Zimmerman, head of the Mine Warfare Branch, Office of the Chief of Naval Operations (CNO), Washington, D.C., will speak on "Riverine Mine Countermeasures Operations." "The Worldwide Threat" will be discussed by Lt Col R. E. Bartos, Office of the Assistant Chief of Staff for Intelligence (ACSI), Washington.

Technical Director William B. Taylor of the U.S. Army Mobility Equipment R&D Center (MERDC), Fort Belvoir, Va., will explain the background of R&D efforts to improve countermine capabilities, milestones of progress, ongoing work and scheduled programs.

Other presentations by MERDC personnel include "Mine Detection R&D," James Wallen Jr., chief, Research Division, ID&S Laboratory; "Mine Neutralization R&D," Frederick DeFilippis, chief, Mine Neutralization Division; and "Countermine Systems," Samuel P. McCutchen, chief, Systems Development Office.

"Present U.S. R&D in Mine Warfare" is the topic of Dr. Eugene L. O'Brien, Office of the Project Manager for Selected Ammunition, Picatinny Arsenal, Dover, N.J. "Future Countermine Concepts and Material Requirements," will be given by Col James N. Dingeman, chief, Ground Mobility Division, HQ USACDC and Col Jack G. Becker, CO of the U.S. Army Combat Developments Command Engineer Agency, Fort Belvoir, Va.

Four concurrent sessions on Mine Detection and four on Mine Neutralization are programed Mar. 25. Session chairmen, topics and speakers are:

Session I: Detection of Mines by Surface Manifestations, James Wallen Jr., chief, Research Division, ID&S Laboratory, MERDC, chairman. Mine-Induced Surface Anomalies, Dwight L. Gravitte, Research Division, ID&S Laboratory, MERDC. Thermal Signatures of Mines and

Missile Pioneer Sermonizes

Father Medaris Conducts National Prayer Service

Prayers for the safe return of the Apollo 14 astronauts were expressed or silently passed through the minds of millions of people, but the U.S. Army general who had the lead role in the first U.S. space effort officiated at a National Prayer Breakfast.

Maj Gen John Bruce Medaris (USA, Ret.), now a 68-year-old ordained Episcopal priest with a parish in Maitland, Fla., came to the Pentagon in Washington, D.C., to lead services at which Army Materiel Command CG (General) Henry A. Miley was the host.

When Explorer I became the first U.S. satellite orbited into space Jan. 31, 1958, General Medaris was commanding general of the U.S. Army Ballistic Missile Agency, Redstone (Ala.) Arsenal.

That feat was accomplished in rapid response to the historic launching of Russia's Sputnik I—just 84 days after the Army was given Department of Defense approval to expedite the effort. General Medaris also was responsible for development and deployment of the Redstone and Jupiter missiles.

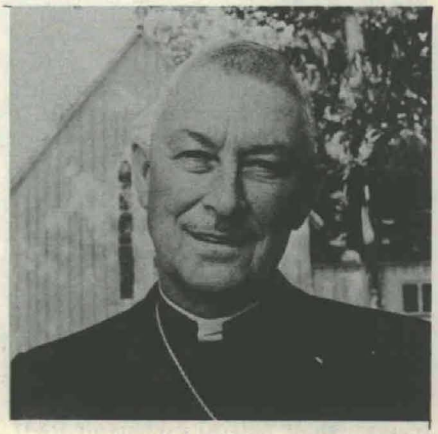
The National Prayer Breakfast was established in 1952 under sponsorship of the U.S. Senate and House Prayer Groups. The purpose is to bring together the leadership of the United States in recognition of the moral and spiritual values upon which the nation is founded. The Reverend Medaris addressed his sermon to this purpose, saying in part:

"If we are to have any renewal of this nation's strength—underlying strength as a nation under God—it must come by the willingness, the readiness of leadership to put God first, the nation second, their families third and themselves way down the list. This is the price of leadership. I submit that anyone unwilling to pay that price is not truly ready to become a leader, or to be a leader.

"With God's help, you, as leaders, can project your own inner conviction and your own sacrifice to the motivation of the people that you lead so that they can feel that the solid undergirdling of belief is certainty. You will find what freedom means, and peace, and you'll get more done than you did before.

"When you are ready to assume that kind of life with God's help, that it is a way out of weakness, then it will undergird your whole life. In quietness and with no great fanfare, your own influence will extend to those about you. They will feel certainty of peace and assurance that comes from your own certainty that God is in His Heaven and all's right with the world, His world, not ours."

When asked why he became a Priest, Father Medaris replied: "I must say the Lord's directives to me in response to my willingness to obey, have been about the clearest instructions I have ever had in my life, and each move has been in response to a very clear urging."



Rev. John B. Medaris

Mine Environments, Joseph R. Moulton, group leader, Imaging Evaluation Group, Night Vision Laboratory, Fort Belvoir, Va. Field Measurements Using a C-Band Microwave Radiometer, George G. Chadwick, vice president, Radiation Systems, Inc., McLean, Va.

Session II: Detection of Mines by Magnetic and Electromagnetic Techniques, Robert L. Brooke, chief, Mine Detection Branch, ID&S Laboratory, MERDC, chairman. Detection of Metallic and Nonmetallic Mines by Lightweight Portable Magnetometer and Flux Gate Arrays, Jack Wenig, chief, Applied Physics Laboratory, Land Warfare Laboratory (LWL), Aberdeen Proving Ground, Md.

Detection of Nonmetallic Mines by Microwaves, Abram Leff, Research Division, ID&S Laboratory, MERDC. Design of Multioctave Bandwidth Radar for Subsurface Target Detection, A. V. Alongi, head of the Applied Electromagnetic Section, Cornell Aeronautical Laboratory, Inc.

Session III: Detection of Mines by Nuclear and Atomic Techniques, Charles N. Johnson Jr., chief, Physical Sciences Branch, ID&S Laboratory, MERDC, chairman. Low-Energy Gamma/X-Ray Scattering, Dr. William Tucker, senior group leader, Nuclear Physics, Texas Nuclear Division, Nuclear Chicago Corp., Austin, Tex. High-Energy Nuclear Techniques, Fredrick L. Roder, Research Division, MERDC; Nuclear Quadrupole Resonance, Robert G. Burton, project engineer, Block Engineering, Inc., Cambridge, Mass.

Session IV: Detection of Mines and Explosives by Trace Gas and Biological Techniques, Dr. Robert Beaudet, associate professor of chemistry, University of Southern California, chairman. Training and Use of Dogs for Mine Detection, Dr. Max Krauss, chief, Biological Sciences Branch, LWL, APG. Trace Gas Detection Schemes, Maryland D. Kemp, Research Division, ID&S Laboratory, MERDC. Trace Gas Sampling, Dr. James Arnold, Varian Associates, Palo Alto, Calif.

Session V: Neutralization of Mines by Mechanical Techniques, Jackson M. Abbott, CDC Engineer Agency, chairman. Mechanical Techniques in Mine Clearing, Joseph F. Kozlowski, Mine Neutralization Division, MERDC. Expendable Mine-Clearing Roller, Don C. Price, manager, Defense Products Teledyne-Monarch Rubber, Hartsville, Ohio.

Impulse Imparted to Targets by Detonation of Land Mines and Protection of Vehicles from Blast Loading, Alex B. Wenzel, senior research engineer, and Peter S. Westine, research engineer, Southwest Research Institute (SRI), San Antonio, Tex.

Session VI: Neutralization of Mines by Explosive Techniques, Dr. James I. Bryant, Physical and Engineering Sciences Division, OCRD, chairman. Neutralization of Mines by Explosive Techniques, James A. Dennis, Mine Neutralization Division, MERDC. Mine Neutralization by the CBU-55/B, Larry H. Josephson, project engineer, Naval Weapons Center, China Lake, Calif.

Session VII: Neutralization of Mines by Other Energy Techniques (Electromagnetic, Acoustic, Magnetic, Laser, Chemical), Dr. William McNeill, acting director, Applied Sciences Laboratory, Frankford Arsenal, Frankford, Pa., chairman. Advanced Mine Neutralization Techniques (Lasers, RF Energy, Chemical Reactions, Pressure, Temperature Shock, Hubert Comminge, Mine Neutralization Division, MERDC.

Minefield Bridging Concepts, Jack T. Stevenson, Mine Neutralization Division, MERDC. Optimum Direct Attack System Using High-Velocity Projectiles, John S. Howland, manager, Engineering Studies Division, Foster Miller Assoc., Waltham, Mass.

Session VIII: System Approach to Countermine Problem, Manfred Gale, STANO scientific adviser, HQ DA, chairman. Mine Countermeasures System Synthesis, Robert N. Hendry and Martin F. Massoglia, senior analysts, Research Triangle Inst., Durham, N.C.

Investigation of Possible R&D Approaches Against Mines and Booby Traps, Ted C. Buckley, operations research analyst, Naval Ship R&D Laboratory, Panama City, Fla. Thermal Imaging Mine Detection System, John A. Christians, chief, Systems Management Division, MERDC.

Army-University Effort Yields Promising Oral Vaccine

Development of a promising oral typhoid vaccine has climaxed more than six years of joint research by a U.S. Army microbiologist and a faculty member of the University of Maryland School of Medicine.

Dr. Morton Reitman of the U.S. Army Biological Defense Research Center at Fort Detrick, Md., began working with the live typhoid vaccine in 1952, when he first isolated and developed the vaccine strain. He is a principal investigator in the Medical Sciences Laboratories.

In 1963 the work developed to the point where the vaccine was provided to the University of Maryland School of Medicine to be tested in man. Dr. Richard B. Hornick, director of the Division of Infectious Diseases at the university, and colleagues initiated further studies that showed the vaccine was safe for human use.

In the meantime work to improve the vaccine was continued and in 1969 it was discovered that addition of sodium bicarbonate increased potency.

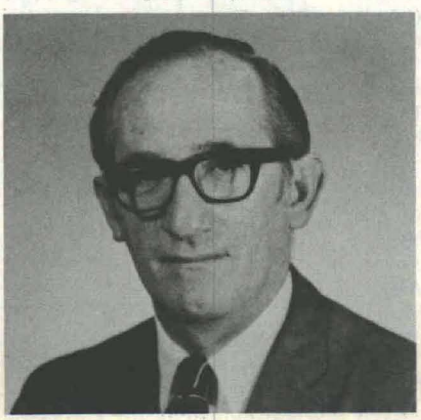
In the 1969–70, as reported recently in the *Journal of the American Medical Association*, Dr. Herbert L. DuPont, a Maryland University staff member, and Dr. Hornick orally administered the living streptomycin-dependent typhoid bacterium vaccine to 30 healthy adult male volunteers from the Maryland House of Corrections.

A month and a half after the 30 volunteers received the oral vaccine, they were exposed—along with 26 additional volunteers who had not been given the vaccine—to an infective dose of virulent typhoid bacilli. Of the 30 who were vaccinated, 25, or 83 percent, were protected against a typhoid dose that produced illness in 50 percent of the 26 not vaccinated.

Probable advantages of a live oral vaccine over a parenteral one, as anticipated by researchers, include a minimization of local and systemic postvaccine reactions; direct stimulation of the local intestinal immune reaction; and, generally, better immunization against proliferation of the virulent typhoid organism.

Because of the favorable results of the first experimental test, researchers believe that the vaccine should be employed in field trials to evaluate its effectiveness against naturally acquired typhoid fever. They are working to determine the best number of doses, how much vaccine each dose should contain, and the best interval between doses?

When these questions are answered, it is hoped that a living vaccine for typhoid fever will be available for use in man that will provide more effective protection than the chemically killed vaccines that have been used for the past 70 years.



Dr. Morton Reitman

Contributions Presaging Space Age Cited

Dr. Bomke Credited With Advancing State-of-the-Art

With the eyes of the world focused on the Apollo 14 manned exploration of the moon early in February, contributions of Dr. Hans A. Bomke of the U.S. Army Electronics Command to the knowledge that makes space voyages possible assumed importance.

"Man-made Extremely Low-Frequency Phenomena in the Ionosphere and Exosphere" is Dr. Bomke's recent technical publication. Among more than 70 that have appeared in prestigious journals or books during his distinguished career, it is in *Aerospace Research and Development*, a recent publication.

Published by the American Astronautical Society as Volume 24 in the Science and Technology Series, *Aerospace R&D* is a compilation of articles by many of the nation's acknowledged leaders in advancing the state-of-the-art for space exploration. All of the authors were carefully selected by the American Astronautical Society.

Edited by Dr. Ernst A. Steinhof, with a foreword by Lt Gen Donald L. Putt (USAF, Ret.) and an introductory paper by Dr. Wernher von Braun, the book was dedicated to German-born Dr. Adolf Baeumker to honor his 75th birthday.

In a rather long and impressive list of Electronics Command scientists who have achieved international renown, Dr. Bomke has enjoyed many deeply rewarding experiences as an ECOM employe since 1952. Few, if any, U.S. Army scientists have had a career that has been as closely associated with many Nobel Prize winners.

Working with the ECOM Institute for Exploratory Research, Dr. Bomke has achieved worldwide recognition with numerous spectacular "firsts" in scientific achievement.

Among his more important committee memberships are Astrophysics Board of the National Science Foundation and chairman of the Ionization subcommittee of the Army Materiel Command NWER/T (Nuclear Weapons Effects Research and Testing) Committee. He has served as U.S. Army delegate to COSPAR (Committee on Space Research—of which the U.S. adherant is the Space Science Board of the National Academy of Sciences) and various other international groups.

During the 1962 U.S. nuclear tests, Dr. Bomke directed Defense Atomic Support Agency Project 6.5E. Two years later, in a study of the sustained effects of a hydrogen bomb explosion on the ionosphere, he collected information from ionospheric and geomagnetic stations in Australia, New Zealand, Japan, India, South Africa and various European nations.

Based upon his findings, Dr. Bomke published a technical paper that is credited with stimulating new concepts on the latent effects of an H-bomb explosion on the ionosphere.

In 1966 he led an Institute of Exploratory Research team to Peru to observe the magnetic effects of the Nov. 12 total solar eclipse. Two published papers report on results of this team effort. New facts were presented on the E-layer recombination coefficient; also, the determination of the contributions of solar X-rays and solar extreme ultraviolet rays to E-layer formation.

Dr. Bomke's most recent technical paper, "An Eclipse Study of Soft X-ray Distribution Over the Sun and the Relative Contributions of X-rays and Ultraviolet to E-Layer Formation," is scheduled for early publication in the *Journal of Geophysical Research.*

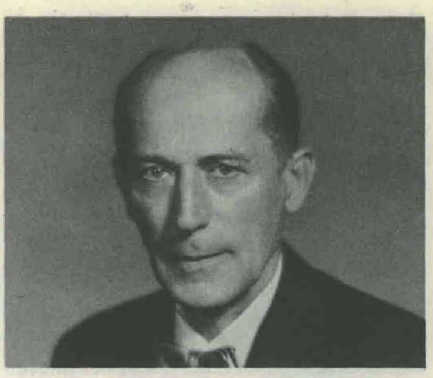
Dr. Harold A. Zahl, who retired in January 1966 as ECOM director of research—but has been called back often to serve as a consultant—interviewed his long-time friend and scientific associate for a recent article in a New Jersey newspaper. One of Dr. Zahl's questions was about famous persons with whom Dr. Bomke had worked during his career.

Looking back upon the beginning of that career, following graduation in 1933 with a doctorate from the University of Berlin, where he studied physics, medicine and mathematics, Dr. Bomke replied:

"People I have known, and many I have worked with, include Niels Bohr, Otto Hahn, Friedrich Paschen, Max Planck, Max von Laue, Erwin Schroedinger, Arnold Sommerfeld, Hans Geiger, Abraham Joffee, George Gamow, Sir Francis Simon, Sir Charles Wright, Sir Hubert Wilkins, Walter Nernst, Johannes Stark, Sidney Chapman, Julius Bartels, Walter Friedrich, Bengt Edlen, The Swedberg—I could go on and on."

Dr. Bomke's association with the military, in his native Germany and in the United States since he first became an employe of the U.S. Air Force in 1947 at Wright-Patterson Air Force Base, Ohio, would permit him to list a similarly long line of distinguished leaders.

Three of the most famous would be Dr. Baeumker, wartime Chief of Research and Development for the German Air Force, Dr. Wernher von Braun and General Walter Dornberger of Peenemunde, where Germany developed the world's first long-range warhead rockets.



Dr. Hans A. Bomke

In Germany, as World War II origins closed in to the climax, Dr. Bomke became a research associate of Nobel Prize winner Otto Hahn, discoverer of uranium fission. While Dr. Bomke was aware of the potential of the atomic bomb, his early wartime research was directed more to scientific than to military objectives.

Accordingly, up to mid-war, his efforts leaned more to the abstract—to producing a U–235 enriched uranium for use in testing chain-reaction feasibility. Unaware of progress being made by the United States Manhattan Project to develop the A-bomb, the German military called upon Dr. Bomke in 1943 to direct his talents more closely to military problems.

Consequently, in rapid succession, he worked on shaped charges in the Ammunition Department, then on microwaves—the latter spurred as German intelligence gradually learned of scientific wonders being achieved by the Allied Powers in this field—many of them by the U.S. Army Signal Corps.

Following World War II ending of hostilities, Dr. Bomke joined the staff of the University of Munich where he worked on radium therapy of cancer and, later, on microwave technology.

The U.S. Air Force then brought him to the United States and five years later the U.S. Army "proselytized" him for the beginning of his career at the Fort Monmouth (N.J.) Signal Corps Laboratories.

Dr. Zahl, to whom the editor of the *Army R&D Newsmagazine* is indebted and properly appreciative for the information upon which this article is based, queried Dr. Bomke regarding how many of the scientists with whom he has worked are listed among Nobel Prize winners.

"Nine," he replied—rather impressive, in itself, for an Army scientist.

AMMRC Develops Transparent Armor Material by Controlled Pressure Sintering

Transparent magnesium aluminate spinel specimens have been produced by pressure sintering in a vacuum during research to develop lightweight ceramic armor materials at the U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, Mass.

Experimentation with various ceramic oxides having cubic crystal structures has enabled Dr. Sunil K. Dutta and George E. Gazza to produce the specimens at moderate temperature and low pressure without using additives to promote sintering.

They report that two critical factors in producing transparency involve use of high-quality starting powder, and controlling the pressure sintering cycle to eliminate entrapment of porosity within the grains.

The die material used is principally graphite, but a molybdenum sheet liner and discs minimize a carbon reaction with the spinel powder to be sintered.

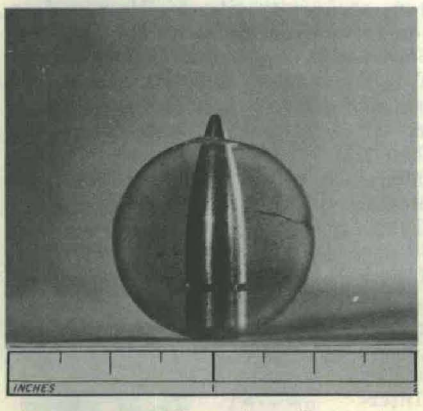
Controlled pressure sintering procedures yield specimens of ultrafine grain. This may result in enhanced strength as indicated from known strength-grain size relationships for ceramic material.

Investigators believe that future studies of pressure sintering kinetics and characterization of the starting powders will show that scale-up of the process is highly feasible as a means of providing the Army with a lightweight, transparent ceramic for use in the transparent armor field.

Other anticipated practical uses include vision blocks for ground vehicles, aircraft windows, and infrared windows in heat-seeking rockets.

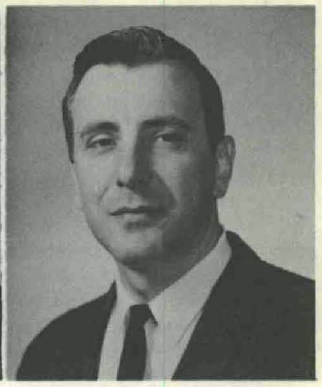
Dr. Dutta is the team leader in ceramics at the AMMRC Development and Engineering Laboratory. Author or coauthor of 11 technical papers, he holds three patents involving processing of transparent ceramic materials.

In 1968 he started his AMMRC career as a senior research ceramic engineer, following more than a year as a post-doctoral fellow in physical ceramics at Lehigh University. There he was involved in processing and fabrication of fully dense ceramic bodies of high strength for structural purposes, in a program sponsored by Army Research Office-Durham, N.C.



Transparent Magnesium Aluminate Spinel by Controlled Pressure

Dr. Sunil K. Dutta



George E. Gazza

Dr. Dutta earned BS and MS degrees from the University of Calcutta, and a second MS degree followed by a doctorate from the University of Sheffield, England.

George Gazza joined the staff of the AMMRC Ceramics Research Laboratory in 1965 and has concentrated on pressure sintering of ceramics and development of ceramic powder processing techniques. He has authored or coauthored 12 technical papers and has five patents on ceramics.

He has a 1955 BS degree in metallurgical engineering from New York University and has continued graduate studies at Polytechnic Institute of Brooklyn and at Northeastern University in Boston, Mass.

Following employment with the Weston Electrical Instrument Corp. (1955–57) in Newark, N.J., he served two years with the U.S. Army's Watertown Arsenal Laboratories (predecessor of AMMRC). He remained at Watertown as a civilian employe and has continued his high-temperature materials studies on graphite and refractory metals.

NLABS Act on Presidential Product Development Order

Procedures for providing selected technical information to the general public regarding useful products resulting from U.S. Government research and specification development work are the goal of a 9-month pilot program announced in January.

President Nixon assigned this task to the U.S. Army Natick (Mass.) Laboratories, under provisions of Executive Order 11566, in October 1970.

The Natick Laboratories, a part of the U.S. Army Materiel Command, are recognized as the Department of Defense activity with the broadest range of involvement in products useful to military personnel and civilians —food, clothing and general supplies.

Technical information provided to the public under the conditions set forth in Executive Order 11566 will include research and development reports acquired by federal agencies during the procurement specifications and standards development process. All of these agencies have been directed to cooperate with NLABS in completing the pilot program.

The President's order also established a Consumer Product Information Coordinating Center, under the General Services Administration. The center will make available to the public the selected product information through Federal Information Centers of GSA and other local and regional U.S. Government offices.

The rationale of the Executive Order is that product information useful to the public, as accumulated during research, development and procurement activities of federal agencies, is in the public interest.

Consequently, there is a responsibility to provide this information to the public and to other government agencies in a manner that is useful to consumers, fair to producers and vendors, and protective of government procurement processes.

Government purchases from private industry of a wide variety of consumer products require development of extensive documents, reports and other informaton for evaluating products. Sharing this information to help the consuming public is thus viewed as an obligation and an opportunity to be of service to taxpayers.

The Presidential Committee on Consumer Interests is charged with over-all direction of the program, to provide continuing policy guidance.

NLABS Scientist Clarifies Purpose of Research on Spores

Research scientists and inventors have in common the task of performing, as a normal requirement, a great deal of preliminary or exploratory experimentation to achieve the desired result or knowledge for potential application to productive use.

In varying degrees of magnitude and variance of the dialogue, the story has been oft repeated about how Thomas Edison was asked how long it took him to invent the incandescent light bulb—and his reply that he had performed thousands of tests of materials and concepts.

"Does that mean you failed that many times?"

"No, merely learned by that many approaches to find the right one."

From the U.S. Army Natick (Mass.) Laboratories comes a memorandum that serves to reemphasize the point of the Edison story—in research the ultimate objective invariably is preceded by a long line of searching to fill the storage bin of knowledge essential to success.

In a memorandum to Dr. G. R. Mandels, deputy director of Life Sciences, Pioneering Research laboratory, H. S. Levison, head of the PRL Bacteriology Group, answers this question:

"Why use *Bacillus megaterium* spores, rather than *Clostridium botulinum* spores to NLABS basic research on spores?

The question arises because bacteria-produced spores are the cause of spoilage of preserved foods, can cause some disease, and must be eliminated as contaminants of bandages, drugs and other medical supplies.

Bacterial spores are the most resistant living things to heat and disinfectants. Therefore, all sterilization and other prevention methods if they are successful must kill or receive bacterial spores. Determining how to do this is not an easy task. There is a continuing need to develop effective practical methods.

If one concedes that the Pioneering Research Laboratory mission of performing basic research is a legitimate one for an Army Laboratory, and if one further concedes that the Army is prepared to support fundamental work on bacterial spores, then the choice of microorganism rests on several factors. These factors include: extent of previous knowledge of physiology and morphology of the organism; the ease with which the organism can be handled; and prospects for fruitful basic results with the selected organism.

Findings with one organism are almost invariably useful in interpreting the physiological reactions of other species, and, regardless of the organism used, studies which point the way for future work are significant.

The use of model organisms is a widely accepted and proven practice in biology. Studies with *Pneumococcus*, with *Escherichia coli*, and with bacteriophages have formed the basis for almost all of modern molecular biology.

Studies such as these have led to an understanding of gene structure, the synthesis of protein, gene replication, cellular regulatory mechanisms, and the genetic code in a wide variety of organisms up to, and including, mammals.

Investigations on the fruit fly, *Drosophila*, over the past 50 years, have produced much of the current knowledge and techniques basic to an understanding of genetics, speciation, and evolution.

Studies with sea urchins, and other echinoderms, have led to a broad understanding of the process of egg fertilization and the role of membranes in that process.

The model organisms for all of these studies *were chosen, in large part*, for their ready susceptibility to experimental manipulation and economy and safety in lab operations.

Similarly, a basic understanding of the dormancy and resistance of bacterial spores, of the conditions under which dormancy is broken and vegetative growth (with protein synthesis) is initiated, and of the differentiation of the bacterial cell so as to form a resistant organism, may be obtained through a study of any of many different spore-formers.

Bacillus megaterium is superior to *Clostridum botulinum* as a model of a spore-former, in that the body of existing knowledge of *B. megaterium* (and other aerobes) is manyfold more extensive than that of *C. botulinum* regarding physiology, morphology, and the differentiation process.

B. megaterium is more easily manipulated in that its spores are more easily produced and on less complex media than are spores of *C. botulinum*. Anaerobic conditions are not required for growth of *B. megaterium* nor does it require the safety precautions related to toxin production by *C. botulinum*. These are their major metabolic differences.

Many important properties, however, are common to *C. botulinum* and

Albright Succeeds Tabor as STRATCOM Deputy CG

Brig Gen (Maj Gen designate) Jack A. Albright became deputy CG of the U.S. Army Strategic Communications Command (STRATCOM), Fort Huachuca, Ariz., when Brig Gen Harry E. Tabor retired Jan. 31.

General Albright also succeeded General Tabor as CG of STRATCOM's Army Communications Electronics Engineering Installation Agency (CEEIA).

Since June 1969 General Albright has served as deputy CG of STRATCOM-Pacific's 1st Signal Brigade, Southeast Asia.

In 1965, he began a 4-year assignment as commander of the White House Communications Agency (WHCA). With the Defense Communications Agency (1963–65), he served as secretary to the Military Communications Board.

General Albright has served in key positions with the Office of the Chief Signal Officer, HQ DA, the Continental Army Command, and the 304th Signal Battalion, Republic of Korea.

He has a military science degree from the University of Maryland, a master's degree in business administration from George Washington University, and has attended the Advanced Signal Officer Course, Command and General Staff College, Armed Forces Staff College, and Armed Forces Industrial College.

Among his awards and decorations are the Distinguished Service Medal, Legion of Merit, Bronze Star Medal (with OLC), Air Medal (w/3OLC) and Army Commendation Medal.

A native of Shelby County, Memphis, Tenn., General Albright joined the Army in 1939 and was assigned to Hickam Field, Hawaii. After the attack on Pearl Harbor, he attended the Signal Corps Officer Candidate School, graduating as a second lieutenant in June 1942.

His first assignment as an officer was in Key West, Fla., with the 123d Signal Radio Intercept Company, engaged in signal interception and direction finding of German U-boats.

Brig Gen Jack A. Albright

B. megaterium especially as related to dormancy and to resistance:

- Spores, the resistant forms, of both species are formed within a vegetative cell (a sporangium) that has reached a certain stage of development and is faced with nutritional deficiencies, i.e., both species have the genetic capacity to form endospores.
- Spores of both species (and indeed all bacterial spores) contain relatively large amounts of the spore-specific compound, dipicolinic acid, and this compound is excreted on spore germination.
- Spores of both species contain relatively large amounts of calcium, and lose calcium on germination.
- Spores of both species are refractile, and lose it on germination.
- Spores of both species are characterized by a low level of metabolic activity, and become metabolically active on germination.
- Spores of both species are resistant to such adverse environmental influences as heat, ionizing radiation, desiccation, and toxic chemicals; they lose this resistance on germination.
- Spores of both species may be more readily germinated by application of a sublethal heat-treatment (i.e., activation).
- In both species, germination is a necessary prerequisite to vegetative growth and to the synthesis of certain proteins and nucleic acids.

The validity of our selection of *B. megaterium* as the experimental organism has been reinforced by the fact that the techniques and principles derived from its use are being applied to *C. botulinum* in the Food Laboratory.

Included are such applications as investigation of protein (toxin) synthesis by "dead" (nonproliferating) *C. botulinum* spores; combination of radiation, followed by heating, in the inactivation of spores; sequence of events during germination of *C. botulinum* spores by methods developed with *B. megaterium* for estimation of germination, such as changes in stainability, loss of refractility, loss of dipicolinic acid and of heat resistance.

One rationale for investigation of bacterial spores lies in their high resistance to heat and to other adverse environmental influences with the concomitant problem of destroying these forms (especially *C. botulinum* spores) during food preservation.

This factor, however, does not constitute the sole basis for military interest in spores. Knowledge of spores is also of relevance in many cases in which *C. botulinum* is not of overriding importance.

Spores and spore-forming bacteria are also important in the sterilization of pharmaceuticals (drugs, biologicals), bandages, hypodermic syringes, etc. Knowledge of spores is important to an understanding of the pathogenesis, diagnosis, and treatment of certain diseases caused by spore-formers, e.g., anthrax (*B. anthracis*), gas gangrene (*C. perfringens*), and tetanus (*C. tetani*).

Spore-formers, when used as biological insecticides, avoid the environmental pollution entailed in the widespread use of chemical insecticides (e.g., *B. thuringiensis* vs. a wide range of lepidopterous insects, and *B. popilliae* vs. the Japanese beetle).

Spore-formers are important also in the anaerobic decomposition of sewage, e.g., *Methanobacterium omelianskii* (which converts carbon dioxide to a usable fuel, methane) and *Clostridium* spp. (which are useful in the anaerobic decomposition of cellulose, perhaps the most abundant waste product in nature).

The Pioneering Research laboratory, U.S. Army Natick Laboratories, is the only Department of Defense laboratory conducting a basis research program on bacterial spores. It would be inappropriate, therefore, to limit such research to problems with food applicability or to an organism that is mainly of food interest.

The extensive background of information on *B. megaterium*, taken together with the probability of obtaining more information more rapidly and with great economy of effort with this organism, make it preferable to *C. botulinum* for basic research in spore resistance and spore physiology.

Shoulder-Fired Dragon Scores Redstone Hit

Armed with a high-explosive warhead for the first time for firing from a man's shoulder during a development test at Redstone (Ala.) Arsenal, a Dragon antitank missile recently scored a direct hit on a stationary target.

Dragon missiles with live warheads previously were fired from fixed launchers with no man in the loop, the Army said in terming the test a milestone success. Earlier manned firings were accomplished with inert warheads which carried telemetry equipment. More advanced testing is scheduled at Redstone Arsenal, including firings at moving targets.

The shoulder-fired Dragon, weighing less than 30 pounds, uses an automatic command-to-line-of-sight continuous guidance system by which corrective signals are transmitted through a wire link. A soldier aims through a telescopic sight, launches the missile and holds his sight on the target until impact.

Dragon is far superior in accuracy and lethality to the 90mm recoilless rifle it will replace, test teams report.

The Dragon development program is managed by the Army Missile Command at Redstone Arsenal under Col Robert D. Funke, project manager and his civilian deputy, Allan Platt. The Army Munitions Command at Dover, N.J., is developing the warhead under the management of Mike Esposito.

MERDC Scientist to Study Under SARS Fellowship

Recognition of his outstanding potential for development into one of the U.S. Army's high-ranking scientists came recently to Karl H. Steinbach, 42, with the award of a Secretary of the Army Research and Study Fellowship.

Since he emigrated to the United States from his native Germany in 1959, Steinbach has been employed at what is now the U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va. He has been chief of the Research Division of the Intrusion, Sensor and Detection Laboratory since 1967.

Among various honors he has been accorded for his work is a 1969 Army R&D Achievement Award. That award was based on his work in electromagnetic pulsing technology and nuclear weapons effects; also, for rapid development and fielding in Vietnam of prototype devices for detection of mines and of the enemy in ambush or tunnels.

Karl H. Steinbach

Under the SARS Fellowship grant, Steinbach will pursue advanced studies and research on intrusion and detection device technology in Germany and the United States over an 8-month period. His work will involve other problems of electromagnetic wave propagation and radars.

Born and educated in Germany, he received a BS degree in physics from the University of Bonn in 1951 and an MS degree from the University of Munich in 1953. He was employed by Telefunken in Germany from 1953 to 1959 and has been working on his PhD thesis since 1962.

Army Nominates 6 Employed in R&D for Annual Federal Woman's Award

Tributes to her as one of the nation's top meteorologists, a reputation achieved during a 29-year career in U.S. Army research and development, were expressed by high-ranking leaders when Mrs. Frances Whedon was honored prior to retirement Jan 2.

Mrs. Whedon is one of six Department of the Army nominees for the 11th Federal Woman of the Year Award.

Chief of Research and Development Lt Gen William C. Gribble Jr. and Army Director of Research Brig Gen George M. Snead Jr. were among dignitaries who sounded the praises of Mrs. Whedon at a retirement luncheon in the Fort Myer Officers Club.

General Gribble presented her a "memory book" containing testimonial letters and pictures of the many top R&D leaders Mrs. Whedon served during her distinguished career.

Maj Gen Walter E. Lotz Jr., CG of the Army Electronics Command and a former Director of Army Research, paid his respects by sending an ECOM shield plaque. Former Assistant Director of Army Research Col (USA, Ret.) Thomas C. Chavis, now an industrial executive in New Jersey, was among more than 50 well-wishers at the luncheon.

Mrs. Whedon started her Civil Service career in February 1942 as a meteorologist in the Office of the Chief Signal Officer. In August 1959 she transferred from that office to join the staff of the Army Research Office, Office of the Chief of Research and Development.

Until her retirement, she was the Army member on the Interdepartmental Committee for Applied Meteorological Research (ICAMR), the Interdepartmental Committee for Atmospheric Sciences (ICAS), and the NATO Group on External Ballistics.

For more than 20 years she served as the principal scientist assigned technical responsibility for formulation of the Department of the Army program guidance in meteorological research and development.

In addition to consulting with U.S. Air Force and Navy meteorologists to fulfill Army operational weather support requirements, Mrs. Whedon obtained the cooperative capabilities of meteorologists in Europe, the Far East, Latin American and South America in solving weather problems.

Graduated from Massachusetts Institute of Technology with an SB degree in physics in 1924, she continued throughout her career to add to her professional stature by completing advanced courses in meteorology and related fields, including courses over a 7-year period in radio and TV.

Joyce L. House

Joyce I. Allen

Vilma B. Harper

Cleo S. Cason

Frances Whedon

Miriam H. Thomas

Known as an effective and prolific writer, she prepared numerous program, policy and guidance documents directed toward the short- and long-term requirements of the Army, joint defense and other federal government agency staffs.

In 1946 and again in 1962 she was awarded the Army Decoration for Meritorious Civilian Service, and has been the recipient of outstanding performance awards and other honors.

Mrs. Whedon's retirement plans call for continued residence at her home in Annandale, Va.. and courses to develop her interests in sculpture, art appreciation and the French language. Army R&D leaders indicate she may be pressed into service as a meteorological consultant.

MISS JOYCE I. ALLEN, a GS–14 supervisory attorney, Office of the Command Staff Judge Advocate, U.S. Army Aviation Systems Command, St. Louis, Mo., offers impressive credentials to support her nomination for the 11th Federal Woman of the Year Award.

Miss Allen entered Federal Civil Service in 1952, four years after graduation from the University of Wyoming College of Law with a doctorate in jurisprudence and has been an Army employee since that time.

The first four years, in the Army Finance Center and later in the Army Procurement Office, Frankfurt, Germany, started her on the road to becoming an expert on defense procurement management. She completed the U.S. Army Logistics Mangement Center's defense procurement management course in 1957 and the ALMC advanced course in 1969, 10 years after completing the Judge Advocate General's procurement law course.

In November 1969, she was honored with the Woman of the Year award of the Downtown Business and Professional Women of St. Louis. Her job capability is attested by successive Outstanding Performance Ratings since 1967.

AVSCOM Employe of the Year distinction in the professional and scientific category was conferred upon her in February 1970. The following month she received the Federal Civil Servant of the Year (professional and scientific category) award from the Federal Personnel Council of Greater St. Louis.

AVSCOM procurement responsibilities involve expenditure of approximately $500,000,000 annually (1969–70) and Miss Allen is the legal adviser on all aircraft engine procurement. This encompasses development, production and modification contracts,

procurement of components and spare parts, training support and technical publications.

In her work she supervises five attorneys who are legal advisers on AVSCOM procurement of the AH–56, CH–34, CH–37, UTTAS, Air Cushion Vehicle, U–21 and RU–21 aircraft.

Miss Allen uses crutches to move about her duties and does not regard that as a serious physical handicap. She is active in numerous civic and professional organizations, in charitable fund drives, and in AVSCOM National Employ the Physically Handicapped Week activities.

Among her professional affiliations are memberships in the Missouri, Wyoming and the American Bar Associations, the American Judicature Society, the Bar Association of Metropolitan St. Louis, and Federal Bar Association.

VILMA B. HARPER's nomination for the Federal Woman of the Year Award is based upon her progress from a GS–2 mail clerk at Fort Eustis, Va., in January 1952 to deputy division chief and GS–14 supervisory specialist, U.S. Army Computer Systems Command, Fort Belvoir, Va. The promotion to her present position in August 1970 followed a year of outstanding performance as project officer for the computer system known as COSMOS (Centralization of Supply Management and Operations).

Mrs. Harper has served as Computer Systems Command spokesman during the conceptual development stages of such projects as TAMMS (The Army Maintenance Management System) and TAADS (The Army Authorization Documents System).

Currently, as a deputy division chief, she is responsible for coordinating six major ADP projects. In addition to COSMOS and TAADS, they are 3S (Standard Supply System supporting the U.S. Army in the Pacific); TASCOM (S), the supply system supporting the U.S. Army in Europe; ASMIS (A), which provides automated support to military personnel accounting below HQ Department of the Army; and the IFS (Integrated Facilities System), which will provide support for real property management Army-wide.

Other ADP systems in which she has taken a developmental role, according to her superiors, include The Army Equipment Records System.

JOYCE L. HOUSE is the nominee of the U.S. Army Behavior and Systems Research Laboratory, Office of the Chief of Research and Development, for the 11th annual Federal Woman of the Year Award.

"Junior in years and senior in achievement" is the tribute to her success during the period since she became a research psychologist and project director with BESRL—after serving in a similar role (1966–68) with the U.S. Army Institute of Environmental Medicine at Natick, Mass.

Miss House started her Federal Civil Service career at Natick soon after she obtained her master's degree in experimental psychology in June 1966 from the University of Delaware. She earned her BA degree in 1964 from William and Mary College.

While at the USARIEM she was credited with "important scientific contributions to our understanding of the effects of hypoxia (based) on an extensive series of performance tasks in Infantrymen." Her achievements were recognized with Outstanding Performance Ratings.

Similar success followed quickly after she joined the BESRL staff. She was elected to membership on the Committee on Professional Activities and is now chairman. She is described in planning her work and accomplishing it as "ingenious, creative and thorough."

Results of two research projects she planned and implemented have been published. Data analysis of a third project is in an advanced stage.

In carrying out her responsibilities she traveled to many U.S. and foreign installations, including United Nations headquarters, for "intensive examination of procedures used in their Interpretation Section, so as to obtain information that might facilitate solution of the sponsor's problem."

A further tribute states: "No such approach or determination of critical

(*Continued on page 20*)

MECOM Announces Assignments of Deputy CO, CofS

HQ U.S. Army Mobility Equipment Command, St. Louis, Mo., has announced assignment of Col F. L. Worthington as the new deputy commander and Col Daniel B. Cullinane Jr. as chief of staff.

Col Worthington recently completed his second tour of duty as chief of the Construction Division, Engineer Battalion, HQ USARV and chief of the Construction Division, Engineer Command (Provisional USARV). He is a 1945 graduate from the United States Military Academy.

Col Cullinane, who succeeded Col George Forsyth upon his retirement, was until reassigned to MECOM the deputy commander of the 13th Support Brigade at Fort Hood, Tex. He is a 1943 U.S. Military Academy graduate.

Col Worthington's military career has been principally in Corps of Engineer assignments, including 1966–69 duty as commander of the 23d Engineer Battalion and later the 555th Engineer Group, U.S. Seventh Army.

In addition to engineer assignments in the Far East and Europe, he has served in the Seattle Engineer District, as resident engineer at the U.S. Military Academy, executive officer of the 70th Engineer Battalion at Fort Campbell, Ky., and in Washington, D.C., in the Office of the Chief of Engineers and the Office of the Deputy Chief of Staff for Operations.

Col F. L. Worthington

Col Daniel B. Cullinane Jr.

Col Worthington earned his master's degree in civil engineering at Texas A&M and a second master's in international relations from George Washington University. He is a graduate from the Command and General Staff College and the Army War College. His honors include the Legion of Merit (with 2 OLC), Army Commendation Medal (with 2 OLC) and Vietnam Commendation Medal.

Col Cullinane's foreign service includes 1943–45 duty with the 20th Armored Infantry Battalion, 10th Armored Division; Far East Command duty in Tokyo, Japan; an assignment as assistant military attache, Baghdad, Iraq; adviser, Argentine War College, Buenos Aires; and Secretary General Staff, I Field Force, Nha Trang, Vietnam.

His stateside assignments include assistant chief of staff, Intelligence, War Department General Staff, executive officer, 3d Battalion, 33d Armor, Fort Knox, Ky.; 67th Armor, 2d Armored Division at Fort Hood and Germany.

Col Cullinane holds the Silver Star, Legion of Merit, Bronze Star Medal, Combat Infantryman Badge, Meritorious Service Medal and the Army Commendation Medal.

Army Nominates 6 in R&D for Federal Woman's Award

(*Continued from page 19*)

factors in the system's operation—and how it hinged on the skill in question—had ever before been attempted. . . . The complexities involved in executing the projects cited . . . were of a discouraging magnitude. . . ."

MIRIAM H. THOMAS is a candidate for the Federal Woman Award based upon more than a quarter century of "significant contributions to a broad and continuing program to assure the nutritional reliability of U.S. Armed Forces rations and food packets." She is employed at the Army Natick (Mass.) Laboratories, where she has served in research since 1945.

Mrs. Thomas started her research on nutritional adequacy of diets through animal feeding tests while she was at the University of Chicago, where she obtained an MS degree in 1942. Her BS degree in chemistry was awarded by Bennett College, Greensboro, N.C., in 1940.

Crediting by her supervisors with maintaining "a very high interest in and devotion to her scientific field," Mrs. Thomas has been recognized with six Excellent and three Outstanding Performance Ratings, the latest in October 1969. In 1968 she was selected by the Department of State as U.S. candidate for a one-year United Nations science fellowship to Israel.

Throughout her Federal Civil Service career, Mrs. Thomas has gained a reputation for providing "high-quality nutritional assistance to other Governmental agencies such as Civil Defense, NASA, Advanced Research Projects Agency, and the U.S. Department of Agriculture. . . ."

The documentation supporting her nomination also states that "she is widely known and admired by her fellow scientists . . . and never fails to give generously of herself to worthy causes, both at her place of work and in the community. . . ."

CLEO S. CASON, a GS–13 supervisory librarian in the physical sciences and engineering field, is the U.S. Army Missile Command nominee for Federal Woman of the Year.

Mrs. Cason studied liberal arts at North Georgia College in 1926–27, resumed her education at Chicago School of Law in 1946, and was awarded an LLB degree in 1949. The small MICOM technical library she established in 1949 has achieved the status of being the largest of its kind in the Army, with more than 1,250,000 books, documents, films and bound journals.

MICOM's statement supporting Mrs. Cason's nomination points to her reputation as being one of the best-informed librarians in her field, as attested by requests for her services as a consultant from agencies in many parts of the nation.

In 1962, the technical library was incorporated as the nucleus of the Redstone (Ala.) Scientific Information Center, under a joint funding agreement between the Missile Command and the George C. Marshall Space Flight Center.

Mrs. Cason's responsibilities incident to creation of the center included the establishment of specialized branch libraries in five locations where demand for specific types of information was found to be greatest.

"This one innovation," MICOM reports, "has saved countless hours of valuable time of scientists and engineers" by eliminating the need to travel to the main library.

Since 1951 she is credited with continually enriching her professional knowledge by taking advanced courses in library science, management techniques and the physical sciences at the University of Alabama, University of Chicago, Western Reserve U., George Washington U., and Florence State College (Ala.).

Mrs. Cason was awarded the Army Decoration for Meritorious Civilian Service in 1970 and has received three Outstanding and Sustained Superior Performance Ratings. In 1961, she was nominated by MICROM as "Woman of the Year." She is listed in *Who's Who in the South and Southwest, Who's Who of American Women, Who's Who in Library Service,* and in the *1969 Royal Blue Book of London* (leaders of the English-speaking world).

STRATCOM Designates Ballard as Director of ATSO

Appointment of Dr. Geoffrey E. H. Ballard as director, Advanced Telecommunication Sciences Office (ATSO), U.S. Army Strategic Communications Command, is announced by Maj Gen William B. Latta, CG of STRATCOM.

Dr. Ballard joined HQ STRATCOM at Fort Huachuca, Ariz., following employment at Fort Monmouth, N.J., where he was director of the Institute for Exploratory Research, U.S. Army Electronics Command (ECOM). He will guide development, engineering and design of advanced telecommunications systems for use by the Army and the Department of Defense.

In 1964 he entered U.S. Government service with the Army Cold Regions Research and Engineering Laboratory, Hanover, N.H., and two years later was appointed a physical science administrator in the Office of the Director of Research and Laboratories, HQ U.S. Army Materiel Command.

Dr. Geoffrey E. H. Ballard

Dr. Ballard served as a research panel member of the National Academy of Sciences Summer Studies in the Department of Defense in 1968 and later was chief of the Earth Sciences Division until transferred to ECOM in 1969.

Graduated from Queens University, Kingston, Ontario, he earned a PhD degree from Washington University at St. Louis, Mo.

Author of several articles in scientific journals and numerous technical reports, he is a registered professional engineer.

Dr. Ballard is listed in *American Men of Science,* and has been honored with the Army Meritorious Civilian Service Award. He is a member of Sigma Xi, the Geological Society of America, American Society of Civil Engineers, and the Committee on Rock Mechanics of the American Society for Testing and Materials.

SCIENTIFIC CALENDAR

Particle Accelerator Conference, sponsored by IEE, Chicago, Ill., Mar. 1-3.

Nuclear Engineering Conference, sponsored by ASME, Palo Alto, Calif., Mar. 7-10.

Symposium on Biophysical Aspects of Radiation Quality, sponsored by the International Atomic Energy Agency, Australia, Mar. 8-12.

9th Goddard Memorial Symposium, sponsored by AAS, Washington, D.C., Mar. 10–11.

6th Aerodynamic Testing Conference, sponsored by AIAA, Albuquerque, N. Mex., Mar. 10-12.

Photographic Science Symposium, sponsored by SPSE, Toronto, Canada, Mar. 10-12.

Conference on Neutron Cross Section, Knoxville, Ky., Mar. 15-17.

Space Shuttle Development Testing and Operations Conference, sponsored by AIAA, Phoenix, Ariz., Mar. 15-17.

The Splanchnic Blood flow and its Relationship to Experimental and Clinical Shock, sponsored by WRAIR, Washington, D.C., Mar. 16-17.

18th International Meeting of the Institute of Management Sciences, Washington, D.C., Mar. 22-24.

IEEE International Convention and Exhibition, N.Y.C., Mar. 22-25.

2d Annual Environmental Pollution Symposium, sponsored by AOA, Edgewood Arsenal, Md., Mar. 24-25.

International Gas Turbine Conference, sponsored by ASME, Houston, Tex., Mar. 28-Apr. 1.

Conference on Statistical Mechanics, sponsored by ARO-D, Chicago, Ill., Mar. 29-Apr. 2.

Reliability Physics Symposium, sponsored by IEEE, Las Vegas, Nev., Mar. 31-Apr. 2.

Brig Gen Meroney Assigned As WRGH CG; Col Buescher Takes Command of WRAIR

Pinning of the stars of a brigadier general upon William H. Meroney's shoulders Feb. 1 preceded his assumption of command of Walter Reed General Hospital, Washington, D.C.

Col Edward L. Buescher, who was deputy director and deputy commandant of Walter Reed Army Institute of Research under Col Meroney, succeeded him.

Maj Gen Colin F. Vorder Bruegge, CG of Walter Reed Army Medical Center and a former CG of the U.S. Army Medical Research and Development Command, pinned the stars on General Meroney.

General Vorder Bruegge recently succeeded Maj Gen Carl W. Hughes, now CG of Tripler General Hospital in Hawaii and also surgeon, U.S. Army, Pacific (USARPAC). General Hughes served as CG of WRGH and also as acting CG of WRAMC after retirement of Maj Gen Glenn Collins.

General Meroney had served since 1968 as director of Walter Reed Army Institute of Research. Training for his duties as commander of Walter Reed General Hospital began when he served his residency there in 1948–49, after his internship at Bellevue Hospital in New York City.

He received a BS degree from the University of North Carolina and continued studies there in the School of Medicine until 1943. Two years later he was awarded his doctorate by the New York University School of Medicine. As a Fellow in metabolism, he studied at Yale University School of Medicine (1950–52).

General Meroney has been a prolific contributor of reports and articles on his research. He has authored or coauthored 53 publications in professional journals and other media, is in wide demand as a consultant, and has served the Army Surgeon General in this capacity since 1962.

Among his assignments over a 20-year period have been: deputy director, Personnel and Training Directorate, Office of the Surgeon General, 1966–68; chief, Research Division, U.S. Army Medical R&D Command, 1964–65; deputy director, WRAIR, 1961–64; commander, U.S. Army Tropical Research Medical Laboratory, Puerto Rico, 1957–61; chief, Department of Metabolism, Walter Reed General Hospital, 1953–57.

General Meroney is a Diplomate of the American Board of Internal Medicine, Fellow of the American College of Physicians, and is a past president,

Brig Gen William H. Meroney

Col Edward L. Buescher

American Federation of Clinical Research, Washington, D.C., chapter.

Among his numerous professional society affiliations are the Association of Military Surgeons, American Association for the Advancement of Science, American Society for Artificial Internal Organs, and Society for Experimental Biology and Medicine.

COL BUESCHER first reported for duty at Walter Reed Army Institute of Research on Aug. 10, 1954, and has been deputy director since 1969. For two years previous he was director, Division of Communicable Diseases and Immunology at WRAIR, after 12 years as chief, Department of Virus Diseases.

From 1954 to 1956 he was in the Army Medical Service Graduate School at Walter Reed Army Medical Center, following a 3-year tour of duty as chief of the Department of Viruses and Ricksettial Diseases, Far East Medical Research Unit, 406th Medical General Laboratory, Japan.

Col Buescher graduated from the University of Dayton, Ohio, in 1945 and received his medical doctorate from the University of Cincinnati.

Since 1963 he has served at Georgetown University Medical School as clinical associate professor and the past year as clinical professor of pediatrics. In 1965 he was awarded the Gorgas Medal for research on the ecology of acute infectious disease and viral immunology.

Col Buescher is a Diplomate of the American Board of Microbiology, and a Fellow of the American Academy of Microbiology. He is a member of the American Medical Association, American Federation for Clinical Research, American Society for Microbiology, American Association of Immunologists, American Epidemiological Society, and Infectious Disease Society of America.

Since 1960 he has been a consultant to the Army Surgeon General on virology and during the same period has been a member of the World Health Organization (WHO) Study Group, Anthropod-Borne Virus Diseases. For nine years (1960–69) he served the U.S. Public Health Study Section on Virology and Rickettsiology.

Col Buescher served six years (1962–68) on the Executive Council of the American Committee for Arthropod-Borne Viruses. In 1964 he was on the Panel for Microbiology, Office of Science and Technology, Executive Office of the President. He has been a member of the Commission on Virus Infections and associate member, Commission on Influenza, Armed Forces Epidemiological Board since 1965. He is a 4-year member of the Vaccine Development Committee, National Institutes of Health.

1970 Zornig Award Honors APG R&D Center Secretary

Presentation of the 1970 Zornig Award to Mrs. Esther M. Johnson, secretary to the chief of the Signature and Propagation Laboratory at the U.S. Army Aberdeen (Md.) Research and Development Center, was announced Jan. 4.

The Zornig Award, which annually recognizes outstanding individual achievement in technical, administrative, mechanical and related fields, honors the memory of Col H. H. Zornig, who first took charge of ballistics research at APG.

Credited with being largely responsible for establishing the Ballistic Research Laboratories, Col Zornig served as director until 1941.

Mrs. Johnson was first employed as secretary to a BRL branch chief in 1956 and has been in her present position since 1966. She was presented with a gold lapel pin, a certificate citing her for achievement and a small replica of the large Zornig Award Plaque, which is mounted in the main BRL building and engraved with the names of all winners.

Army Research, Development Office Announces Assignments of 12 Officers

Brig Gen Donald D. Blackburn

Col Louis F. Felder

Col Walter A. Dumas

Lt Col Henry C. Evans Jr.

First-hand knowledge of combat conditions in Southeast Asia is among the experience assets most of 12 recent returnees from that theater bring to new assignments in the Office of the Chief of Research and Development, HQ Department of the Army.

Brig Gen Donald D. Blackburn started 1971 by returning to OCRD to head the Directorate of Developments. He served as director of Plans and Programs (October 1968–August 1969) until assigned as deputy director for Operations (SACSA), Office of the Joint Chiefs of Staff, Washington, D.C.

General Blackburn also served as the first chief of the OCRD Special Warfare Office, established in 1962, and earlier was deputy director, Developments for Special Warfare.

Other major assignments have included assistant commander, 82d Airborne Division, Fort Bragg, N.C.; director, Special Warfare, Office of the Deputy Chief of Staff for Operations, HQ DA; commander, Special Operations Group, HQ Military Assistance Command Vietnam (MACV); and assistant deputy director, U.S. Army Element, Communications Planning Group, Defense Communications Agency.

General Blackburn has served as commander, 77th Special Forces Group (Airborne) at Fort Bragg and as senior adviser, Military Assistance Advisory Group (MAAG), Vietnam. He taught military psychology and leadership at the U.S. Military Academy (USMA) from 1950 to 1952. During World War II, he was a leader of guerrillas in the Philippines.

His decorations include the Silver Star (SS), the Legion of Merit (LOM) with two Oak Leaf Clusters and the Presidential Unit Citation with three Oak Leaf Clusters (OLC). He has a BS degree from the University of Florida and is a graduate from the Command and General Staff College (C&GSC) and the National War College (NWC).

Col Louis F. Felder, OCRD Deputy Director of Developments, was until recently commander of the 21st Divison Combat Assistance Team and senior adviser to the 21st Division, Army of the Republic of Vietnam (ARVN).

Col Felder served three years with OCRD (1964–67) as executive for International Programs and chief of the Combat Materiel Division. From 1958 to 1960 he was with OCRD as an R&D coordinator.

After serving two years in the Office of the Chief of Staff, he was assigned in June 1963 as deputy chief of the Army Section of MAAG in Saigon and (later) as adviser to the Vietnamese Airborne Brigade.

Other assignments have included

Friend Finds Friends in Full Force at Farewell

Countless books and articles have been published about the importance of the "human" touch in getting a difficult job done with the minimum amount of sweat and "discombobulation," by winning friends to simplify the work.

Hilbert E. Friend's farewell testimonial luncheon, coincident with his retirement from U.S. Government employment Jan. 26, evidenced that he achieved recognition as a "legend in his own time" in mastering this art.

The legend-in-his-own-time accolade came as a "double-barreled shotgun" testimonial from two men who learned to know him well over the years. Army Director of Research Brig Gen George M. Snead Jr. paid the tribute along with numerous "nice to remember" sentiments.

Assistant Director of Army Research Col Norman R. Rosen, who doubles as commander of the Army Research Office-Washington, was the first to use the legend-in-his-own-time compliment as applied to his knowledge of the guest of honor for more than 10 years.

Col Rosen was chief of the Research Programs Office, which included the Research and Contracts Branch that Friend headed until he left in mid-1962 to accept a similar position with the National Science Foundation. In 1964 Friend resumed his Army research job, and served as branch chief until he retired.

Known as one of ARO's "old-timers" because of his initial employment when the organization was being formed, Friend was, in the opinion of his coworkers, well named for the qualities he proved in his job performance.

About as close to 100 percent of Army Research Office employes as was feasible, in view of "skeletal operational force" requirements, attended the luncheon to show their esteem for the departing guest of honor. It was an occasion marked by high good humor—as appropriate for one whose reputation for ready wit to fit all occasions was well recognized.

If any of those present failed to receive his personal invitation to visit "me and 'Ginny'" (Virginia) at what will be his retirement home on the Potomac River near Colonial Beach, Friend extends to his many friends a hearty "Hope to see you all soon!"

Hilbert "Hib" Friend

commander, 8th Special Forces Group, Panama Canal Zone; Allied Land Forces Central Europe; and 508th Airborne Regimental Combat Team, Fort Benning, Ga.,

Col Felder received a BS degree in military science from the University of Maryland in 1956 and earlier attended the University of Wisconsin and the City College of New York. He earned an MBA degree from George Washington University in 1963.

He has graduated from the Industrial College of the Armed Forces (ICAF), Armed Forces Staff College (AFSC) and the C&GSC.

Among his awards and decorations are the LOM with two OLC, Bronze Star Medal (BSM), Air Medal (AM) with 11 OLC, Army Commendation Medal (ARCOM), and the Vietnamese Cross of Gallantry with Palm and Gold Star.

Col Walter A. Dumas is the new chief of the Nuclear, Chemical and Biological Division. He recently completed flight training at Fort Walters, Tex., and Fort Rucker, Ala., under the senior officers' flight program.

He has served tours of duty with the Weapons Systems Evaluation Group (WSEG) in Washington, D.C., and as an adviser in Vietnam, and in Germany (1964–66) with the 3d Armored Division and the Operations Division, HQ U.S. Army Europe (USAREUR). He was with the Defense Atomic Support Agency (DASA) Field Command (1961–64).

Col Dumas graduated from the USMA in 1946. He earned BS and MS degrees in mechanical engineering from the University of Arizona in 1960 and completed the Army War College (AWC) in 1967.

Among his awards and decorations are the LOM, BSM with "V" device, AM, Joint Service Commendation Medal (JSCM), ARCOM, Purple Heart with OLC, and the Vietnamese Cross of Gallantry with Gold Star and two Silver Stars.

Lt Col Kenneth R. Ebner is assigned as a staff officer with the Terrestrial Sciences Branch, Environmental Sciences Division, U.S. Army Research Office (USARO), OCRD. He recently completed a tour of duty as plans officer, J–5, HQ MACV and deputy senior adviser, 7th ARVN, MACV.

A 1950 USMA graduate, he earned an MA degree in geography from Columbia University in 1965 and is working on his doctorate. He completed the C&GSC course in 1970 and served four years (1965–69) as an associate professor at the USMA.

Col Ebner has been awarded the BSM with two OLC, JSCM, ARCOM, AM with three OLC, Vietnamese Cross of Gallantry with Gold Star, Vietnamese Honor Medal (1st class), Vietnamese Staff Service Medal (1st class), and the Combat Infantryman Badge (second award).

Lt Col Samuel W. Patellos served with HQ 10th Aviation Battalion, 17th Aviation Group, 1st Aviation Brigade, and with HQ 1st Field Force, Vietnam, prior to assignment to the International Office, OCRD.

In 1966 he served in Vietnam with the 11th Aviation Battalion. His next assignment was with HQ Combat Developments Command (CDC), Fort Belvoir, Va. He was a staff officer in 1962–63 with the Intelligence Division, HQ U.S. Army Europe (USAREUR), Heidelberg, Germany.

Lt Col Patellos earned a BSA degree from the University of Maryland in 1970 and completed the C&GSC course in 1961.

His awards and decorations include the LOM, Distinguished Flying Cross (DFC), BSM with OLC, AM with 11 OLC, Meritorious Unit Commendation, Senior Aviation and Senior Parachute Badges.

Lt Col Henry C. Evans Jr., chief of the International Office, OCRD, served until recently as military assistant to the assistant director for Ranges and Space Ground Support, office of the Deputy Director of Research and Engineering (ODDR&E).

Graduated from the USMA in 1951, he has a BSME degree from the University of Arizona (1964) and an MS degree in personnel administration from George Washington University (1967). He completed courses at the C&GSC in 1962 and ICAF in 1970.

A staff officer assignment with the CDC in 1968–69 followed a tour of duty with the 4th Infantry Division in Vietnam as assistant chief of staff, G–5, and battalion commander, 5th Battalion, 16th Artillery.

With the Office of the Assistant Chief of Staff for Force Development (ACSFOR), Washington, D.C., he served (1964–67) as a staff officer, Plans and Programs Division, Aviation Directorate; with the Combat Materiel Division, Doctrine and Systems Directorate; and with a Department of the Army study group on Aviation Requirements for Combat Structure of the Army.

Lt Col Evans has received the LOM with OLC, BSM with "V" device, AM with OLC, and ARCOM w/2 OLC.

Lt Col John R. Hook is the new chief of the OCRD Surveillance, Target Acquisition, Night Observation (STANO) Branch, STANO Division. In Vietnam (1969–70) he served as deputy G1, II Field Force, and as 3d Brigade executive officer, 9th Infantry Division, RVN.

In Germany (1967–69) he ws assistant chief of staff, G–3, 32d Army Air Defense Command, and battalion commander, 3d Battalion, 7th Artillery (Hawk).

In 1967 he was graduated from the Armed Forces Staff College, subse-

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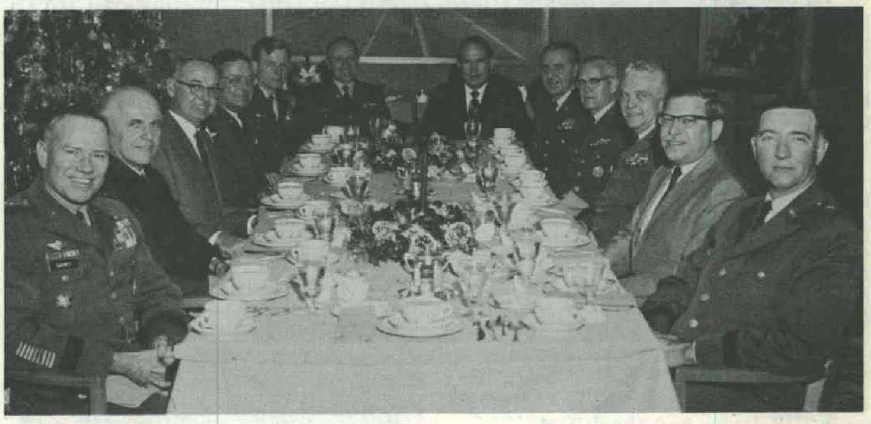


DIRECTORS' LUNCHEON at the Pentagon was one of the several affairs held to honor Lt Gen A. W. Betts prior to his retirement as Chief of Research and Development with more than 35 years active military service. From left are Brig Gen John W. Barnes, Director of Plans and Programs; Dr. Marvin E. Lasser, Army Chief Scientist; Robert L. Johnson, Assistant Secretary of the Army (R&D); Maj Gen John R. Guthrie, Director of RD&E, Army Materiel Command; Col Charles Daniel Jr., former Director of Missiles and Space, now assigned to Supreme HQ Allied Powers, Europe (SHAPE); Col Donald R. Keith, OCRD Executive; Dr. Richard L. Haley, Scientific Adviser to the Director of Missiles and Space; Maj Gen George Sammet Jr., Deputy Chief of R&D; General Betts; Lt Gen William C. Gribble Jr., new Chief of R&D; Dr. Jacob B. Gilstein, Director of the Advanced Ballistic Missile Defense Agency; Brig Gen George M. Snead Jr., Director of Army Research.

Office, Chief of R&D Announces Officer Assignments

(*Continued from page 23*)

quent to a tour of duty as R&D coordinator with the Blast and Shock Division, HQ Defense Atomic Support Agency. He completed the C&GSC course in 1964 and earned a BSEE degree from Purdue University in 1956.

His military honors include the LOM, BSM with two OLC, JSCM, ARCOM, Combat Infantryman Badge (CIB), and Vietnamese Cross of Gallantry with Bronze Star.

Lt Col William P. Wheeler, staff officer with the Weapons Branch, Combat Materiel Division, OCRD, recently completed a tour of duty with the 7th Division in Korea as 2d Brigade executive officer and 2d Battalion commander, 32d Infantry.

He was assigned as G3, Army Section, and as chief of the Northern Advisers Team, MAAG Taiwan (1967–69). He completed the C&GSC course in 1967, subsequent to more than three years duty as senior course monitor, Director of Instruction Office, U.S. Army Infantry School, Fort Benning, Ga.

Lt Col Wheeler has a 1961 BS degree from the University of Georgia and received the ARCOM in 1966.

Lt Col William A. Walker completed a tour of duty as an Artillery battalion commander with the 101st Airborne Division (Airmobile) in Vietnam before he was assigned to the Physics, Electronics and Mechanics Branch, Physical and Engineering Sciences Division, USARO.

Graduated from the USMA in 1952, he earned MS and PhD degrees in physics from the University of Virginia in 1960 and 1962, and completed the C&GSC course in 1966.

He served with Supreme Headquarters, Allied Powers, Europe (SHAPE) in Belgium as chief of the Analysis and Program Section, ADP Division (1967–69) and as a staff officer, Nuclear Activities Branch, Operations Division (1966–67).

Among his awards and decorations are the BSM with "V" device, Meritorious Service Medal (MSM), ARCOM with "V" device and the JSCM.

Lt Col Gordon T. Carey is newly assigned to the OCRD Navigation Satellite Management Office. In 1970 he commanded the 3d Squadron, 17th Air Cavalry in Vietnam, following two years with the U.S. Army Land Warfare Laboratory (LWL), Aberdeen Proving Ground, Md.

Lt Col Carey served in Vietnam (1965–66) as an aviation adviser and as CO of the A/501 Assault Helicopter Company. During 1964–65, he was assistant division aviation officer with the 101st Airborne Division, Fort Campbell, Ky.

He has a 1964 BGE degree from the University of Nebraska and in 1967 completed the C&GSC course. His decorations include the SS, LOM, DFC with OLC, BSM with two OLC, MSM, AM with 26 OLC, ARCOM, and the Purple Heart.

Lt Col Thomas J. Shaughnessy is a new staff officer in the Vehicle Branch, Combat Materiel Division, OCRD. In 1970 he was project officer for the Army Concept Team in Vietnam (ACTIV) and commander, 214th Combat Aviation Battalion.

In Vietnam in 1966–67 he commanded D Troop, 1st Squadron, 10th Cavalry, 4th Infantry Division. He completed the C&GSC course in 1968, followed by assignment as a branch chief with the Doctrine Directorate, HQ Combat Developments Command.

He has a 1953 BS degree in correctional administration from the University of Wisconsin. His military awards include the SS, LOM, DFC with two OLC, BSM, MSM, AM, ARCOM with OLC, Vietnamese Cross of Gallantry with Palm and Silver Star, Vietnamese Armed Forces Honor Medal (1st class), Vietnamese Staff Service Medal (1st class), and the Air Service Medal.

Lt Col Exequiel R. Sevilla Jr. is assigned to the Social Sciences Branch, Behavioral Sciences Division, OCRD. He recently earned an MA degree in social psychology from Northwestern University.

Graduated from Fordham University in 1953 with an AB degree in sociology, he completed the C&GSC course in 1967.

He was an adviser in Vietnam (1967–68) with the 61st ARVN Artillery Battalion, following three years as a battery commander, S3, and battalion executive officer at Fort Carson, Colo.

A tour of duty in 1962 as an adviser to the Royal Laotian Army followed duty as director of the 4th Army Language Training Facility at Fort Hood, Tex.

Lt Col Sevilla has been awarded the SS, BSM and the ARCOM.

BATS Succeeds in 8 Redstone Flight Tests

Flight tests of BATS (Ballistic Aerial Target System) selected from the production line have produced successful results in eight firings reported Jan. 22 by HQ U.S. Army Missile Command, Redstone (Ala.) Arsenal.

MICOM regards the low-cost BATS as a singular achievement in defense hardware procurement, where success generally involves sophisticated complexity and proportionate costs.

The eight test targets were taken from the first month's production of BATS, under a Teledyne Brown Engineering contract that calls for 5,660 units and launchers for $1,656,730.

Personnel from the MICOM Directorate for Research, Development and Engineering and Missile Systems Laboratory conducted the tests.

Used for training firings by soldiers manning mobile Vulcan gun batteries as well as Chaparral and Redeye air-defense guided missile systems, BATS provides a more realistic target than those it will displace.

BATS simulates an attacking jet aircraft expected to fly low to avoid radar detection, then suddenly "pop up" to a higher altitude as it nears its objective for payload delivery.

BATS is propelled by various standard rockets obtainable from government stocks. Items include booster motors from the Army's 2.75-inch air-to-ground rocket, Air Force rocket motors used as cartridges to start jet engines, and infrared flares obtained from the Navy to provide a heat source for Chaparral and Redeye missiles to "home-in" on target.

The maximum use of standard components available from Defense inventories illustrates the tri-Service cooperation in effect in air-defense target systems.

EXCELLENCE IN SERVICE and support will be recognized at Deseret Test Center, Utah, by a suitably inscribed plaque displayed by CO Col Max Etkin, who will evaluate nominees for the newly established award. It will not be awarded periodically—only when, in the opinion of the nominee's supervisor, it has been earned by exceptionally meritorious performance.

AEC Honors Starbird, Betts With Top Award

Lt Gen Alfred D. Starbird and Lt Gen A. W. Betts recently became the first military recipients of the U.S. Atomic Energy Commission Citation, AEC's highest honorary award.

AEC Chairman Dr. Glenn T. Seaborg presented the awards in the Office of the Secretary of the Army for exemplary participation in the nation's atomic energy program.

Established in 1960, the AEC Citation has been presented to only 33 individuals and one group.

General Starbird's professional career and active duty as a regular Army officer spans 37 years. Almost half that time he worked in close association with AEC projects.

Since November 1967, General Starbird has managed the Safeguard (formerly Sentinel) Antiballistic Missile System. His citation reads:

"As director, Division of Military Application, U.S. Atomic Energy Commission from 1955 to 1961, General Starbird guided the Commission's nuclear weapons program in an outstanding manner.

"Under his leadership, the acceleration of nuclear weapons development and production made possible the deterrent capability on which our nation's defense has long relied. Largely through his personal efforts, the program remained viable during the test moratorium from 1958–1961, when many key personnel were encouraged to remain with the program and continue their contributory efforts during this uncertain period.

"In 1961–62 he organized and commanded the last U.S. atmospheric nuclear weapons test series—Operation DOMINIC. The success of this joint AEC–DoD undertaking was largely the result of his tireless efforts. His loyalty, devoted service, and inspiring leadership were vital contributions to the AEC and to the nation."

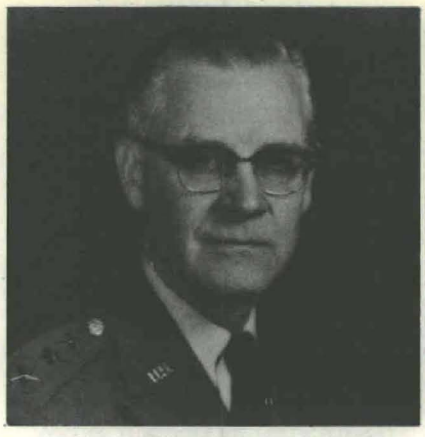
General Betts terminated more than 35 years of military service when he retired Jan. 1. Nearly half of his career was devoted to military application programs and projects of the Atomic Energy Commission.

The AEC Citation lauds General Betts for contributions to nuclear weapons program beginning in 1945. He was then assigned to the Los Alamos Scientific Laboratory as associated director and as director of the AEC Division of Military Application. The citation states:

" . . . From 1961 to 1964, General Bett's management insight and technical abilities were major factors in the advancement of the nation's nuclear weapons technology and preparedness. Under his skillful direction, nuclear weapons testing was promptly resumed in the U.S. and in the Pacific in 1961–62 after the voluntary 3-year moratorim was suddenly ended.

"Later the transition to underground testing following the 1963 limited test ban treaty was accomplished under his expert guidance. Throughout these major program adjustments, significant technological achievements were recorded to his credit which enabled the U.S. to maintain its position of leadership in the free world.

"His scientific and management efforts have represented invaluable contributions to the AEC and to the nation."



Lt Gen (USA, Ret.) A. W. Betts

Lt Gen Alfred D. Starbird

NLABS Review Bacterial Deterioration Problems

Research efforts to reduce bacterial and environmental deterioration of materials and military materiel estimated at billions of dollars annually in damages and malfunctions were reported at a recent Army Natick Laboratories conference.

The conference was the 19th in a series initiated in 1952 and the 17th at Natick, Mass., under sponsorship of the NLABS' Applied Microbiology Group (AMG) Pioneering Research Laboratory. Dr. Arthur M. Kaplan of the AMC was presiding chairman.

Subject areas for presentations of technical papers and discussion included hydrocarbon fuels, plastics, polymers, polyurethane-coated nylon, wooden ammunition boxes, wood preservatives, paint, leather, electronic equipment, missile and computer components, marine deterioration, environmental factors, and analyses.

Representatives of the U.S. Navy and Quadripartite Agreement nations, the latter joined with the United States in R&D directed toward standardization of weapons and doctrine, participated in the discussion.

The foreign representation was from the National Research Council of Canada, United Kingdom Admiralty Materials Laboratory, and the Australian Embassy. U.S. Navy representation included the Facilities Engineering Command, Crane Naval Ammunition Depot, and Office of Naval Research.

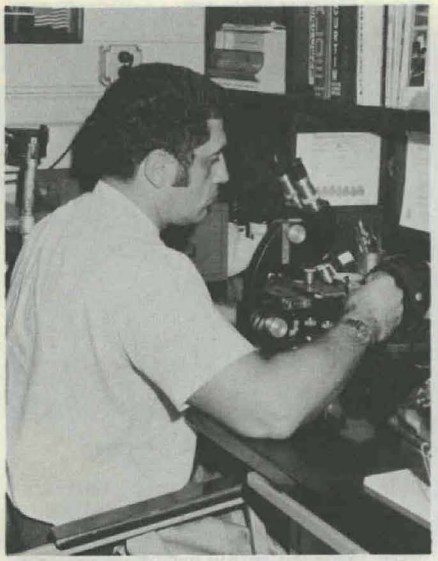
U.S. Army agency participants included the Army Materiel Command, Tank-Automotive Command, Combat Developments Command, Munitions Command, Weapons Command, Electronics Command, and Office of the Chief of Research and Development.

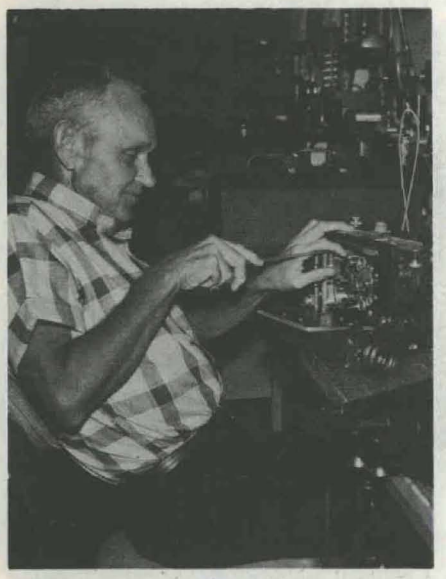
Also, the Office of the Surgeon General, Frankford Arsenal, White Sands (N. Mex.) Missile Range, Army Research Office-Durham (N.C.), Army Electronic Proving Ground at Fort Huachuca, Ariz., Materials and Mechanics Research Center at Watertown, Mass., and Army Coating and Chemical Laboratory, Aberdeen, Md.

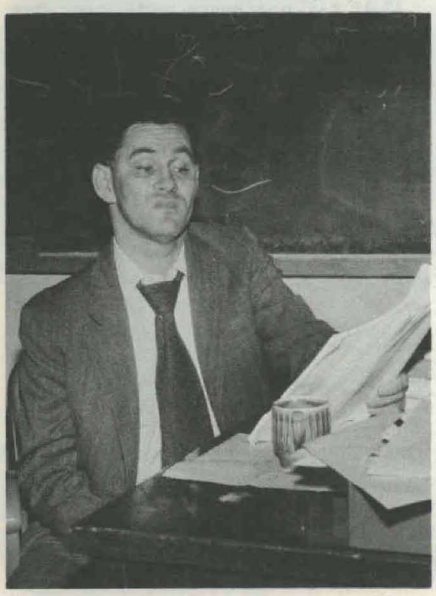
U.S. Army concern with problems of deterioration of materials and military materiel reached a high point in World War II when damages to supplies, equipment and weapons systems seriously hampered operations.

The Quartermaster Corps Tropical Deterioration Research Laboratory was established at Philadelphia, Pa., in June 1944 with the specific function of combating the problem. The research effort has continued at a modest level, involving all the Military Departments.

With the establishment of the Quartermaster R&D Laboratories at Natick, and the subsequent series of joint-service annual conferences to consider problems of deterioration, the Natick Laboratories became a focal point for research effort in this field. NLABS' capabilities to provide information on problems of microbial deterioration are widely recognized.







10 of 22 Nominees for Handicapped Award Employed in Research, Development Efforts

Ten of 22 nominees selected Army-wide in narrowing the field of candidates for the Department of the Army Handicapped Employe of the Year Award, the winner of which is expected to be announced in March, are working in research and development activities.

Intended to give recognition to Army employes who have demonstrated exceptional courage, perseverance and initiative in overcoming handicaps and performing their duties in a manner inspirational to coworkers, the Handicapped Employe of the Year Award was initiated three years ago.

NOMINEES for Army Handicapped Employe of the Year Award (1) *Hollis K. Russell,* Armed Forces Institute of Pathology, Walter Reed Army Medical Center, Washington, D.C. (2) *William B. Howard,* U.S. Army Missile Command, Redstone Arsenal, Ala. (3) *Dr. Edmund H. Inselmann,* Office of the Chief Mathematician, Research, Development and Engineering Directorate, HQ U.S. Army Materiel Command, Washington, D.C. (4) *James I. Campbell,* U.S. Army Engineer District, Fort Worth, Tex. (5) *Miss Alice Chancellor,* U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz. (6) *Fred C. Lilley,* U.S Army Aviation Systems Command, St Louis, Mo. (7) *Neil R. Miller,* U.S. Army Tank-Automotive Command, Warren, Mich (8) *John A. Zwolinski,* U.S. Army Mobility Equipment Command, St. Louis, Mo. (9) *Harold F. Combs,* Department of Medical R&D, William Beaumont General Hopsital, El Paso, Tex. (10) *Wallace E. Brooks,* U.S. Army Engineer District, Oregon.

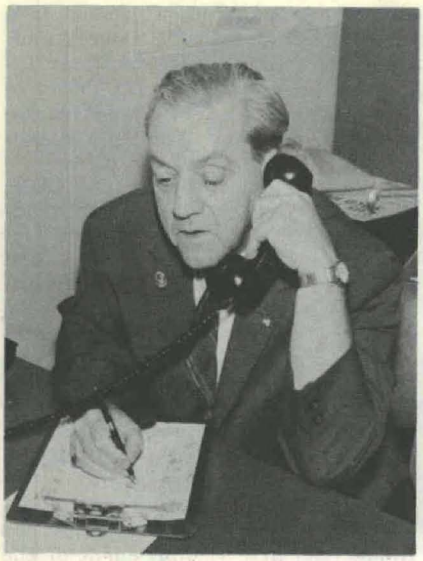
John A. Zwolinski, a 24-year-old mechanical engineer, paralyzed from the chest down, was nominated for the award by the U.S. Army Mobility Equipment Command (MECOM), St. Louis, Mo.

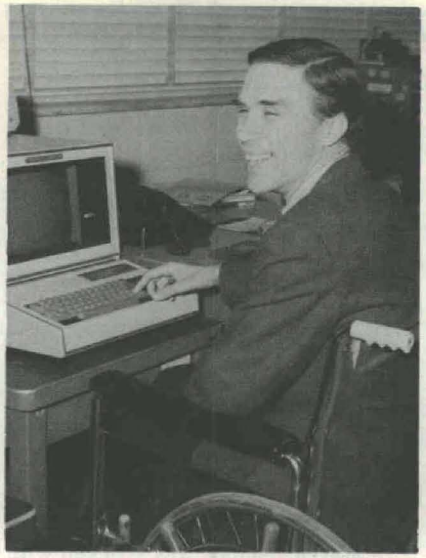
Wheelchair confinement has not prevented Zwolinski from leading an active life and carrying out with superior ability his duties as a project engineer at the U.S. Army Mobility Equipment R&D Center (MERDC), Fort Belvoir, Va., his citation states.

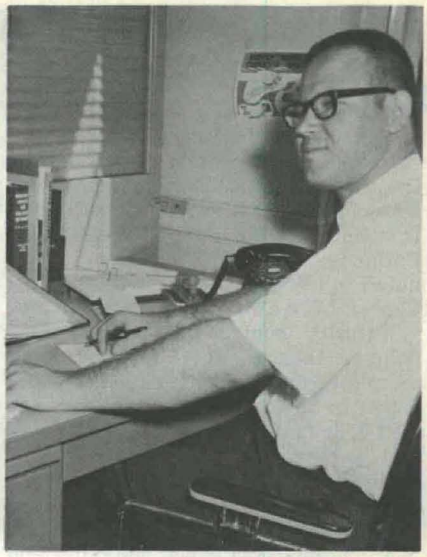
Although he has no control of his legs, the MECOM nominee operates his own automobile with hand controls which he designed and installed. He carries an additional set of controls on plane trips for use in car rentals. "Completely self-sufficient in every way," he transports himself between his automobile and wheelchair, and there are "few places not accessible to him."

Zwolinski does not consider himself a handicapped person and has conveyed this attitude to coworkers, who credit him with "a delightful sense of humor." He enjoys watching all sports, is an avid bridge player, and enjoys woodworking as a hobby.

In his work with the MERDC Mechanical Equipment Division, Zwolinski plays a key role in two R&D programs. His responsibilities deal with budgets, programing, contracting, in-house analysis and final reports. He has devised a comprehensive evaluation system that mathematically con-







siders technical factors requiring evaluation.

John played football and baseball all through high school and entered Washington State University on a sports scholarship. A bicycle accident in his freshman year left him paralyzed but did not deter him from pursuing his studies. He earned a BSME degree in 1968.

Following graduation, he became a MERDC employe under the Engineer and Scientist Training Program, which is enabling him to work for a master's degree in mechanical engineering at George Washington University in Washington, D. C. When his schedule of three night classes weekly permits, he is active in the American Society of Mechanical Engineers, of which he is a past president. He is a member of the Phi Eta Sigma and the Sigma Tau societies.

Dr. Edmund H. Inselmann, a cerebral palsy victim from birth, was nominated in recognition of his outstanding contributions as an employe in the Office of the Chief Mathematician, Research, Development and Engineering Directorate, HQ U.S. Army Materiel Command (AMC), Washington, D.C.

Since May 1969, as a GS–13 mathematician, he has been concerned with developing sound statistical procedures in Army test programs.

In his review of technical documents published by all subordinate commands, his citation states, he "continually renders outstanding judgment and professional integrity in calling attention to inadequacies in statistical procedures in the test programs of major weapon systems. The guidance provided by the nominee will have impact on the Army Test Program for years to come."

Because of lack of human understanding regarding potential capabilities of cerebral palsy victims, Dr. Inselmann sought professional guidance in determining a suitable career while he was a senior in high school.

After a series of tests, he was advised to operate a newstand. Determined to attain a more meaningful career, he enrolled at Temple University in 1946 and received a BA degree in mathematics. In 1951 he earned an MA degree in mathematical statistics, preparing at Columbia University his thesis on "Weak Law of Large Numbers."

Frankford Arsenal employed him in 1952 as a GS–7 mathematician. Later he enrolled at the University of Pennsylvania to complete work for a PhD degree in mathematics, which he received in 1962.

His work at the arsenal has included modern inventory systems for spare parts, error analysis of fire control for major weapon systems, development of Monte Carlo technique for evaluation of pulse-corrected projectiles, statistical hypothesis testing, and design of experiments in test programs for small arms ammunition. The nomination states that he is "a recognized authority in risk analysis and has rendered an outstanding contribution to PROMAP–70, Task 26 Risk Analysis."

Dr. Inselmann also was cited for community service as founder and past president of the Philadelphia Youth for Cerebral Palsy. In 1960 he was honored by the United Cerebral Society of Philadelphia with the Outstanding Achievement Award for Cerebral Palsy victims.

He is a member of the Institute for Mathematical Statistics and a former member of the Research Society of America, Frankford Arsenal Chapter.

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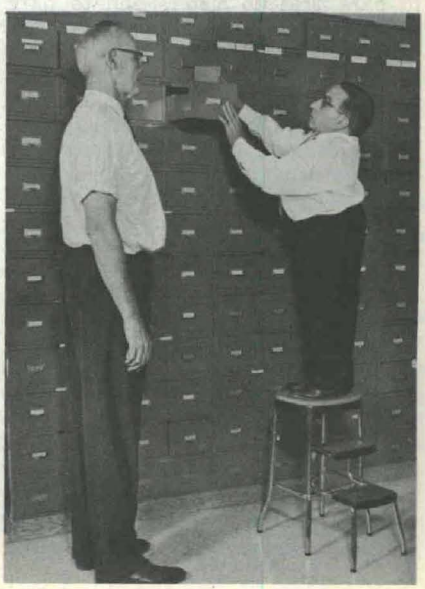


Army Nominates 10 in R&D for Handicapped Award

(*Continued from page 27*)

He is the author of eight technical papers on mathematical statistics.

Hollis K. Russell is chief of the Geographic Pathology Laboratory Branch, Histopathology Laboratories Division, Armed Forces Institute of Pathology (AFIP), and was nominated by Walter Reed Army Medical Center (WRAMC), Washington, D.C.

Russell contracted spino-bulbar polio in 1954, at age 20, resulting in complete paralysis from the waist down. In 1960 he was employed by the AFIP as a GS–3 medical technician and is currently a GS–9 supervisory medical technician in histopathology.

After attending Joseph Bulova School of Watchmaking, Long Island, N.Y., he operated a watchmaking and jewelry shop in 1957–58 in Tunkhannock, Pa. Prior to his illness, he attended New York State Institute of Agricultural Sciences, Cobskill, N.Y., receiving an associate in applied sciences degree in 1954.

During his AFIP employment, he completed postgraduate courses at the National Institutes of Health Graduate School in Bethesda, Md., and the basic supervisory course at WRAMC.

Russell's activities at the AFIP and in the local communities are credited in his nomination with being responsible for helping to educate the public to recognize the inherent restrictions in construction of buildings and parking facilities for physically handicapped personnel.

His accomplishments include spearheading passage of an ordnance in Montgomery County, Md., permitting special cars for paraplegics and drivers who use crutches or wheelchairs to park free at meters and to park indefinitely in limited time areas. His efforts are being directed toward passage of legislation on a national level.

He also is working toward the solution of problems that prohibit people in wheelchairs and users of crutches from entering public buildings.

A strong proponent of education in the laboratory sciences, Russell prepares lectures at home (after working hours) for presentation at meetings and symposia on histopathologic techniques. He is known for his readiness to discuss and pursue any aspect of safety that will improve the laboratory and benefit the professional and technical staff.

Russell resides in Silver Spring, Md., with his wife and two children. When not working for the rights and improved working conditions of the physically "restricted," he pursues a hobby of photography.

Harold F. Combs is a GS–9 physical science technician in the Department of Medical R&D, William Beaumont General Hospital, El Paso, Tex., and was nominated by the U.S. Army Medical Service.

Scarlet Fever left him totally deaf when he was 10 years old. He attended Parker Deaf Oral School for elementary children, learning to lip read and converse orally and with sign language. In normal conversation his lip reading is so proficient that strangers often are unaware of his deafness. No allowance was made for his handicap when he attended normal secondary schools and colleges and he was forced to rely solely on lip reading and self study.

In March 1965, he was stricken with an acute myocardial infarcation following a period of hypertension. Nevertheless, with the aid of medication, he performs his job outstandingly eight hours daily.

Since March 1967, when he was first employed as a GS–7 physical science technician at the hospital, Combs has authored or coauthored reports on 12 medical research studies. His contributions have been recognized by two consecutive Outstanding Performance Ratings.

Combs established the El Paso, Tex., Juarez, Mexico, Chapter of the International Catholic Deaf Association in 1967 and served a year as its first president. He is now treasurer.

Combs also initiated and helped parents organize the El Paso Area Society for the Hearing Impaired, a nonprofit organization chartered in 1970 under the laws of the State of Texas. Its purpose is to promote the welfare of the deaf in El Paso by providing for mutual assistance and encouragement in improving their education and bettering their economic and social conditions.

Fred C. Lilley, totally blind since 1950, is a nominee of the U.S. Army Aviation Systems Command (AVSCOM), St. Louis, Mo., where he has been employed in the Personnel Training and Force Development Directorate for more than three years.

As a GS–7 benefits and services assistant Lilley, who is now 57 years of age, reviews real estate reimbursement claims by employes moving in and out of the Command, which involves hundreds of thousands of dollars annually. He also performs various services that include handling large sums of money through the sale of discount tickets, postage stamps and bi-state bus passes.

The over-all work performance of Lilley is outstanding, which led to a promotion in less than a year. In addition, he received a Quality Step Increase. His counseling of fellow employes led to his appointment as assistant coordinator for the Handicapped Program at AVSCOM.

Prior to employment at AVSCOM, he had 15 years experience as a vending stand operator for Business Opportunities for the Blind, Inc., and five years experience as assistant executive director for the organization.

Lilley has been active in Lions Clubs activities for more than 15 years, is a member of the AVSCOM Winged Word Toastmaster Club, where he has won numerous awards, and is a certified member of American Institute of Parliamentarians.

He is now president of Real Independence Through Employment of the Blind, Inc., first vice-president of the Missouri Federation of the Blind, Inc., and a member of the Board of Directors for the American Council of the Blind, Inc.

Miss Alice Chancellor, a GS–12 electronic engineer at Fort Huachuca, Ariz., is the choice of the U.S. Army Electronic Proving Ground (USAEPG) for Army Handicapped Employe of the Year (AHEY).

A childhood accident resulted in a blood infection that caused blindness in one eye, stiffness in many joints and (later) amputation of both legs.

Her first employment was in private industry as a typist and stenographer. In 1952 she became a stenographer in the Federal Civil Service, and later was promoted as a publications writer.

Miss Chancellor resigned her government position in 1956 to enroll as a full-time student in electrical engineering at the University of Arizona. In her junior year, it became necessary to amputate her right leg. This delayed but did not prevent her graduation with a BS degree.

In July 1962, she returned to the USAEPG as a GS–5 electronic engineer in the Field Test Facilities Department. Despite amputation of her left leg in 1964, she has gained numerous honors for outstanding accomplishments, including the Decoration for Meritorious Civilian Service.

Within two years after her second amputation, she was recognized as one of the few civilian employes who had used no sick leave during the previous year. Records reveal that she did not use any sick leave during 1968, 1969 or 1970.

In July 1969, she received a Quality Step Increase and her two most recent performance appraisals have been "Outstanding."

Miss Chancellor lives by herself, in

a home she owns, drives a specially equipped car, does her own housekeeping and her own gardening. She has made her own clothes since childhood and enjoys making clothes for disadvantaged children.

To celebrate Easter in 1969, she made and donated 50 Easter dresses to young girls on an Indian Reservation and is now providing all the clothing for four girls in the Papago Indian School.

Miss Chancellor has counselled many amputees in adjusting to their handicaps. After retirement, she plans to devote her life to teaching handicapped and other disadvantaged children to sew, knit and weave.

A member of the Institute of Electrical and Electronics Engineers, she has served the past five years as secretary-treasurer of the Arizona Chapter of the Armed Forces Communications Electronic Association.

Neil R. Miller, nominated for the AHEY award by the U.S. Army Tank-Automotive Command (TACOM), is employed as a GS–11 computer specialist in the Management Information Systems Directorate at Warren, Mich.

Miller was injured in 1954 during Army basic training. The accident made him a paraplegic limited to the use of his arms and thumbs.

Nonetheless, he earned a bachelor's degree in industrial management in 1961 from the Lawrence Institute of Technology and in 1964 received a master's degree in business administration from Wayne State University.

Miller was hired as a GS–5 computer digital programer in 1965. His demonstrated ability has been so striking that the directorate in which he works has not been hesitant about hiring other handicapped employes—specifically, since 1967, three deaf-mutes and one epileptic.

Ready acceptance of these handicapped employes, TACOM management reports, was sparked in part by Miller's superior performance, his courage and initiative in demonstrating that his disability was not disabling with respect to his profession.

James I. Campbell, a GS–9 supervisory engineering technician, is the AHEY nominee of the U.S. Army Engineer District, Fort Worth, Tex.

While training for military service in World War II, he contracted pneumonia; a severe general rheumatoid arthritis that developed later left his body twisted and barely mobile.

Campbell's fight for self-sufficiency has been all uphill, but he finds time to assist and encourage other handicapped persons. In 1960 he was instrumental in motivating a 21-year-old man, suffering from muscular dystrophy, who had resigned himself to an employment goal of five years—his predicted life expectancy.

Observing Campbell's persistence, dedication and mature attitude in the face of severe setbacks, the young man reassessed his goals and developed a true strength of character. He has married, adopted two children, purchased his own home and received several job promotions.

In more than 13 years of federal service with the Corps of Engineers, Campbell has been recognized for performing his duties in an exemplary manner. He also has improved his education through numerous Civil Service Commission and local training courses, including high school subjects. In 1965 he passed a test and was awarded a Certificate of Equivalency for High School Achievement by the Texas Education Agency, at the age of 45.

William B. Howard, who lost his eyesight in a bicycle accident at age 15, is the AHEY nominee of the U.S. Army Missile Command (MICOM).

Employed at Redstone Arsenal, Ala., as a WG–11 photographer equipment repairman in the Directorate of Arsenal Support, Howard is in a trade that no blind person is known to have entered. He was formerly employed at Anniston (Ala.) Ordnance Depot as a small arms repairman.

Supervisors, administrators and doctors had to be convinced that he could do the work before he was employed by MICOM. His performance has proved he can. He also has made tools that help him to adjust a camera without sight more accurately than many persons with normal vision. One such tool is now being used by all camera repairmen in the shop.

Howard assists many handicapped persons in becoming self-supporting and encourages them to join with him in taking an active part in the social and political activities of their communities. He is president of the Huntsville Chapter and is first vice president of the Alabama Federation of the Blind.

Wallace E. Brooks, a GS–6 supervisory clerk, was nominated for the AHEY award by the Portland (Oreg.) District, U.S. Army Corps of Engineers.

Handicapped since birth in a way that limited his growth to four feet two inches, he also has been hampered by marked dorsal kyphosis and a congenital dislocation of the hips. Brooks began his federal government career in 1941 and is now chief of the Service Branch, Engineering Division.

District Engineer Col Robert L. Bangert has stated: "As a result of his handicap, Brooks has been turned down repeatedly by prospective employers. Only after urging employment on a trial basis was he hired. He has continuously displayed a vast amount of initiative and an abundance of resourcefulness while completing all assignments in an exemplary manner."

Brooks has long been active in organizations of and for the handicapped and the small people. He has served on the Multnomah County (Oreg.) Governor's Committee for Hiring the Handicapped and is a member of several organizations that assist physically handicapped persons.

Agencies Review Army Plans For Safe Disposal of Stockpiles

Detailed plans of the U.S. Army for safe disposal of all offensive biological and toxin stockpiles, as approved recently by President Nixon, are being reviewed by appropriate federal state and local agencies for the environmental impact of such action.

No demilitarization will begin until the final environmental impact statement and comments of these agencies are filed with the Council on Environmental Quality, a Presidential agency.

The plan calls for disposal of the entire U.S. stocks at their present locations, involving no transportation in the procedures. The stockpiles are at Pine Bluff Arsenal, Ark., Rocky Mountain Arsenal, Colo., Fort Detrick, Md., and Beale Air Force Base, Calif. The Army has only a small quantity of unprocessed material in temporary storage at Beale AFB.

Watervliet Chemist Elected to London Chemical Society

Dr. Iqbal Ahmad

Dr. Iqbal Ahmad, chief of the Physical Chemistry Laboratory of Watervliet Arsenal's Benet Research and Engineering Laboratories, has been elected a Fellow of the Royal Institute of Chemistry, London, primary professional chemical society in England.

Dr. Ahmad, known for his research on materials and composites, received his BS and MS degrees in chemistry from the Royal Institute of Chemistry in Lahore, Pakistan, and his PhD in physical chemistry from the Imperial College of Science and Technology.

He is the author of some 35 research papers and has been granted several patents. He is a member of the American Chemical Society, American Ceramic Society and the American Institute of Mining, Metallurgical and Petroleum Engineers.

Mastering the Messhall Menace . . . or

Fighting Insecticidal Damage Without Pesticidal Pollutants

Pesticides used to control insect infestations responsible for billions of dollars a year damages to crops and materials are currently under severe attack in the nation's response to President Nixon's antipollution program.

In increasingly numerous ways, the U.S. Army is responding rapidly to the President's directive to U.S. Government agencies to conduct operations with full attention to pollution prevention as a problem of prime concern.

Many of the Army's ongoing efforts or potential approaches to the most urgent problems of pollution in the military environment were discussed at a Nov. 23–24, 1970, conference of 50 invited representatives of major U.S. Government agencies.

The meeting was sponsored by the Army Chief of Research and Development as the initiation of a broad-scale effort to pinpoint critical pollution control problem areas, and to plan for integration of activities. (For a detailed report, see *Army Research and Development Newsmagazine*, November-December edition, page 2.)

Use of highly toxic nonbiodegradable pesticides, however, has long been of concern to the Army. For more than a decade, continuing research has been conducted to investigate nonpoisonous methods or more efficient and controlled use of pesticides, that is, limiting dispersion to small areas.

Army researchers are looking for new methods of control that will harm only the insect pest under attack—that will not destroy natural environmental predators of pests.

Scientific application of such methods requires a thorough knowledge of the life habits and behavior of the species of pest to be controlled. For example, one of the Army's problems is that of sanitation of kitchens, messhalls and field feeding facilities, including food storage.

Each year the Army sustains losses of millions of dollars due to insect infestation of foods and materials. In Vietnam alone last year, 3½ million pounds of flour had to be destroyed because of infestation in military warehouses. Insects also are responsible for shortening the life cycle or impairing reliability of many items of combat materiel.

In an effort to minimize the damage caused by insects, the Entomology Group, Pioneering Research Laboratory, U.S. Army Natick (Mass.) Laboratories has been studying the physiology and behavior of a number of insect pests (mosquitoes, moths, cockroaches and stored product pests). Several of the studies have yielded valuable information.

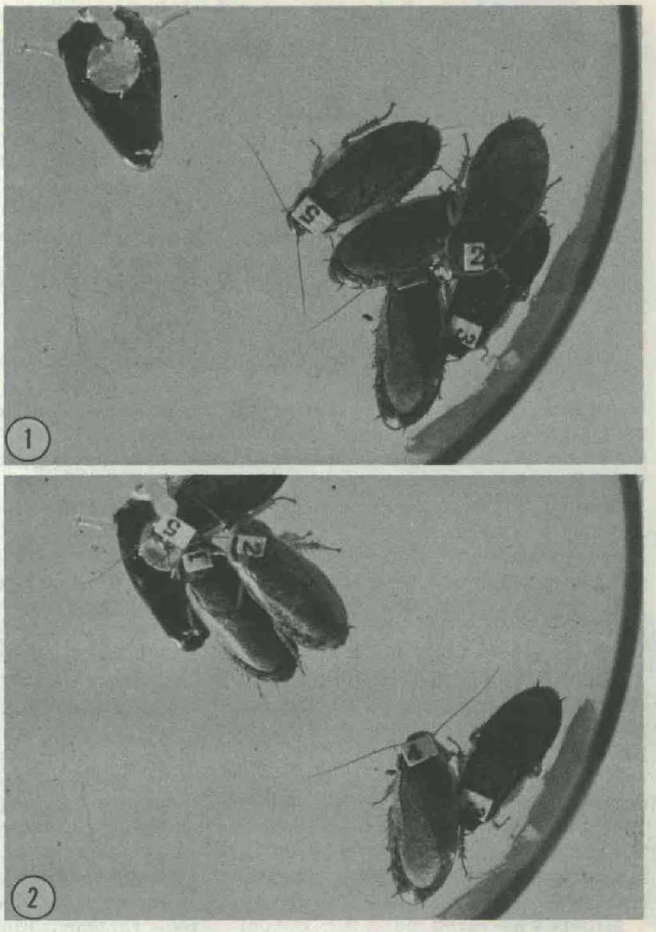


Fig. 2. (1) FEMALE COCKROACHES, numbered for identification, near a glass dummy male. (2) Three of 5 females try to palpate dummy after sex attractant was placed upon it.

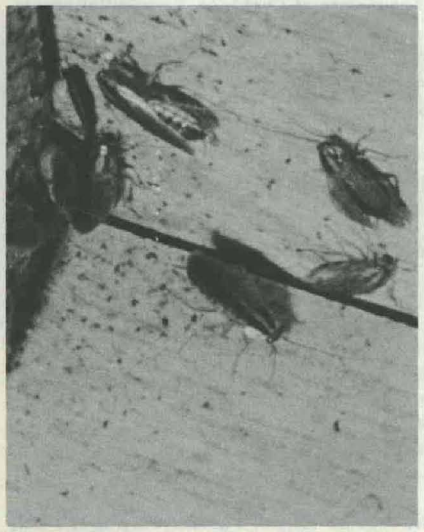


Fig. 1. COCKROACHES under an Army messhall table. Note accumulation of feces where insects have returned to rest when not foraging for food.

As a messhall menace, the cockroach is a natural enemy for the Army to fight.

Cockroaches have been used extensively by NLABS investigators as experimental animals to learn about mechanisms controlling behavior and reproduction. For many years, it has been known that pest cockroaches invading food establishments are gregarious and tend to assemble in large numbers in resting places (Fig. 1).

The aggregation response is largely olfactory and is dependent upon the insect producing a special chemical—one of a class of substances called pheromones, which are formed in the gut and excreted in the feces.

Researchers can extract the aggregation pheromone from the insect or from objects on which the insects have rested. To measure the amount of the chemical, the insects are placed in containers and given a choice of small strips of filter paper, one of which is wet with the chemical.

How successful the paper is in attracting the cockroach is dependent upon how much of the chemical is present. Both sexes at all stages of the life cycle of the species produce the pheromone.

Growth of young roaches, called nymphs, is slower when they are raised in isolation. Research has shown that gregarious behavior favors their growth and development.

Another discovery is that the pheromone of one species is not specific and can be used to cause gregarious behavior in several species of cockroaches. This knowledge is expected to simplify the task of finding chemicals to attract different species.

NLABS researchers also have

learned that a different kind of pheromone is produced on the backs of male roaches; also, that this substance attracts and causes the female to palpate the male's back to stimulate mating.

A simple bioassay was devised to measure purification of extracts obtained from bodies of thousands of males of *Nauphoeta cinerea*. This species, a circumtropical pest of East African origin, was found to harbor *Salmonella* during an outbreak of Salmonellosis food poisoning in Australia.

In the NLABS' investigation of behavior of roaches, small discs of filter paper inserted on the backs of dummy males (Fig. 2) are impregnated with a few microliters of the extract to be tested. If the test material is active, females are attracted to the disc.

Substances extracted from bodies of nine species of cockroaches, including the American species (nymphs and adults of both sexes), acted as an attractant to females of *Nauphoeta cinerea*. Since females also produce sex attractants, a potential method has been discovered to bring roaches together in a mass where they can be easily destroyed.

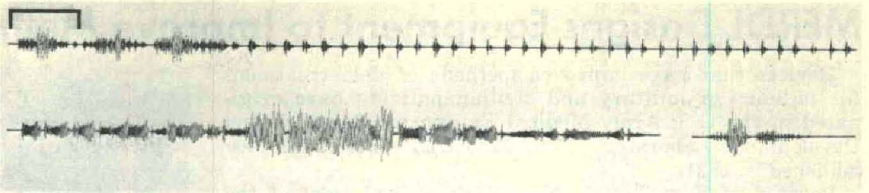
Current experiments at NLABS are seeking ways to use the newly discovered chemicals in traps or other devices to destroy the roaches. A study of *Nauphoeta* behavior revealed for the first time that some male roaches stridulate ("talk") to the female.

The noise-making apparatus is found on the pronotum and fore wings. The male of *Nauphoeta* produces characteristic sounds (phrases) only if the female does not respond to his courtship behavior. The phrase consists of two to six complex pulse trains followed by a long series of disyllabic chirps (Fig. 3), linked in "sentences" as long as three minutes.

How light might be used to kill roaches is the most recent discovery by NLABS experimenters that is considered of practical importance. Various sources of ultraviolet light have been shown to be lethal to cockroaches in certain developmental stages.

The mortality rate is proportionate to the wavelength, dose, intensity of the light, and age of the insects. Exposure of young nymphs (first and second instars) of *P. americana* and *B. germanica* to a germicidal lamp for one hour yielded 100 percent kill.

Studies are under way to determine the various stages and species sensitive to ultraviolet light and the wavelengths responsible for lethality. The goal is to make it possible to use pheromones to attract roaches into areas exposed to killing ultraviolet light—eliminating need for pesticides.



OSCILLOSCOPE RECORD (top) of a typical phrase in a "sentence" made by a stridulating male cockroach (Nauphoeta cinerea). Bracketed section was filmed at high speed (bottom) to show details of complex pulse train. Detail of a typical "chirp" is shown at bottom right of photo.

NLABS scientists anticipate that future pest control, in many cases, probably will combine physical, chemical and biological methods made possible by knowledge of the behavior of the various species of pests.

The role of the Entomology Group at the Natick Laboratories is to supply this information where it can be used to minimize food losses due to insect infestation; also, to protect the health of troops who often must operate in situations where insect pests are naturally abundant.

The program at Natick has attracted wide interest in both the popular and scientific press, as evidenced by numerous requests for scientific reports on the work.

Dr. L. M. Roth, the leader of this research effort, has been invited to speak at Smithsonian Institution, Cornell University, Harvard University, the American Museum of Natural History, U. of Iowa, U. of Maine, U. of Texas, U. of Massachusetts, U. of Illinois and numerous other academic institutions.

The French Government also extended an invitation that was accepted by Dr. Roth to report on the research on the reproduction and behavior of insects before an international group of scientists.

ECOM Briefing to Outline C-E Mission Through FY-74

An advanced planning briefing for industry on Electronic Systems Planning (ESP), outlining programs through FY 1974, is scheduled Apr. 6 and 7 at the HQ Army Electronics Command, Fort Monmouth, N.J.

ECOM is sponsoring the meeting jointly with the Armed Forces Communications and Electronics Association and the National Security Industrial Association. The classified briefing is designed to give industry full visibility on all research, development and related supporting activities conducted and planned by ECOM to execute its communications-electronics mission.

Presentations will be made by senior responsible officials, laboratory directors and their top scientific or engineering aides.

ESP is ECOM's part of an Army Materiel Command program to establish a cohesive research and development master plan in each of its subordinate commands, of which ECOM is one, to show the purpose and direction of R&D planning in each major Army combat operations area.

ECOM's electronic systems plan is currently outlined in a multivolume document covering the entire evolutionary period of an electronic system from concept and fundamental research through applied research, development, service testing and the first production buy.

The comprehensive plan develops the user requirements, identifies the system equipment objectives, assesses the available technology, pinpoints major technical problems, tabulates resources and accomplishment time frames and identifies the R&D elements responsible for program execution.

Information in the plan is presented in both narrative and graphic form, in progressive fashion, to permit periodic management review of system progress, from inception to production. Use of the plan permits better cooperation and interaction among R&D personnel, management, higher level Army planners and industry as to purpose, direction, timetables, resources and progress on all ECOM system developments.

Nine functional electronics areas assigned as mission responsibilities to the command are covered by the plan. They are systems in surveillance and target acquisition, night observation, IFF, environment (meteorology), avionics, communications, ADP, electronic warfare and supporting (component) R&D.

ESP, in effect, establishes the technical and economic strategy linking priority Army needs with the scientific and technical capabilities and resources necessary for their accomplishment. As a management tool, it is designed to lead to efficient, timely and most economic fielding of new systems.

MERDL Designs Equipment to Improve Methods of Field Treatment

Devices that have improved methods of field treatment for millions of military and civilian patients have originated in the U.S. Army Medical Equipment Research and Development Laboratory (USAMERDL) since it was established in 1921.

Located at Fort Totten, New York, this element of the U.S. Army Medical Research and Development Command, headquartered in Washington, D.C., was established originally at Carlisle Barracks, Pa. The laboratory's principal mission is the design and development of rugged and lightweight equipment for use by U.S. Army Medical Services in treating military patients in the field environment.

USAMERDL is staffed with engineers, consultants, technicians and administrative personnel. Facilities include machinery to build engineering design models and prototypes of a wide variety of medical equipment. Organizational elements include a mechanical engineering branch, electrical engineering branch, drafting branch, packaging and assemblies branch, test and evaluation branch, human factors engineering branch, maintenance analysis branch and a value engineering branch.

In addition to carrying on major developmental activities, the laboratory provides a quick-response, limited production capability to meet urgent requirements from the field. A recent example of this service was the production of 500 units of spring-traction devices for patient care, especially during airlift evacuation.

MASS DELOUSING OUTFIT operated by preventive medicine personnel has a collapsible hopper capable of holding 50 pounds of dusting powder, a centrifugal electric blower powered from a generator of the unit, and four dispensing lines. Outfit is capable of continuous or intermittent operation for the 10 hours required to exhaust powder supply.

Equipment developed by USAMERDL has gained wide recognition, due partially to emergency field use in civilian disasters.

Notable items include a jet injection apparatus for high-speed mass innoculations and immunizations in emergency situations, a portable iron lung, and a battery-operated lightweight field X-ray apparatus; also, a resuscitator for field use, lightweight hospital bed, numerous medical kits, dental-treatment devices, insecticide dispersal devices, and veterinary food inspection instruments.

Dental Field Equipment. USAMERDL has been quite active in the development of equipment for use by field dental surgeons. Currently, two of the four major dental equipment improvement programs have been assigned to USAMERDL for development effort and/or implementation.

Dental Treatment Set, Forward Areas

The first project, established under a Small Development Requirement (SDR), is a Dental Treatment Set, Field, Hand-Carried, Forward Areas. The objective is to develop a lightweight hand-carried or backpacked set of dental equipment.

Contents of the set will include a self-contained dental handpiece and other instruments and materials required to perform essential dental service for patients in remote areas and/or nonambulatory hospital patients.

Developmental effort has resulted in the design and fabrication of a high-speed electric contra-angle handpiece capable of delivering in excess of 100,000 rpm with suitable torque. This capability has been verified by tests conducted by the National Bureau of Standards. A companion straight handpiece capable of delivering 20,000 rpm also has been developed.

A battery capable of supporting the handpieces for a period of six hours has been included in the set. The battery can be recharged by the power pack from 24-volt DC, 110-volt AC and 220-volt AC power sources.

The dental equipment, plus a spray/cooling device, electrical cables and cushioning material are packaged in a waterproof plastic container. A supplemental container provides space for sufficient supplies and instruments for three days of operation. The component boxes are placed in a nylon bag for ease of carrying and dust protection.

The Qualitative Materiel Development Objective (QMDO) program for dental field equipment is directed to planning for future requirements rather than patch-and-make-do efforts with basic equipment sets that have been revised many times. Various sets are being evaluated with the view of eliminating outmoded and nonessential equipment and supplies.

Efforts have been directed to the design and fabrication of plastic modules to improve basic dental field equipment. These modules would save weight, improve utility and provide some aesthetic value to field equipment. Nine field dental sets are being reviewed for possible modification to assure compatibility with the modern cabinetry.

An experimental group of collapsible, modularized mobile dental equipment was evaluated recently at the Brooke Army Medical Center, Fort Sam Houston, Tex. It had everything the dentist needs in the field for sophisticated and modern dentistry, including a contoured upholstered chair, operator's stool, modularized cabinetry, ultra-high-speed drills, new prophylaxis sets and a portable sink. All of the equipment folds into small transportable boxes.

Initial reports received from dental officers assigned to the evaluation study (all of whom have had extensive field experience) indicate that the new equipment would permit the field dentist to give professional treatment equivalent to the finest dental clinics in the United States. Further evaluation and testing will be required before the items will be submitted for type classification.

Vector Control Equipment. The research and development objective of the Vector Control Equipment Branch is to develop a family of lightweight, durable pesticide-dispersal and pest-surveillance equipment. This equipment is designed for combat, field, and installation use by preventive medicine (PM) personnel of the Armed Forces of the United States in controlling reservoirs and vectors of arthropod-borne diseases and pests injurious to personnel and property.

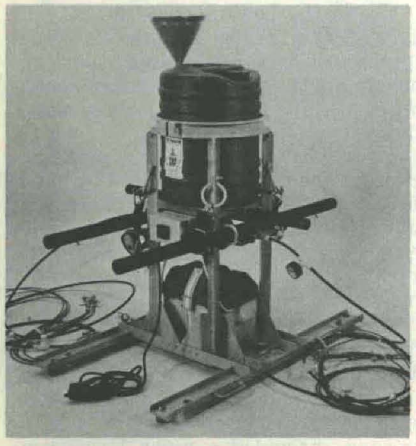
Commercially available pesticide-dispersal and pest-surveillance equipment is not available or is inadequate for use by field armies because of operational conditions of the military environment. Current worldwide commitments of the United States increase the possibility of military operations in remote, underdeveloped areas where disease-carrying arthropods may inflict a heavier toll than the enemy.

Pest-surveillance equipment being developed by USAMERDL is used in the field to determine the need for and adequacy of control measures to reduce arthropod-borne diseases.

The Live Animal Trap developed by this laboratory is collapsible and designed to capture small animals, particularly rodents, for identification and evaluation as vectors of communicable diseases.

A Carbon Dioxide Insect Survey Device, which attaches to the MERDL-developed Battery-Operated Insect Survey Trap, is under development. It will enable mosquitoes not attracted to light to be collected for identification and examination as vectors of communicable diseases, particularly malaria.

A Vehicle-Mounted Insect Collector (mountable on a sedan or small pickup truck) has been developed for flying insect surveys along areas of vehicle movement.



Rotary-wing Aircraft Liquid (ULV) Insecticide Dispenser is a lightweight, self-contained unit with a battery operated pump and cable-supported telescoping booms, which can be mounted easily in the UH–1 series helicopters.

Both aerial and ground operational pest control equipment is under development. A Hand-Operated Insecticide Sprayer is being considered to replace all 2-gallon sprayers used by field sanitation teams. It is lightweight, compact enough to be carried in a jacket pocket, and costs approximately $2.00 as compared to the $26.00 2-gallon sprayer.

A prototype of a Vehicle-Mounted Centrifugal Sprayer/Fogger can be jeep-mounted or carried by one man. It will replace a sprayer and a fogger, each of which requires a crane to be mounted on a vehicle.

USAMERDL has developed a Delousing Outfit to control louse-borne diseases that is practically maintenance free, has a few moving parts, weighs only 50 pounds, and can be fabricated for less than one-half the cost of the present standard delouser.

Spraying equipment being used on helicopters in Vietnam for mosquito and malaria control was developed at the USAMERDL. A rotary-wing aircraft Liquid (ULV) Insecticide Dispenser developed for use in UH–1B and UH–1D aircraft for malarial control missions is being tested. Two men can install it. The spraying system is constructed of nylon and tygon to withstand corrosiveness of ultra-low-volume (ULV) insecticides.

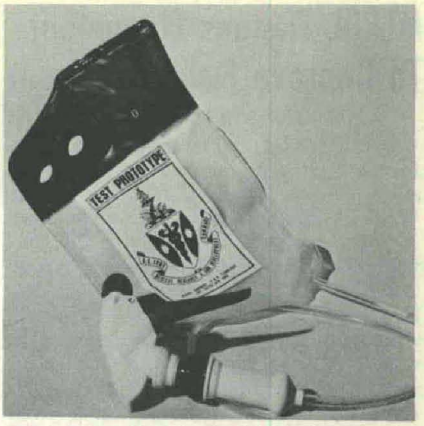
In developing these items of vector control equipment, USAMERDL strives to conserve the combat strength of field forces through preventive medicine.

Exerciser Traction Device. A lightweight exerciser traction device has been developed to replace expensive and cumbersome equipment requiring, in many instances, movement of hospital patients to the equipment. Forces of 3, 5 or 10 pounds are provided by spring and cable reels of varying sizes. Many of these devices are being used in Vietnam.

Globe Temperature Kit. In this the age of electronic devices, USAMERDL recently negotiated a small and successful venture in trend reversal to simplicity and low cost. The Wet Bulb Globe Temperature Index (WBGTI) is now used by the Armed Forces to measure hot-weather risks to health of troops in training.

Information gained is in the form of an index computed by the weighted integration of readings obtained from three thermometers exposed in different ways, as a wet bulb, a dry bulb, and in the center of a 6-inch black globe.

Various kits have been used by field forces, none of which has proved entirely satisfactory for measurement of health risk factors for field forces. The smallest, an electronic type, weighed 11 pounds and had a volume of 0.63 cubic feet. USAMERDL initiated a task to redesign this device. Investigation showed that equipment incorporating all the desired characteristics would be expensive, with every increased requirement increasing complexity and decreasing probable reliability.

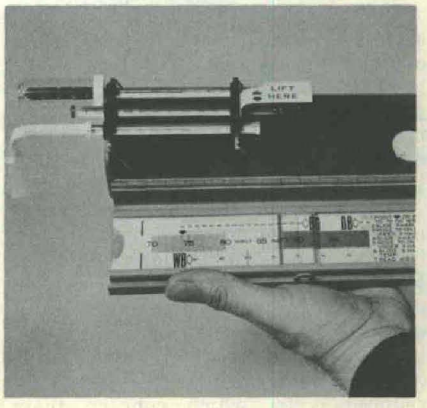


Hand-Operated Insecticide Sprayer is being developed to provide sanitation teams engaged in field operations with a control of mosquito adults, larvae, rodents, houseflies and other insect pests.

Consequently, in the interest of simplicity of design, reliability and ease of handling, an alternative approach was adopted. It was based on a slide-rule-type calculating device "married" to three 6-inch glass thermometers, each in the proper environment.

The 6-inch black painted copper globe was replaced by a transparent air flow reducer and black copper sheath analog that maintains equivalency. The device weighs only 11 ounces, measures 10 x 2½ x 1¾ inches and requires virtually no set-up maintenance.

(*Continued on page 34*)



Wet Bulb Globe Temperature Kit

MERDL Designs Equipment To Improve Field Treatment

(*Continued from page 33*)

Preliminary reports from field forces indicate very satisfactory results. Easy portability makes the WBGTI system more versatile than its predecessors. It can be used conveniently on the actual site of troop training. This is important because the index may vary several degrees in a short distance, due to variation in wind or cloud cover. Neat stress information can be gained in such environments as the interior of a tank where predecessors to the WBGTI were impossible or difficult to use.

The USAMERDL staff recognizes that individuals in the field may offer good ideas for medical equipment changes, and they would welcome submission of suggestions. The address is: U.S. Army Medical Equipment Research and Development Laboratory, Fort Totten, Flushing, New York 11359.

Picatinny Automates Flow Of ECP Print-Out Reports

Automated processing of the data from engineering change proposals (ECTs), in the form of monthly print-outs of reports, has substantially solved Picatinny Arsenal's problem of providing information to management personnel in readily usable form.

Further progress is planned and work is under way, to develop a faster computer system, the Technical Services Directorate reports. The need for the changes was recognized more than two years ago, leading to establishment of an ad hoc technical data package committee.

Arsenal directors and office chiefs cooperated in the project. Manual record keeping procedures gave way to punched card machine equipment. Committee members now check the print-out reports and distribute them within major staff segments.

The print-outs contain information such as control member, responsible engineering segment, status (approved, pending, completed), class priority, category, justification, document affected, suspense data, action dates, contractor's ECP number, end item nomenclature.

Configuration and functional managers at many echelons reportedly are finding the information valuable. Personnel ranging from director or office chief to project manager can tell quickly the number and status of the ECTs prepared to bring about changes, such as improved safety or reduced costs, which concern their functions.

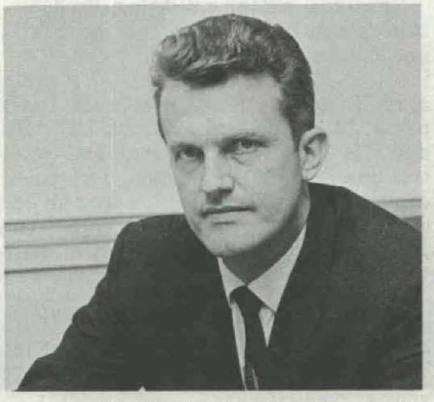
Rechtin Assumes Principal Deputy DDR&E Post

Promotion of Dr. Eberhardt Rechtin as Principal Deputy Director of Defense Research and Engineering was announced early in January.

Dr. Rechtin had filled the position in an acting capacity since Feb. 1, 1970, following the assignment of Dr. Gardiner L. Tucker as Assistant Secretary of Defense for Systems Analysis. In addition, Dr. Rechtin continued as Director of the Advanced Research Projects Agency (ARPA), ODDR&E, a position he assumed Nov. 21, 1967.

The position of Principal Deputy Director of Defense Research and Engineering was established by the President in December 1967. Dr. Finn J. Larsen, former Assistant Secretary of the Army for Research and Development. was the first to fill the job.

Dr. Rechtin was Assistant Director of the Jet Propulsion Laboratory, California Institute of Technology, until he became Director of ARPA.



Dr. Eberhardt Rechtin

He received a BS degree in 1946 and a PhD degree (Cum Laude) in 1950 from that institution.

Honors and awards conferred upon Dr. Rechtin include: Fellow, American Institute of Aeronautics and Astronautics; Fellow, Institute of Electrical and Electronics Engineers; and Academician, International Academy of Astronautics. He received the Space Act Award from NASA in recognition of his pioneering work in space communications systems; also, the Medal for Exceptional Scientific Achievement from NASA for outstanding contributions in design, development and operation of NASA's Deep Space Network for tracking, communications and control of the United States lunar and planetary exploration spacecraft.

He is a member of the National Academy of Engineers.

24-Year-Old MERDC Physicist Earns RESA Scientific Award

Kenneth J. Oscar, a 24-year-old physicist at the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va., won the 1970 Scientific Achievement Award of the Scientific Research Society of America (RESA), Belvoir Branch.

Oscar was selected on the basis of outstanding research in barrier applications of low frequency sound. William B. Taylor, technical director of the Center, presented the award consisting of a hand-scripted certificate and technical books (of the recipient's choice) up to $50.

Natick Publishes Technical Report on Combat Clothing

Modern Counter-Surveillance in Combat Clothing, a recent report compiled by Alvin O. Ramsley, describes new methods of protecting the combat soldier against detection by infrared photography, the image intensifier and the sniperscope.

Technical Report 71–9–CE earned the author a $250 award when presented as a paper at the 1970 Army Science Conference at the U.S. Military Academy. Ramsley is employed in the Clothing and Personal Life Support Equipment Laboratory, U.S. Army Natick (Mass.) Laboratories.

The report deals with development of a colorant system for combat clothing that satisfies the reflectance requirements for camouflage protection against detection by modern surveillance devices, as well as by visual observation.

The clothing must have specific reflectances in the visible and near-infrared regions of the spectrum, as described by a theoretical curve that has been derived empiracally.

Use of the new infrared fluorescent dyes on fabrics has resulted in actual spectral reflectance values that approximate the theoretical curve—making it possible to cope with these sensitive detection devices.

To reduce the reflectance in the regions of the spectrum utilized by these devices without quenching the essential infrared fluorescence, black rayon yarns were woven with undyed acrylic yarns to produce a closely checkered fabric.

When this fabric was immersed in the infrared fluorescent dye, its reflectance—as demonstrated by infrared photographs and observations with an image intensifier and a sniperscope—provided a much lower contrast with terrain backgrounds than fabrics currently used.

Requests for copies of the report should be directed to the U.S. Army Natick Laboratories, Natick, Mass. 01762.

NLABS Board of Fellows Serves as Advisory Group

Twelve distinguished scientists and technologists at the U.S. Army Natick Laboratories form a Board of Fellows who serve as a top level technical advisory group for accomplishment of the NLABS mission.

Secretary of the Army Research and Study Fellowships have been awarded over the years to 10 board members. Several have attended military Senior Service Schools.

NLABS Scientific Director, Dr. Dale H. Sieling, established the board and imposed few restraints on the scope of its activities.

The group met for the first time in April 1969 to draft a charter which spelled out its functions:

"To advise and recommend . . . provide viewpoints, suggestions, and assistance to the Scientific Director, as well as the NLABS Directorate in general, in those technical areas in which the board has particular competence, and in matters which are considered to be proper and relevant to the board's combined talents and capabilities."

The board may concern itself with any facet of NLABS operational efforts that might contribute to efficiency, improved morale and new interests; also, to the general betterment of communications and person-to-person interactions among installation elements, and between the installation and the community.

The board established a joint university-NLABS graduate degree program in its first year. Selected candidates perform research at NLABS under the guidance of local university personnel and NLABS scientists.

As a supplemental means for acquiring ideas and assistance from NLABS technical and scientific personnel in the solving of difficult problems, the board directed placement of science bulletin boards at key locations for use in soliciting and exchanging information.

The board may also serve as a review body in evaluating NLABS candidates for Secretary of the Army Research and Study (SARS) Fellowships and attendance at Senior Service Schools.

An insight into the board's range of concerns can be gleaned from a list of recent agenda subjects, including:

- Discussion of the relationships between universities and federal labs.
- Discussion of NLABS post-doctoral program and the requirement for personnel spaces.
- Consideration of improved procedures for contracting of scientific and technical journals.
- Procedures for assigning scientifically trained military personnel to NLABS.
- Means for improving scientific interchange between NLABS elements.
- Procedures related to submission of NLABS published open literature to non-West scientists.

BOARD OF FELLOWS at U.S. Army Natick Laboratories serves as a top-level advisory group for mission accomplishment. Seated (from left) are Dr. David Bass, Dr. Edward Ross, Dr. Malcolm C. Henry (chairman), Dr. John Kapsalis (secretary), Frank Rizzo. Standing (from left) are Dr. Derek Ball, Dr. Ralph Dusek, Dr. S. David Bailey, Dr. Roy Laible, Dr. Elwyn Reese. Dr. Edward S. Josephson and Dr. Emory G. Simmons were not available for the picture.

Dr. Malcolm Henry, deputy director, Clothing and Personal Life Support Equipment Laboratory, recently succeeded Dr. Edward S. Josephson, associate director for Food Irradiation, as board chairman. Dr. John Kapsalis, head of the Physical Chemistry Group, Food Laboratory, is secretary.

Board members are Dr. S. David Bailey, director, Pioneering Research Laboratory; Dr. Roy Laible, chief, Textile Research Section; Dr. Derek Ball, assistant head of the Organic Chemistry Group; Dr. Elwyn Reese, senior microbiologist; Dr. Edward Ross, staff mathematician; Frank Rizzo, chief, Textile Research Division; and

Dr. Emory G. Simmons, head of the Mycology Laboratory, and two staff members of the U.S. Army Research Institute of Environmental Medicine, a Natick tenant activity: Dr. David Bass, deputy scientific director, and Dr. Ralph Dusek, director, Behavioral Sciences Laboratory.

Veterans Discuss Use of Chemical Items in Vietnam

Reports by Vietnam veterans regarding experiences in use of chemical materials and equipment in Southeast Asia were heard by 110 military and civilian representatives of HQ DA and major commands at a recent 2-day conference.

The "after-action" discussion at Edgewood (Md.) Arsenal featured five Chemical Corps officers who served in Vietnam. In questions-and-answers panels following formal presentations, they presented suggestions for new and improved use of riot-control items.

In addition to Department of the Army headquarters representation, there were participants from the Army Materiel Command, Munitions Command, Test and Evaluation Command, Army R&D Center at Aberdeen (Md.) Proving Ground, the Land Warfare Laboratory (also at APG), Fort McClellan, Ala., Fort Detrick, Md., and Edgewood Arsenal.

Panel members were Lt Col Lewis A. Welzel, commanding officer of the Troop Command, Edgewood Arsenal, who served in Vietnam with XXIV Corps; Lt Col James R. Klugh, former chemical officer of the 101st Airborne Division in Vietnam, now CO of the 13th Support Brigade, Fort Hood, Tex.; Lt Col Gary L. Callier, Ent Air Force Base, Colo., who served in Vietnam with the Americal Division; Lt Col James L. Templeton, who served in Vietnam with the First Air Cavalry Division, and is presently assigned to HQ Combat Developments Command, Fort Belvoir, Va; and Maj Robert G. Graham, project officer, Combat Developments Command CBR Agency, Fort McClellan, Ala., who served in Vietnam with the First Brigade, 4th Infantry Division.

Procurement Procedural Progress Noted

Materiel Command Views PROMAP-70 First-Year Gains

(*Continued from page 2*)

turned attention to 12 major materiel systems, including a "draft" model of each for cost estimating.

Responsibility for cost estimating has now been extended to the PMs individually for application to five additional major materiel systems. The original draft model for life-cycle cost estimating is serving as a guide for all future life-cycle estimates.

One of the early estimates was that 25 percent of the success of PROMAP–70 would relate to formal and on-the-job training. Thirty-four existing courses applicable to requirements were identified and 13 courses were added.

Total AMC training of materiel acquisition personnel, which averaged 6,814 man-weeks in the past few years, has increased to 15,199 man-weeks. Trainees who will receive instruction has increased from the 2,994 average in recent years to a projection of 8,200 during FY 1971.

"Refinement of Requirements Documentation" is among the most significant tasks. In cooperation with the Combat Developments Command (CDC), the AMC has developed a single requirements document (Materiel Need) to replace four existing documents (QMDO, ADO, QMR and SDR).

Documentation processing time as a result, is expected to decrease from 2½ years to 60 weeks, and the number of steps from 239 to 153. Face-to-face meetings between developers and users will be arranged. The MN document will be used to streamline procedures and increase efficiency in establishing the need for new or improved items/systems for the Army; also, to provide guidance to the materiel developer throughout the life cycle of materiel.

PROMAP–70 is developing a capability within PM organizations and commodity commands to utilize modern techniques of Risk Analysis. Trade-off decisions then can be made between cost, schedule, user requirements and technical design.

In pursuance of this goal, 66 top and middle-management personnel were oriented to the techniques of Risk Analysis in a special course. An additional 140 employes received in-depth training. Risk analysis was applied to nine acquisition projects to compile findings on "Lessons Learned."

Use of competitive prototypes to identify and reduce risks is being applied to 16 development programs—from the Ultra Reliable Area Radio to the Forward Looking Infrared Sensor; from Cargo Containers to Heavy-Lift Helicopter Components.

Six important new development programs are being considered for the application of competitive prototyping. These include the Armored Reconnaissance Scout Vehicle, the Multipurpose Unit Mine, the Unmanned Aerial Surveillance System, and the Advanced Light Antitank Weapon (LAW) 1972.

AMC's Test and Evaluation Command (TECOM) at Aberdeen (Md.) Proving Ground has adopted a more responsive organizational structure. TECOM also has established a computerized test resources management system, reduced total test time, and initiated more meaningful and timely test plans and reports.

AMC's Missile Command, headquartered at Huntsville, Ala., reported more than $60 million in cost avoidance by planning coordinated tests in advance, eliminating duplicative testing, and using fewer test facilities.

AMC emphasis on the reliability and maintainability aspects of integrated logistics supported resulted in

Troops Test WES-Developed Landing Strip Membrane

Six months of engineering and service testing of a new membrane material for use in surfacing military landing strips, developed by the U.S. Army Waterways Experiment Station, started recently at the Fort Bragg (N.C.) Falcon Strip.

A 3,700-foot landing strip and an aircraft turn-around area were covered with the heavy-duty material by Army combat engineers from Company "C" and other troops of the 47th Airborne Combat Engineer Battalion, which will maintain the airfield throughout the tests.

For test purposes, soil underneath the membrane was prepared to meet standards of a Type III runway, the most sophisticated of three types of tactical assault landing strips.

Engineering tests of the airfield membrane are being conducted by personnel from the U.S. Army General Equipment Test Activity of Fort Lee, Va. Service tests are the responsibility of the Armor and Engineer Board of Fort Knox, Ky. Both agencies are part of the U.S. Army Test and Evaluation Command.,

Testing will be done during landings and takeoffs by a variety of fixed- and rotary-wing aircraft, including an Air Force C–130 aircraft loaded with cargo of various weights.

Aircraft also will perform maneuvers such as locked-wheel braking and locked-wheel turns to determine if the material will stand up under all conditions.

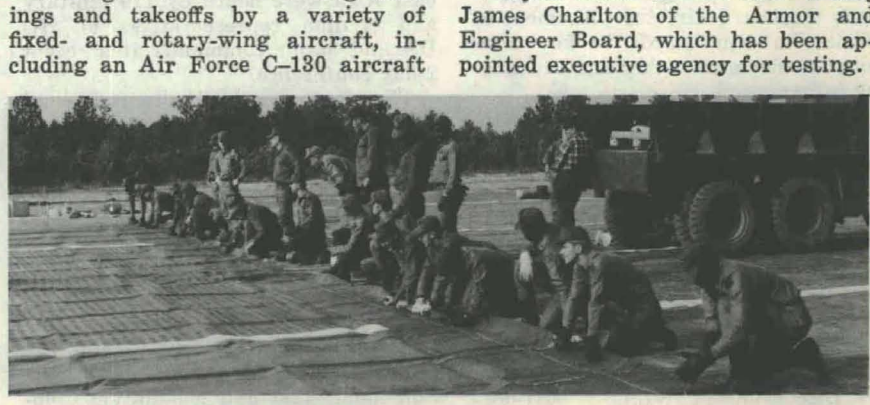
The membrane is made of a 4-ply nylon fabric impregnated with neoprene, a synthetic rubber characterized by a high resistance to oil, gasoline, sunlight and adverse weather.

Sections 53 by 66 feet can be installed rapidly, using large tacks specially designed for that purpose, over any relatively smooth prepared surface.

To prevent moisture from forming between the membrane and the subgrade, a liquid adhesive is used to seal the material where sections meet and where tacks have been used.

Installed on the highly prepared subgrade for test purposes only, the membrane is designed for use in forward areas where permanent airfields would be impractical and where rapid deployment of a landing strip is required.

Project officer for the tests is Maj James Charlton of the Armor and Engineer Board, which has been appointed executive agency for testing.



TROOPS from Company "C" of the 4th Combat Engineer Battalion (Airborne), Fort Bragg, N.C., perform finishing touches to a 3,700-foot runway covered with a new heavy-duty, airfield membrane material developed by the U.S. Army.

every PM office establishing a new organizational element.

The Tank-Automotive Command reported that the number of reliability/maintainability engineers and the quantity of training was doubled during CY 70. TACOM recommended product improvements expected to realize a saving of more than $150 million over the next five years.

AMC is participating in the Cost-Schedule Control System Criteria (CSCSC) program sponsored by the Department of Defense, involving Army, Navy and Air Force efforts.

CSCSC will require contractors to submit only data meaningful for management purposes—that which is necessary to evaluate work performed versus the planned value at any stage of the project development.

AMC program leaders have conducted a demonstration of AC electronics and will apply CSCSC to the Main Battle Tank, Improved Hawk weapon, TNT explosive, Army Scout Vehicle (or mechanized infantry combat vehicle) and the technical control facility known as AACOMS (AN/TSQ 85).

Competitive procurement and formal advertising are being increased under PROMAP–70 as shown by the following chart depicting percent of procurement dollars:

	FY 69 program	FY 70 goal	FY 70 actual	FY 71 goal
Competitive procurement	25.1	28.0	38.5	40
Formal advertising	8.9	11.0	16.9	19

Improvement is being made in preparing Technical Data Packages and Requests for Proposals in procurement. AMC's Weapons Command (WECOM) at Rock Island, Ill., reduced the lead time for secondary item procurement from an average of 147 days to 87 days.

WECOM saved $18 million, compared to $1–$2 million in past fiscal years, by shifting from noncompetitive to competitive procurement. AMC field commands during PROMAP–70s first year achieved a cost avoidance of $2,061,295 by reducing data in procurement packages.

Coincident to a PROMAP–70 task, In-Process Review (IPR) procedures were streamlined by the Department of the Army.

Participating commands now sign off on the review results at a joint session; HQ DA will require additional time for approval only in cases where differences must be resolved. IPR results now get back to the project within 25–35 days instead of the previous 144 days.

An AMC study of obsolete reporting requirements resulted in cancellation of 34 reports, and 29 recommended to HQ DA for cancellation, representing 36 percent of the total.

Cost savings from 34 cancelled reports are estimated at more than $200,000 annually. AMC's Mobility Equipment Command (MECOM) at St. Louis, Mo., claims $144,000 annual savings from reduced reports.

In the PROMAP–70 Numerical Control/Computer Aided Manufacturing task, AMC's Munitions Command (MUCOM), Dover, N.J., initiated a program to use numerical control (NC) machine tools to satisfy urgently needed spare and repair part requisitions on a fast-reaction basis.

During only three-quarters of FY 70, MUCOM reported a saving of $333,000 by manufacturing parts on NC machine tools rather than conventional methods. The average time per job was reduced from 94 to 47 days.

PROMAP–70 efforts to improve control over changes in ongoing programs are reported to have reduced change orders by more than 35 percent (from $98 million to $63 million).

Outstanding and over-age letter contracts have been reduced as follows:

(Dollar amounts in millions)

	June 1969		October 1970	
	Amount	Contracts	Amount	Contracts
Outstanding letter contracts	$728	149	$198	43
Over-age lttter contracts	$552	29	$ 86	6

AMC leaders say PROMAP–70 is only the beginning of a long-term improvement program. Many of its tasks have established new ways of managing materiel acquisition, but the real payoffs are expected during the ensuing years. Long-range AMC improvements are planned to relate to the life cycle of materiel acquisition.

Managerial progress in such programs as integrated logistics support, procurement careers and "should cost" studies are expected to pay larger dividends in the future.

NATO Committee to Sponsor Denmark Meeting, July 5–9

Applications of Optimization Methods for Large-Scale Resource-Allocation Problems is the theme of a conference scheduled in Elsinore, Denmark, July 5–9, under the sponsorship of the NATO Science Committee.

Attendance will be limited to 120 persons. Sessions are under the directorship of Professors George B. Dantzig and Richard W. Cottle of Stanford University. Discussion and presentations will review the state-of-the-art and planned objectives.

Technical papers will deal with methodology for solving structured mathematical problems, models for national planning, experience in solving problems of large-scale systems, and the need for experimentation.

Dr. Murray A. Geisler is the American point of contact. Inquiries may be addressed to him at: The Rand Corp., 1700 Main Street, Santa Monica, Calif. 90406.

CHIEF OF R&D Lt Gen William C. Gribble Jr. and Maj Gen Paul A. Feyereisen, Deputy CG for Materiel Acquisition, Army Materiel Command, recently visited the Mobility Equipment R&D Center (MERDC) for an orientation in selected areas of MERDC endeavor. They are flanked by William B. Taylor, MERDC technical director, and Col Bennett L. Lewis, CO of the center at Fort Belvoir, Va. In the second row are laboratory chiefs (from left) Kennedy K. Harris, Military Technology; Francis B. Paca, Intrusion Detection and Sensor; Mark H. Henderson, Mechanical Technology; Terence G. Kirkland, Electrotechnology; and Ronald J. Bostak, Electromagnetic Effects.

Kudos

MERITORIOUS SERVICE. *Martin C. Malone*, chief of the Quality Assurance Office, Eustis Directorate, U.S. Army Mobility R&D Laboratory (formerly AVLABS), Fort Eustis, Va., recently received the Decoration for Meritorious Civilian Service.

Maj Gen John L. Klingenhagen, CG of the U.S. Army Aviation Systems Command (AVSCOM), St. Louis, Mo., presented the award, citing Malone's 22 years service with AVLABS and predecessor organizations. Malone was credited with "innumerable contributions to the Army's air mobility R&D program. . . ."

The MCSA, the second highest award the Army may bestow upon a civilian employe, also was presented to *Bill G. Pales* for service with the U.S. Army Missile Command (MICOM) Intelligence Directorate, Huntsville, Ala.

Pales served at MICOM from June 1960 to June 1970 and is now employed in the Foreign Developments Division, Research, Development and Engineering Directorate, HQ Army Materiel Command, Washington, D.C.

The citation accompanying his award states in part: "Mr. Pales is recognized as one of the Army Materiel Command's (AMC) foremost experts of foreign intelligence officer operations. He has consistently demonstrated an outstanding capability to accomplish extremely heavy workloads with minimum resources.",

Two employes of the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H., recently received the MCSA from Lt Col Joseph F. Castro, CO and director, for the "display of unusual courage and competance in the rescue of a fellow employe."

The citation noted that quick action by *Raymond F. May* and *Robert B. Northam* prevented serious or fatal injuries to a man injured in an explosion of a refrigerated storage tank.

The MCSA also was bestowed on two key executives of the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss. WES Director Col Ernest D. Peixotto presented the awards to *James P. Sale*, chief of the Soils Division, and to *Dr. Dean R. Freitag*, chief of the Office of Technical Programs and Plans and assistant technical director of WES since 1969.

Sale's citation credits him with initiating and guiding design of expedient airfields for maximum use of air support in Vietnam. He developed new dust alleviation products to reduce deterioration of aircraft. Research directed to new rapid road construction techniques, protection of aircraft from flak, revetment studies, and a method for detection of hidden aggregate sources for construction was recognized by the award.

Dr. Freitag was lauded for "development of long-range plans for the involvement of WES in ecological research . . . and developing numerical expressions for performance of pneumatic tires on clay and sand soils."

The justification for the award states that Dr. Freitag has demonstrated a "high sense of dedication to the furtherance of basic research and knowledge in the environmental sciences. He has coordinated a long-range program of research to minimize the undesirable environmental effects of Corps of Engineers civil works projects."

LEGION OF MERIT. *Col Richard M. Story Jr.*, CO of the 1677th Mobilization Designee (Mob Des) Unit, R&D, until his retirement, was awarded the LOM for outstanding

AMS Presents Margetis Award to Cassidy

The first Margetis Award was presented to Col James E. Cassidy, chief, Professional Branch, Office of the Surgeon General's Assistant for Dental Services, during the annual meeting of the Association of Military Surgeons (AMS) in Washington, D.C.

Army Surgeon General (Lt Gen) Hal B. Jennings Jr., presented the award, which honors Col Cassidy for his development of a new concept of resources management applied to the oral disease problem. The citation states, in part, that "these changes may well set new patterns for the nation in dental public health."

Consisting of a plaque and honorarium, the award was established by the AMS and Astra Pharmaceutical Co. to honor annually a dentist in federal service who has made outstanding contributions to dentistry.

The award honors the memory of Col Peter M. Margetis, a widely renowned Dental Corps officer who served as director of the U.S. Army Institute of Dental Research, Walter Reed Army Medical Center, until his death in 1969.

A graduate of Tufts University School of Dental Medicine, Col Cassidy also has a BA degree from Incarnate Word College, San Antonio, Tex. In 1967 he completed work on his MPH degree at John Hopkins University of Hygiene and Public Health; a year later, he was awarded a PhD from the same institution. Col Cassidy has served with the Dental Corps since 1949.

Col Crozier Receives 1970 Gorgas Award

Research and development of new vaccines provided the basis for award of the 1970 Gorgas Award, presented annually by the Association of Military Surgeons, to Col Dan Crozier, commander of the U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, Md.

Army Surgeon General (Lt Gen) Hal B. Jennings Jr. presented the award, consisting of a silver medal, a scroll and honorarium. Instituted in 1942 by the AMS and Wyeth Laboratories of Philadelphia, Pa., the award honors the memory of Maj Gen William C. Gorgas, whose work in preventive medicine made possible for workers the construction of the Panama Canal.

Col Crozier graduated from the University of West Virginia and Harvard Medical School, served his internship at Methodist Hospital, Brooklyn, N.Y., and was awarded a fellowship at Vanderbilt University Hospital. He served his residency in internal medicine at St. Thomas Hospital, Nashville,Tenn.; Oliver General Hospital, Augusta, Ga.; and the Army's Fitzsimons General Hospital, Denver, Colo.

In 1953 he began active duty with the Army as chief of the Medical Service at Camp Rucker's Army Hospital. He has served as medical consultant, Eighth U.S. Army, Korea; chief, Medical Service, Ryukus Army Hospital, Okinawa; and chief medical consultant, Office of the Surgeon General. In 1961 he was assigned to the staff of the Army Medical Research Institute of Infectious Disease at Fort Detrick.

Col Crozier is certified by the American Board of Internal Medicine and is a Fellow of the American College of Physicians.

Col Dan Crozier

service during 30 years military duty.

Col Story commanded the unit while it conducted two research seminars (1968–70) on Reliability and Quality Control sponsored by the Chief of R&D and the Chief of Army Reserve, University of Connecticut.

Maj Gen Maurice C. Fournier, CG of the 76th Division, USAR, presented the award. Col Story performed a 1968 special tour of duty in OCRD during which he prepared a report on In-processing Review accepted as a "valuable contribution to the management effort of the office."

He also was cited for his contributions during a study of the Troop Programing Division, Office of the Assistant Chief of Staff for Force Development; for analysis of the resident course of the Industrial College of the Armed Forces; and as an instructor at the Command and General Staff College course in the U.S. Army Research School System.

Col Story is among the first Reservists to receive the LOM under new regulations that permit a Reservist not on active duty to be selected.

Col Robert T. Cutting distinguished himself while serving as chief, U.S. Army Medical Research Team (Walter Reed Army Institute of Research), Vietnam (June 1969–70), to earn the LOM presented recently by the Army Deputy Surgeon General, Maj Gen Spurgeon Neel.

During his tour in Southeast Asia, Col Cutting was responsible for identification and investigation of the various medical problems primarily affiliated with the fields of preventive medicine, combat surgery, combat medicine and neuropsychiatry.

The citation accompanying the award states in part: "Col Cutting's assessment on the impact of these diseases and psychosomatic affilictions on allied personnel greatly enhanced directional design in regard to comprehensive management and control of regulated health standards. . . .

"Through his persuasive power and respect, he also was responsible for the success of an Army-Air Force study of physiological changes in the wounded during air evacuation to Japan, a study which has already modified clinical criteria for air evacuation in Vietnam."

BRONZE STAR MEDAL. S/Sgt *Michael J. Fairlie*, now with the U.S. Army Engineer Reactors Group (USAERG), Fort Belvoir, Va., was awarded the BSM for meritorious service in Vietnam.

Brig Gen George A. Rebh, deputy director of Military Construction, Office of the Chief of Engineers, presented the award.

MERITORIOUS SERVICE MEDAL. *Col George A. Lynn*, Edgewood (Md.) Arsenal deputy commander, was awarded the MSM for achievements from May 1969 to July 1970 as deputy director, Research, Development and Engineering, HQ U.S. Army Munitions Command.

Col George W. Connell, Edgewood Arsenal commander, presented the award. The citation states in part: . . . Col Lynn exhibited extraordinary leadership and the highest quality of technical ability in the management of research and development activities ". . . assumed responsibility for a myriad of complex activities . . . rapidly identified problem areas, ascertained appropriate corrective actions and provided the managerial acumen to achieve highest quality results."

Lt Col Jess E. Baldwin, until recently deputy for Support of the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va., received the MSM prior to departure for Vietnam.

Col Bennett L. Lewis, MERDC commander, presented the award. The citation states in part: "Despite the pressure of duties arising from four command changes in less than two years, Col Baldwin successfully shaped support functions at the Center into a cohesive element capable of insuring that the Center retain its leadership among Army Materiel Command Commodity Commands in meeting AMC objectives. . . ."

COMMENDATION MEDAL. *Capt Donald C. Dahmann*, U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, Va., was awarded the Army Commendation Medal for achievements as executive officer of the 72d Engineer Detachment (Survey) in Monrovia, Liberia, from January 1969 to March 1970.,

Now serving as an R&D coordinator in the USAETL Research Institute, Capt Dahmann was cited for "unusual tact and diplomacy in dealing with various United States and Liberian governmental agencies, which added immeasurably to the project's image and won him the respect and cooperation that is vitally necessary in a host country."

Capt Dahmann received a BA degree from the University of Cincinnati in 1968 and entered on active duty in July of that year.

COMMENDATIONS. Office of the Chief of Research and Development, HQ DA commendations were presented recently to Mrs. Nora L. Comer, Outstanding Performance Rating (OPR), Mrs. Cathleen R. Durkin, OPR, and Mrs. Mary Elizabeth Heinbuch, OPR with Quality Increase, Office of the Chief of Adminstration.

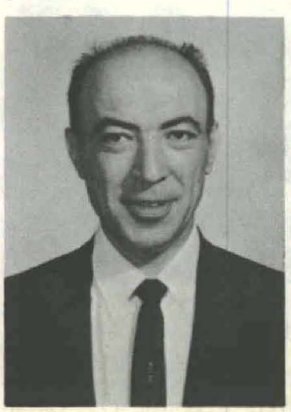
Dr. Sidney R. Alexander, U.S. Army Advanced Ballistic Missile Defense Agency, was awarded a 30-year Length of Service Certificate and Pin.

OCRD Mathematician Accorded Dual Honors by ASA

Dual recognition by the American Statistical Association (ASA) was conferred recently upon Fred Frishman, Physical and Engineering Sciences Division, U.S. Army Research Office, Chief of Research and Development. HQ DA.

Chief of the Mathematics Branch since 1962, Frishman was selected for membership in the International Statistical Institute (ISI) Conference Committee and appointed to the Samuel S. Wilks Memorial Medal Committee of the ASA for a 3-year term.

Devoted to the development and improvement of statistical methods and applications throughout the world, the ISI will hold its 38th biennial session Aug. 10–20 in Washington, D.C. About 1,000 statisticians and social and physical scientists are expected to attend.



Fred Frishman

The Wilks committee selects an outstanding statistician to receive the Samuel S. Wilks Award each year in recognition of significant contributions to the theory of experimental design benefiting the U.S. Government, the Department of Defense and the U.S. Army.

Prof. Wilks served as a key member of the U.S. Army Mathematics Panel, later redesignated the Army Mathematics Steering Committee, from its inception in 1954 to his death in 1964, when the award memorializing him was initiated.

Frishman has a BBA degree in business statistics from the City College of New York and BA and MA degrees from George Washington University, where he is completing studies for a PhD.

He is executive secretary of the Army Mathematics Steering Committee, a member of the DoD Liaison Group for Research in Quality Control and Reliability, and chairman of the Joint Services Advisory Group for Mathematics.

TACOM Studies Vehicle Signature Diagnosis, Countermeasures

By David Wilburn

Army vehicle project managers are becoming progressively more aware of the survivability of their products in an environment of sensory weapons which may utilize sound, infrared, magnetics or imagery as a mode of detection and delivery. Even the foot soldier's eye and ear can be a critical threat to a vehicle which is unnecessarily noisy or contrasts visibly with its background.

To provide a degree of security from detection by remote sensory devices, the U.S. Army Tank-Automotive Command (TACOM) Physical Sciences Laboratory is investigating vehicle signature diagnostic techniques and developing countermeasures through application devices. Since 1960 this laboratory has developed what is considered a unique capability in the science and technology of sensory analysis.

A vehicle signature is defined as a descriptive set of qualitative and quantitative data characterizing the salient features of a vehicle as a target to a sensory detector. Realistic signature data are gathered in the field on target vehicles operating through a prescribed course under known and controlled conditions of speed, load and engine power settings.

To duplicate air-to-ground observation conditions, a 60-foot tower has been constructed recently adjacent to the TACOM test track to provide aircraft simulation of slant angle detection from 2.5 to 90 degrees.

Instrumentation used in signature diagnostics is highly specialized and must be updated to provide state-of-the-art data. Five basic signature tests are now performed routinely: acoustic, infrared, magnetic, photometric/imagery, and seismic.

The acoustic or sound-emission tests include a listening jury which ear-evaluates each vehicle's sound. Octave band analysis and high-resolution tape recordings are made on each vehicle.

Octave band analysis is the measurement of a broad spectrum signal through filters which electronically separate energy into discreet bands. High-resolution analysis is a narrow-band filter separation of a complex signal that can approach band width of one cycle or less. The tape recordings are used later for computer input analysis of the sound spectra.

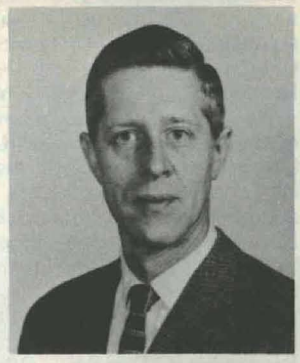
Radiometer observations of vehicle targets provide the basic infrared signature information. This is supplemented by passive imagery tests—the acquisition of pictoral target information derived without the aid of illumination sources—and high-resolution spectrophotometric observations.

A spectrophotometer is an instrument that optically separates small increments of energy for detailed quantitative analysis.

The photometric signature of a vehicular target is similar to the previously described infrared, but covers a different portion of the electromagnetic spectrum. Photometric sensors operate from the ultraviolet region, through the visible portion of the spectrum and out to a long wavelength of about 1-micron.

The most important part of the photometric signature is the eye sensitivity portion. In this case, interior and exterior vehicle lighting systems are photoelectrically analyzed in terms of how far the vehicle lights can be seen against a given background.

Under study also are surface and point reflectivity phenomena, as related to seeing the over-all form dis-



The author is currently serving as a senior project physicist with the Physical Science Laboratory, U.S. Army Tank-Automotive Command (TACOM), Warren, Mich., where he has specialized in infrared physics, photometry and spectroscopy. He joined the command in 1950 after he received a BA degree in physics and mathematics from Andrews University, Berrien Springs, Mich.

Wilburn is now engaged in committee activities on the Tri-Service Target Signature Panel and the Infrared Countermeasures Sub-Group of the Infrared Informational Symposia. He is past national chairman of the Thermal and Infrared Committee, Society of Nondestructive Testing.

The author has written several technical reports on military infrared and annually presents papers on associated subjects. He has received several awards for his activities in infrared. He holds two patents and has three patent disclosures in scientific fields.

Army Adopts Standard Lightweight Avionics System

Adoption of an aviation electronics (avionics) system one-third as heavy as equipment it will replace, smaller, more versatile, and with improved reliability, is announced by the U.S. Army Electronics Command.

Standard A classification of the system, developed under technical supervision of ECOM by contract with Sylvania Electric Products, Inc., is being acclaimed as a major milestone in Army avionics. Standardization means that the research, development and testing phases are completed.

The SLAE (Standard Lightweight Avionics Equipment) consists of three communications transmitter-receiver units (UHF, VHF and FM), an automatic direction finder set and an intercommunications control. Combined they weigh only two pounds more than the single UHF (ultra-high frequency) transceiver currently being used in Army aircraft.

Each transceiver is small and light enough to be held in one hand. The reductions in size and weight result in a less crowded cockpit and an increase of the aircraft payload.

Maintenance difficulties encountered on earlier avionics equipment have been eased by the improvement in reliability, maximum use of microsize integrated circuits, removable circuit boards, a built-in self-test capability, and special ancillary test equipment.

Experience to date indicates that maintenance is seldom needed; when required, the repair usually takes about 15 minutes at the Direct Support level, field technicians report.

PROJECT MANAGER for SLAE, Lt Col C. B. Maddox Jr., and his deputy, Anthony E. Filippo, demonstrate lightweight and small size of radio transmitter-receivers recently type-classified "Standard A" for production.

crimination of the vehicle without its on-board lighting system in operation. Photometric or visual imagery systems, such as low-light level television and image intensification, are used in collecting characteristic vehicle imagery data in the photometric region.

In both seismic and magnetic, triaxial sensors—devices which measure directional phenomena in three mutually perpendicular axes—are used to observe any vehicle-induced anomalies in the geophysical background.

Once the uncorrected signature data have been obtained from the instrument recordings, a computer program is set up for each of the sensory systems to reduce the multiplicity of data into meaningful units of energy.

Based on the reduced data, predictions can be made on lock-on distances and vulnerability aspects for specified weapons systems operating against a given vehicle, or for unaided detection by human beings.

Full-scale vehicle tests provide the best baseline data. However, a method of signature prediction has been developed using scale models or vehicle targets in the laboratory. Vehicle components and materials are also evaluated in the laboratory under controlled conditions of environment.

In the case of target imagery, this is accomplished by simulating a field environment through use of model vehicles placed against a controlled-contrast background.

For infrared target evaluation, vehicle exhaust systems can be scaled down and operated with controlled heat inputs to simulate actual engine operation.

In addition to these standard signature tests, several USATACOM research efforts are concerned with smoke and dust obscurations made during vehicle operation, ice fog generations in Arctic conditions, and special background and climatic effects.

Signature measurements are planned also for microwave radiometry, ultraviolet reflection and properties of exhaust gas effluence.

Telemetry methods are under development which will permit transmission of signature data from remote observation points to the laboratory for direct-input computer analysis.

Another goal of the vehicle signature program is the development of energy-limiting specifications for each sensory mode usable as a guide in determining vehicle acceptability.

In the case of noise, for example, one specification would outline aural security ranges which would be the distance a vehicle could be heard by a listener under a given set of engine operating conditions and background noise levels.

A specification for infrared emission has been derived for use in determining the vulnerability of vehicles to detection by IR sensory systems in various wavelength regions.

The most important aspect of the over-all USATACOM program, however, is the reduction of superfluous signatures. This can best be accomplished in future vehicles through the use of designed-in countermeasure devices while the vehicles are yet in the concept stage.

Current production and older vehicles can be aided through the use of bolt-on kits for suppression of specific unwanted signature characteristics. Efforts also include studies on special application of materials of low emissivity and low reflectivity, as well as component studies on mufflers and exhaust shroud devices.

ECOM Technical Paper Published

"Fabrication of RF Sputtered Barium Titanate Thin Film," a technical paper by Isaac H. Pratt and Stanley Firestone," HQ U.S. Army Electronics Command, appears in the January-February 1971 Special Proceedings, *Journal of Vacuum Science and Technology*. The paper was presented at the 17th National Vacuum Symposium in Washington, D.C.

Picatinny VE Team Cuts Cost of Detonating Fuzes

Efforts of a 5-man Value Engineering (VE) team at Picatinny Arsenal, Dover, N.J., have been credited with a 39 percent reduction in the unit cost of M551 point detonating fuzes—a validated (by the Army Audit Agency) cost reduction of $1,741,759 in FY 1970 and estimated savings of $1,963,089 in FY 1971.

The reduction was achieved by substituting a one-piece, die-cast, zinc adapter for a machined steel adapter assembly formerly used with a mylar seal. Credited with the improvement are Barney J. Skladany, Charles A. Brown, Arthur L. Besse, William R. Schneider and Vincent E. Bozzer. All are employed in the Applications Engineering Laboratory, Ammunition Engineering Directorate.

A VE investigation indicated the part could be successfully manufactured by the die-cast method with commercially available machines. Several changes were made to the basic design before the adapters were delivered to the arsenal for test and evaluation.

The fuzes with zinc adapters passed all production tests. Assembled to high-explosive cartridges, they were then subjected to comprehensive environmental tests at Picatinny Arsenal. The tests included jolt and jumble, 5- and 40-foot drop, transportation vibration, and impact safety; also, function firing on steel, sand and gravel at ambient −65° F. and +165° F. temperatures and at ranges varying from 100 to 600 feet.

Environmental test results proved the die-cast adapters are an acceptable substitute for machined steel adapters, since no test failures occurred in the 600 items tested.

The technical Data Package for the M551 fuze has since been revised to include the die-cast adapter, based on a proved capability of withstanding rigorous environmental conditions.

Col Price Assigned to ECOM as Associate Deputy (MO)

Assignment of Col Wilbur F. Price to the staff of the U.S. Army Electronics Command Deputy for Laboratories, with the title of associate deputy for R&D Management Operations, was recently announced.

Col Price reported to his new position after serving as deputy director, Plans and Operations, HQ U.S. Army Ryukyu Islands. He has served two duty tours in Korea, in 1958 as assistant G3 of I Corps and in 1967–68 as a battalion commander, 7th Division.

Col Wilbur F. Price

Among his other assignments was a 3½-year tour in the Office of the Deputy Chief of Staff for Personnel, HQ DA, Washington, D.C.; also, deputy director for personnel, HQ Combat Developments Command, Fort Belvoir, Va., and S–3 and executive officer of the 501st Airborne Battle Group of the 101st Airborne Division.

Col Price attended Pennsylvania Military College, graduated with a bachelor's degree from Omaha (Neb) University, and entered the Army as an enlisted man. He was commissioned in 1944 after graduating from OCS.

From 1954 to 1958 he was an instructor in the Tactical Department at the U.S. Military Academy and later served as adjutant of the 1802 Special Regiment at the USMA.

RDT&E, Procurement Contracts Exceed $913 Million

Orders for continuation of production and deployment of the Safeguard ABM System by Western Electric Co., at a cost of $365,057,105, are included in Army RDT&E and procurement contracts totaling $913,624,991 from Nov. 1 to Jan. 1. Only contracts exceeding $1 million are listed.

Jeep Corp. was awarded two contracts totaling $73,400,156 for 5-ton trucks. National Presto Industries, Inc., is receiving $50,048,933 for 105mm high-explosive parts.

Operation and maintenance of the Radford (Va.) and Sunflower (Lawrence, Kans.) Army Ammunition Plants accounted for $43,271,583 in contracts to Hercules, Inc. Three contracts totaling $38,142,279 with Chrysler Corp., are for combat tanks and for TOW missile production.

General Motors Corp. gained $29,420,606 in five contracts for research and development and advanced production engineering on combat tanks, transmissions, for storage batteries, and for a study on reentry physics and hypervelocity measure in support of the Antiballistic Missile Defense Agency's program.

Remington Arms Co., Inc., received $19,816,409 for operation of the Lake City (Independence, Mo.) Army Ammunition Plant. Olin Corp. was awarded $18,782,149 for operation of ammunition productions facilities.

Harvey Aluminum, Inc., will receive $17,599,220 for 20mm projectiles and for operation and maintenance of the Milan (Tenn.) Army Ammunition Plant. Hughes Aircraft Co. was awarded $16,107,550 for production of TOW missiles and equipment.

Raytheon Co. was issued four contracts totaling $16,012,924 for advanced development of the SAM–D system, for fuel conversion of Hawk support equipment to improved configuration, for R&D programs for the Hawk missile, and M904E3 fuzes.

NHA, Inc., was awarded $14,916,027 for the contracting of field teams to supplement maintenance of aircraft in Vietnam. Thiokol Chemical Corp. is loading, assembling and packing 60mm and 81mm cartridges plus 155mm illumination projectiles, signals and expelling charges under a $10,890,731 contract award.

Honeywell, Inc., will get $10,224,800 for grenade fuzes and associate spare parts. Chamberlain Manufacturing Corp. is receiving $10,028,434 for metal parts for projectiles.

Contracts under $10 million. Textron, Inc., $9,333,190 for UH-1H helicopters; Sperry Rand Corp., $9,071,908 for operation of the Louisiana Army Ammunition Plant; Appalachian Power Co., $7,841,076 for operation of a power plant to support production requirements at the Radford Army Ammunition Plant; and

Research Analysis Corp., $7,346,106 for research in scientific studies and reports, and for furnishing support applicable to operational research techniques; Philco-Ford Corp., $6,504,197 for services on the Chaparral Weapons System, for continuation of an optical measurement program for the Advanced Ballistic Missile Defense Agency, and for electronic equipment; and

General Dynamics Corp., $6,075,000 for automatic data processing equipment; Walter Kidde and Co., Inc., $5,506,250 for fuze parts; Rulon Co., $5,490,498 for point detonating fuzes.

Contracts under $5 million. Gulf and Western Industrial Products Co., $4,936,413 for manufacture of production equipment for 5.56mm ammunition; Uniroyal, Inc., $4,896,948 (two contracts) for pneumatic tires for trucks and for operation and maintenance of the Joliet Army Ammunition Plant; Day and Zimmermann, Inc., $4,584,030 for operation of the Lone Star Army Ammunition Plant; and

Firestone Tire and Rubber Co., $4,567,289 for track shoe assemblies for personnel carriers; E. I. du Pont de Nemours and Co., $4,488,639 for preoperation activity to provide a 5-line TNT plant, and for operation and maintenance of the inactive portion of the Army Ammunition Plant, Newport, Ind.; and

Goodyear Tire and Rubber Co., $4,410,346 for track shoe assemblies for personnel carriers; R. G. Le Tourneau, Inc., $4,175,600 for metal parts for bombs; Consolidated Box Co., Inc., $4,102,898 for fiber containers for ammunition; and

Holston Defense Corp., $3,937,923 for operation and maintenance of facilities at the Holston Army Ammunition Plant; AMBAC Industries, $3,786,270 (two contracts) for illuminating signals; AVCO Corp., $3,625,894 for turbine blades and modification kits for gas turbines.

Dynasciences Corp., $3,594,429 to design, develop and fabricate automatic test equipment for internal combustion engine-powered equipment; Temco, Inc., $3,539,222 for projectiles; Standard Container Co., $3,483,104 for ammunition boxes; and

Ingraham Industries, $3,265,304 for projectile parts; RCA Corp., $3,156,555 for engineering services for Land Combat Support System; United Ammunition Container Corp., $3,115,780 for ammo containers;

Fab-Weld Corp., $2,869,805 for cargo containers; I. D. Precision Components, Inc., $2,823,320 and Action Manufacturing Co., $2,752,960 for fuze parts; Pine Bluff Arsenal, $2,500,000 to load, assemble and pack cluster bombs; and

Federal Cartridge Corp., $2,469,093 for operation and maintenance of facilities at the Twin Cities Army Ammunition Plant; Norris Industries, $2,195,700 for projectiles; DVA Corp., $2,076,375 for parts for boosters.

Contracts under $2 million. Davidson Optronics, Inc., $1,831,904 for night observation devices; Dynalectron Corp., $1,831,703 for maintenance services in support of communications in Vietnam; Gulf and Western Industries, $1,822,208 for grenade parts; and

Baldwin Electronics, Inc., $1,787,400 for loading, assembling and packing 2.75-inch rocket motors; Mohawk Rubber Co., $1,592,169 for pneumatic tires for trucks; Computer Sciences Corp., $1,559,408 for maintaining the Safeguard Management Information System; and

Fairchild Corp., $1,540,800 for fuze parts; TRW, $1,500,000 for electronic equipment; Batesville Manufacturing Co., $1,479,616 for rocket launcher parts; G&R Industries, Inc., $1,463,000 for bomb assemblies; Galion AMCO, Inc., $1,456,049, projectiles;

George K. Garrett Co., $1,330,550 and Heckethorn Manufacturing Co., $1,274,100 for 7.62mm ammunition links; Paper Tubes, Inc., $1,260,000 for ammunition containers; and

Scovill Manufacturing Co., $1,244,401 for grenade fuzes; Inter-Alloys Corp., $1,242,000 for armor-vehicle launch bridges; Stanford Research Institute, $1,199,718 for research, scientific studies and evaluations; Capitol Engineering and Manufacturing Co., $1,183,875 for M60A1 tank chassis launchers; and

Northrop Corp., $1,175,498 for warheads; Westinghouse Electric Corp., $1,147,010 to furnish unit substations for the Safeguard electrical system; Atlas Chemical Industries, Inc., $1,127,459 for operation and maintenance of facilities at the Volunteer Army Ammunition Plant; and

Clevetak Corp., $1,127,099 for fiber containers for 2.75-inch rockets; Magnavox Systems, Inc., $1,071,969 for gun direction, M18 computers; Syracuse University Research Corp., $1,060,000 for a study for Safeguard electronic countermeasures; and

Maxson Electronics Corp., $1,042,500 for rocket fuzes; Uniroyal, Inc., $1,020,527 for ammunition; General Relay Corp., $1,013,000 for Hawk launcher modification kits; Control Data Corp., $1,000,000 for classified research and development.

ISF Winners End Japan Trip as Good Will Envoys of U.S. Armed Forces

Ten days in Japan as good will envoys of the U.S. Armed Forces to the 14th Japan Student Science Awards ended successfully late in January for Debbie Anne Meloy, Ronald Lee Amey and James D. G. Lindsay, all selected at International Science Fair.

In the opinion of Miss Meloy, the U.S. Army representative, it was an experience to remember for the rest of her life, and also her first trip outside the United States. Debbie Anne is a 17-year-old Fairfax, Va., beauty-with-brains type who ranks first in her class of 653 students at J. T. Woodson H. S. in Fairfax.

Ronald Amey was the choice of the Navy and James Lindsay was chosen by the Air Force from among more than 400 finalists who displayed their research exhibits at the 21st annual International Science Fair last May in the Baltimore (Md.) Civic Center. Debbie Anne is one of 40 finalists in the forthcoming annual Westinghouse Science Talent Search.

Operation Cherry Blossom, as the annual trip to Japan is known to the Army, Navy and Air Force sponsors, was inaugurated in 1963 and traditionally has earned the warm-hearted response of the Japanese people.

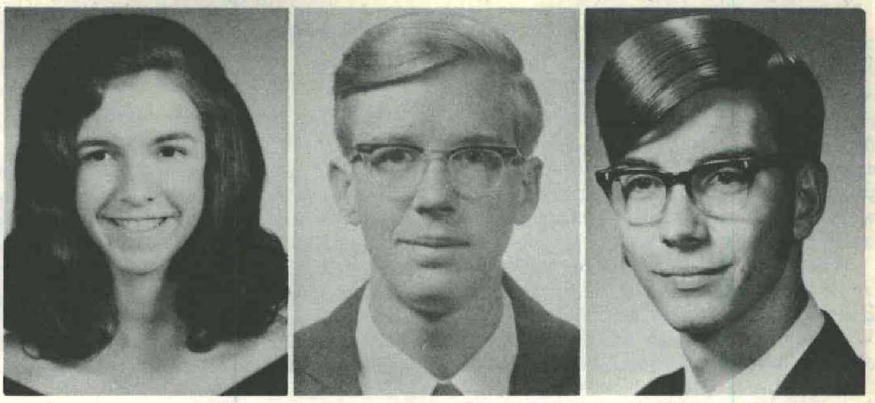
The goal of U.S. Armed Forces science fair representatives is to stimulate an appreciation of capabilities of high school science students in the "grass roots level" of young people.

Cmdr Joan M. Reece was selected by the U.S. Office of Naval Research as escort officer for the trio of students on a strenuous schedule of activities during the full 10 days that called for physical endurance as well as charm for all occasions. The escort officer duty rotates among the sponsoring services.

Cmdr Reece reported that the scientific displays exhibited by the U.S. representatives in the Japan Student Science Awards appeared to be highly impressive to visitors. The displays evidenced the exceptional research talents of the young Americans, but were not in the prize competition.

Japanese Prime Minister Sato sent a representative to the awards presentation ceremonies, which were presided over by their Imperial Highnesses, Prince and Princess Hitachi. Numerous high-ranking Japanese officials participated in the activities.

The itinerary arranged for the American students included visits to Japanese homes to learn about social customs and cultural traits; also, a tour of the National Science Museum at Ueno Park; and a trip through the *Yomiuri Shimbun*, one of Japan's largest newspapers. The paper sponsors the Japan Student Science Awards program.



Debbie Anne Meloy | James D. G. Lindsay | Ronald Lee Amey

Other scheduled activities included radio interviews at HQ 5th U.S. Air Force, a courtesy call on the commander of the U.S. Air Force Japan, a visit to the Meiji Shrine, and interviews by *Stars and Stripes* reporters.

Included also were sightseeing in Tokyo, a tour of the National Aerospace Laboratory, a visit to the Jindaiji Temple and Botanical Garden, and a cultural tour of the ancient capital of Kyoto and the gardens.

Miss Meloy's display depicted about five years of highly intensive research effort. It was titled "A Visual and Radio Investigation Concerning the Nature of Jovian Decametric Emission" and it explored five major areas of investigation of the Planet Jupiter and its physical phenomena.

She constructed most of her equipment, including assembly of a $200 superheterodyne receiver, tape recorder and strip recorder to plot her observations.

Debbie Anne also built a telescope with a 6-inch reflector that she ground and polished over a 6-month period. The total telescope required over a year. Construction of a cubical quad antenna 13.9 feet on each side and 13.9 feet from the ground was a part of her project.

Debbie Anne plans to pursue her goal of becoming an astrophysicist by attending Cornell University—a goal that could be furthered substantially if she were to win one of the top prizes (as high as a $10,000 4-year scholarship) in the Westinghouse Science Talent Search.

Ronald Amey's exhibit showed results of his research to develop a powerful new adhesive impervious to long periods of underwater exposure. His approach was to collect Atlantic Coast barnacles from rocks and ships and to extract the adhesive secreted in their bodies.

The result is an adhesive that is envisioned as having potential application to both military and civilian requirements, when it can be synthesized economically for mass production. One of the possible uses, for example, is for dentistry.

James Lindsay's interest in science began at the age of five (possibly stimulated by his parents, both of whom have MS degrees) and he has competed in numerous science fairs.

The research that made him a finalist in the International Science Fair was on metals. He succeeded in determining superconducting transition temperatures of niobium-titanium alloys, as correlated with Mathias' empirical rules.

Debbie Anne Meloy Selected For Westinghouse Scholarship

While the ink on the page proofs of this issue of the *Amy R&D Newsmagazine* were still wet, Debbie Anne Meloy went on to win a $4,000 scholarship as one of the top 10 scorers in the 30th Annual Westinghouse Science Talent Search finals held in Washington, D.C.

She and 39 other nationwide high school science finalists displayed their research exhibits at the Shoreham Hotel and underwent a series of meetings and interviews to vie for 10 scholarships ranging from $4,000 to $10,000. James H. Van Aken, 17, of Western Spring, Ill., was the top award winner and recipient of a $10,000 scholarship for his display of a mathematical project, "The Covarient Chain Rule." The remaining finalists received cash awards of $250.

Army Survey Shows Fluidics Potential in Military Aerospace

By James W. Joyce Jr. and Lyndon S. Cox

Fluidics, the technology of sensing, computing and/or controlling mechanical devices or systems using flowing fluid as a power source—hailed increasingly for potential industrial applications important throughout the world—has progressed amazingly in its first decade.

When a press conference was held in March 1960 at the U.S. Army's Harry Diamond Laboratories in Washington, D.C., to announce development of the principles of what was then termed "fluid amplification," news media, including more than 25 journals, carried the story worldwide.

Importance of the discovery was recognized internationally in 1967 when the Harry Diamond Laboratories trio of inventors were honored with the John Scott Award. Dating back to 1816, this award is reserved for epochal contributions to science—such as those of Mme. Curie, Edison and Marconi.

The primary patent for fluidics controls was issued to Billy M. Horton, presently the HDL technical director, Raymond W. Warren and Dr. Romald E. Bowles.

Frequent reassessments of the feasibility of new fluidic systems are proving profitable in the cycle of exploratory development. Despite the widespread industrial interest in advancing this technology, involving expenditures of many millions of dollars annually in R&D effort, no significant military applications have been deployed.

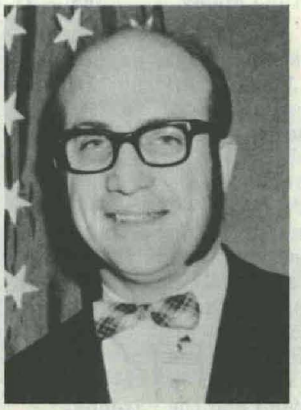
Consideration of the military potential of fluidics, particularly in the aerospace field where radiation hazards pose a serious threat, was the assignment of a U.S. Army team which recently completed an in-depth study.

An example of many remarkable advances in fluidics technology is increase in speed of oscillator-counter timers—from less than 100 hertz (Hz) in 1964 to 8,000 Hz in 1969.

Effects of radiation can directly disturb semiconductor electronics, but do not directly affect fluidics. Temperature changes from energy absorption can cause changes in pressure, density, viscosity and other fluid properties; fluidic circuits, however, can be made relatively insensitive to changes in these parameters. Energy absorption effects can be minimized, therefore, to a greater degree than in electronics.

Examples of the potential applications of fluidics in the military aerospace industry include offensive, defensive, and general-purpose systems. Systems discussed in this article have a competitive advantage over other technologies, due to the potential radiation tolerance of fluidics at extreme levels combined with the immediate availability of pneumatic or hydraulic power.

JAMES W. JOYCE JR. has been employed since 1962 at the Harry Diamond Laboratories (HDL) where his efforts have been directed mainly toward uses of fluidics in medical engineering. He is credited with contributions to development of an artificial heart blood pump, two types of respirators, and an artificial heart implant still in the early experimental phase. He received BSME and MSE degrees (1961–65) from George Washington University.



LYNDON S. COX is a project leader in the HDL Fluidic Systems Development Branch where he has been concerned with design of weapons and fuzes; also, research on environmental effects, nuclear vulnerability, and fluidics. He had similar research experience with the U.S. Navy. Cox earned a BSM degree in 1957 from the University of Maryland where he is seeking a PhD.

★ ★ ★

The list of potential systems for utilization in military aerospace developments is not intended to be complete; rather, it is a representative sampling of applications amenable to fluidics. Offensive systems to which fluidics can be applied include timers, safing and arming devices, and reentry vehicle guidance and control.

Constituent parts of a typical precision timer are an oscillator and a counter, which have been combined to form fluidic timers. For missiles or projectiles flying through the atmosphere, it would be both reasonable and advantageous to use fluidic timers because the motion of the projectile generates a ready source of fluidic power and the ram air constitutes an environmental signature.

A fluidic timer could be used to generate an accurate time delay during which electronic systems could be turned off. Many electronic circuits are less vulnerable to radiation effects when off. Therefore, where portions of the electronics may be both more vulnerable and nonessential during maximum threat periods, these circuits could be turned off for a fixed time determined by a fluidic timer, which offers a highly reliable way of doing this job.

Fluidic timers could also be used in safing and arming systems to compute a prescribed time after launch. However, a safing and arming system generally entails more than a timer. Other aspects of a typical mission (e.g. environmental signature) generally are used to reduce the chance of an accidental firing.

One very simple system employs a fluidic rate sensor to monitor the roll rate in a missile. Only after a predetermined roll rate is achieved is it possible to arm the warhead. The basic rate sensor used in the system is a laminar device that differs markedly from the present fluidic vortex rate sensors.

A second fluidic safing and arming system insures that a minimum dynamic pressure is achieved before electrical power is generated. The heart of this system is a fluidic generator that converts ram air into electrical power. Sufficient electrical power can be generated to operate many of the fuzes in military use.

A reentry vehicle roll-control system presents a particularly reasonable application of fluidics. The roll rate can be clockwise or counter clockwise, but must remain within given minimum or maximum absolute values. Generally, there is a large difference between maximum and minimum roll rates, so the roll-control system need not be designed to maintain a given roll rate with even moderate precision.

The relatively simple logic scheme needed here was breadboarded with 15 fluidic logic elements. A study of this system has shown that the performance of existing fluidic components can be degraded by a factor of four and still give satisfactory performance. The fluidic system should prove to be simple, reliable and insensitive to defensive actions that might imperil an electronic system.

Another aspect of using fluidics in a reentry vehicle guidance and control system can be seen by reference to Figure 1. A maneuverable missile or reentry vehicle requires a control system including some part or all of the generalized scheme depicted.

Usually the system is duplicated to control pitch and yaw axes independently. The controller actuates fins or reaction jets to keep the error between the commanded and measured vehicle response at a minimum.

The command signal may be telemetered from the ground or be determined by an on-board guidance computer. With the slow time response capabilities of the fins and reaction jets, a fluidic controller should be fast enough to translate the guidance-error command into the proper actuator responses. The controller need not possess extreme accuracy because any growing deviations from the desired trajectory will eventually show up in the command signal.

An example of a defensive system is the antiballistic missile that must perform a difficult mission in a potentially severe radiation environment.

To determine potential feasibility of using fluidics, a computer simulation of a fluidic autopilot for a Sprint missile used in the Safeguard ABM System was developed.

The system block diagram (Figure 2) indicates that acceleration commands are telemetered from the ground. The autopilot operates controls to minimize the error between the desired and measured acceleration signals. The autopilot must make the systems table. Minor steering errors can be corrected by future signals.

The simulation studied the interaction of the vehicle dynamics with the response capabilities of the fluidic components. Variable gain is provided to compensate for the varying effectiveness of controls during a mission.

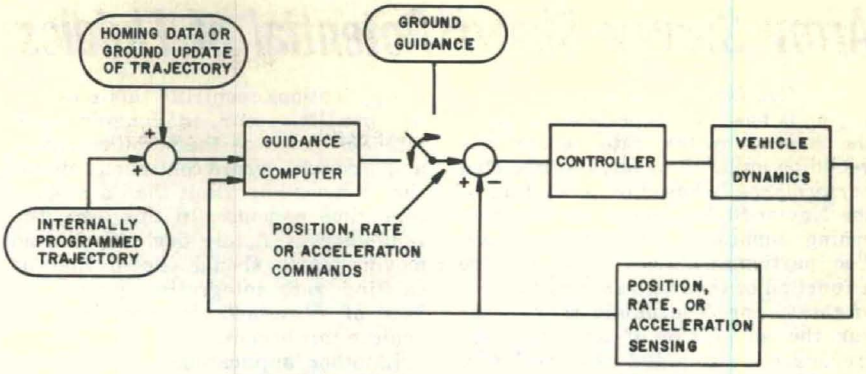


Fig. 1. Generalized Guidance and Control Scheme

The fluidic gain variation mimics the gain variation used in the present electronic system. In this simulation of existing fluidic components, results showed that the fluidic system would have about half the gain and phase margins of the electronic system.

However, assuming modest improvements in most fluidic components and a major improvement in the fluidic rate sensor (to be discussed later), the simulated fluidic system demonstrated acceptable dynamic performance.

The Army study of possible military aerospace applications has shown that fluidics systems possess both the capability of performance and the environmental hardness potential needed for antiballistic missiles. Because the high-speed Sprint application was studied, it is reasonable to conclude that there are many slower-responding missiles for which a fluidic autopilot would also be feasible.

Other defensive applications include the fluidic timers already discussed and the general-purpose fluidic systems, which will be described next.

A natural area where fluidics should be considered is the directional control of a rocket. Thrust vector control of a rocket is utilized to provide both stability and guidance.

The Army has achieved thrust control by diversion of propellant gases through auxiliary thruster nozzles. Power amplification via multiple staging to produce significant, controllable thrust levels with minute input signals has been demonstrated.

Deflection of the main motor jet by fluidic control also has been demonstrated. The U.S. Army Missile Command has successfully test flown a fluidically guided missile that used flow diverted from the main engine to power reaction jets for guidance.

The application of fluidics to perform these functions reduces the number of close tolerance dimensions, eliminates a large power requirement, and reduces environmental sensitivity.

All these factors increase system reliability and performance, and should decrease the system cost.

Experimental and analytical efforts have indicated recently that fluidics may be able to compete very effectively with electronics in the measurement of angular rates. Recently developed laminar-flow rate sensors appear to have thresholds that are competitive with the rate integrating gyros available today, although the fluidic threshold is achieved with a relatively slower time response.

Performance of the laminar-jet rate

(*Continued on page 46*)

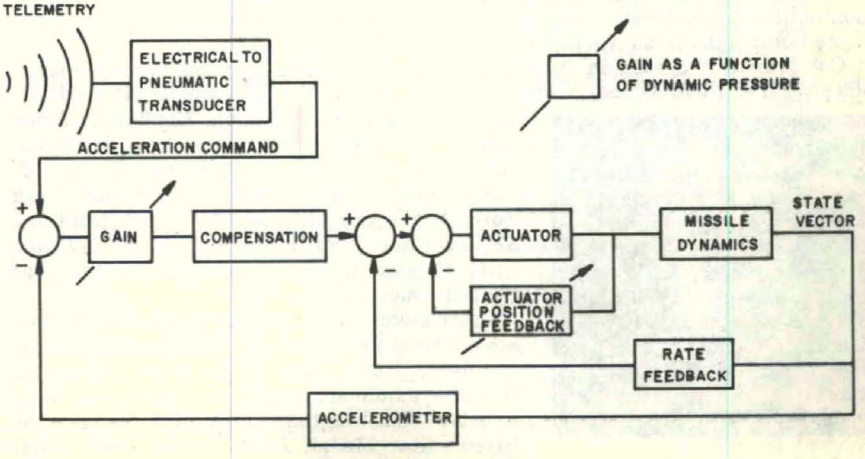


Fig. 2. Missile Autopilot

Army Survey Shows Potential of Fluidics in Military Aerospace

(*Continued from page 45*)

sensor is based on experimental data; the laminar-vortex rate sensor has yet to be built. However, its predicted performance is based on a solution of the Navier-Stokes equations (the governing equations for laminar flow). The particular design point will be a function of the flow rate and the size of the sensor. The fluidic rate sensor has the advantage of surviving extreme acceleration and rate overloads.

Although time response can be improved with a loss in threshold, there is some question as to the need for a rapid response when rates of one degree/hour are to be measured.

Applications requiring this sensitivity usually occur in long-duration missions (such as the stabilization of a spacecraft) where continuous operation is more important than a millisecond time response. In this area, the reliability of fluidic devices with no moving parts should exceed that of existing rate integrating gyros. No loss of threshold is necessary to achieve this benefit.

In other applications, such as the stabilization of a high-performance missile, it would be desirable to sacrifice the threshold for a more rapid response. Although the environmental insensitivity of a laminar rate sensor is still unproven, these sensors should be able to tolerate the environment in which such missiles would operate.

Additionally, the existence of an analytical solution should facilitate the compensation of the temperature effects resulting from energy absorption. The work to date indicates that fluidic rate sensors offer the reliability, environmental tolerance and, most important, performance to compete with existing electro-mechanical rate sensors in certain applications.

Another potentially important role for fluidics is to serve as a backup to more sophisticated electronic systems. Electronic computers are likely to remain in contact with a distant headquarters while observing the progress of a battlefield action. The system could provide a headquarters with live television coverage of remote military operations.

Aircraft Radio Linkup Termed 'Significant First'

Two-way voice contact between a U.S. Army helicopter flying above Lakehurst, N.J., and a U.S. Air Force EC–135 aircraft over Sydney, Australia, by microwave radio linkup via satellite, was reported Jan. 15.

HQ U.S. Army Satellite Communications (SATCOM) Agency acclaimed the feat as a "significant first" in communication between aircraft flying thousands of miles apart.

The linkup at superhigh frequency (SHF) was effected through a tri-service tactical communications satellite orbiting 22,000 miles above the earth. SATCOM Agency said the normal range of reliable microwave communications, without the satellite relay, is about 50 miles.

The agency designs, develops and deploys the terminals for the Department of Defense satellite communications systems. Project engineer William Todd said the feat was accomplished by a unique antenna system for the helicopter developed under a contract with Bell Aerosystems under a joint program, involving the Air Force Avionics Laboratory, Wright-Patterson AFB, and the Army.

SATCOM Agency has been engaged in testing the feasibility of the high-gain tracking antenna and terminal equipment to meet a need for dependable long-distance communications. The antenna is mounted under a protective cover atop the rotor of the helicopter to obtain a path to the satellite unobstructed by the rotating blades.

Agency engineers indicated that a microwave satellite communications terminal on a helicopter should make it possible to transmit and receive voice and data traffic dependably over any distance up to 10,000 miles.

Development of such a capability would enable a field commander to remain in contact with a distant headquarters while observing the progress of a battlefield action. The system could provide a headquarters with live television coverage of remote military operations.

The SHF helicopter system employs a 32-inch parabolic antenna, kept pointed toward the tactical communications satellite by an automatic "power steering" system driven from the pitch, roll and heading gyroscopes for other instruments.

Drift in the gyro system is compensated by a supplemental target-seeking system using a slow mechanical oscillation (conical scan) around the angle to the satellite. The antenna remains pointed toward the satellite despite aircraft motions.

Designated AN/MSC–57, and adapted from ground vehicle to aircraft operation, the terminal has a transmitter power of about 100 watts.

RADOME covers 32-inch parabolic antenna mounted on top of helicopter rotor for tactical satellite communications experiments. Automatic "power steering" keeps antenna on satellite.

Col Kunkel Assigned as SATCOM Deputy Project Manager

Col Laurence J. Kunkel is the new deputy project manager of the U.S. Army Satellite Communications (SATCOM) Agency at Fort Monmouth, N.J.

Until he assumed this position, he served two years as acting chief, Systems Compatibility Division, Defense Communications Engineering Office, HQ Defense Communications Agency (DCA), Washington, D.C.

Col Kunkel's career in recent years has included duty as deputy Signal officer, First Field Force, Vietnam; chief, Electronics Branch, Doctrine Division and Materiel Division, Combined Arms Group, Combat Developments Command (CDC), Fort Leavenworth, Kans.; Signal officer, U.S. Army Southern European Task Force (SETAF); CO, 560th Signal Battalion, SETAF; and chief, Plans and Policy Division, CDC Communications-Electronics Agency at Fort Monmouth.

Col Laurence J. Kunkel

Col Kunkel has a bachelor's degree in business education from St. Benedict's College, Atchison, Kans., and a master's degree in business administration from American University, Washington, D.C. He holds the Bronze Star Medal, Joint Service Commendation Medal and Army Commendation Medal.

main uncomfortably sensitive to radiation. For large-scale controlled maneuvers occurring several minutes before impact, a total loss of guidance might result in a huge miss distance.

If fluid power is on board, it would be reasonable to use some of it to operate a relatively simple fluidic (backup) guidance system that takes over only when the electronic (primary) package is damaged.

A system using equations of dubious accuracy should be several orders of magnitude better than total loss of guidance, and in some cases might at least deliver the warhead close to the intended target.

Another valuable backup system that could be realized with fluidic components is an inertial fuze designed to trigger a reentry vehicle warhead. Fluidic accelerometers and integrators would be needed for this application. The demand for precise, drift-free integration would suggest form of digital integration be used.

Initial efforts to build this backup fluidic fuze have indicated the general feasibility. Work is continuing to solve some of the practical problems, such as impedance matching and temperature compensation.

Fluidics offers a natural method for detecting and measuring the effects of radiation. Because of its radiation tolerance, a fluidic instrument could measure a quantity of interest without the suspicion that the data have been altered by a secondary effect. This worry would always be present with an electronic instrument.

This concern has prompted the exploratory development of at least three fluidic instruments. One is an accelerometer to record the effects of the blast wave produced by a nuclear explosion in the atmosphere. This accelerometer uses a mass suspended on flexible arms between two gas bearings.

An acceleration of the mass produces a differential pressure at the two bearings; this signal is amplified fluidically and used to drive a flexible diaphragm. A pen is connected to the diaphragm to record the acceleration on a moving paper tape. The basic signal measured at the air bearings is very clean and consistent. The few problems with this instrument seem to be those of properly applying existing fluidic technology as opposed to real state-of-the-art limitations.

A second fluidic instrument has been designed to measure the neutron flux emitted by a nuclear reactor. One of the limitations is that it is necessary to wait perhaps 50 milliseconds for the heat generated in the materials to be convected into the flowing gas. This eliminates the possibility of instantaneous measurements in a weapon environment. The measurements would be proportional to dose.

A third fluidic instrument is an ammeter designed to measure the currents induced in the bridge wire of an electro-explosive device by a radio frequency field. Present electronic instrumentation uses a thermocouple to detect the heat generated by the induced currents.

The fluidic ammeter measures the current indirectly by using a miniature fluidic temperature sensor to measure this heat. The instrument must then be able to transmit the fluidic signal away from the radio frequency field (perhaps a distance of 10 meters) where shielded electronic transducers can measure the fluidic signal. The ammeter has been breadboarded and demonstrates fairly good performance; however, some refinements are still desirable.

A few other applications of fluidics that might some day prove to be practical are (1) a fluidic backup memory for a computer, (2) fluidic launch sequencers and ground-support equipment for missiles, and (3) a fluidic north-seeker.

The fluidic memory would permit the storage of important data (e.g., the state vector for a missile) in a hardened memory bank. If the computer experienced a strong magnetic field from a nuclear weapon, the memory might be altered without destroying the computational elements. A fluidic memory would then permit the computer to survive the effects of the blast without any loss of important data.

Fluidic ground-support equipment for a missile might be desired to insure that the missile can be properly armed and launched even after a severe radiation exposure has occurred.

A fluidic north-seeker would allow the determination of true north even after the earth's magnetic field in a locality is severely distrubed. This might be an especially valuable capability for a submarine, airplane or missile silo.

From the examples cited herein, it should be apparent that fluidics R&D has progressed to the point where it can perform useful military aerospace functions, and in some instances represents the best technology to employ. This is true in spite of the fact that fluidics is slower and usually less accurate than electronics.

Fluidics should be used only when the combination of system constraints (e.g., hardness, long life) and acceptable performance (i.e., speed, accuracy) justifies the choice.

Fortunately, within the past few years, fluidics has progressed so that it can perform militarily meaningful sensing, computing, and controlling roles. Fluidics is now a reasonable alternative where electronics cannot tolerate the environment.

$11.2 Million Award Funds Vietnam Communications Net

Award of an $11.2 million contract to operate and maintain the existing integrated communications system in the Republic of Vietnam was announced Jan. 18 by HQ U.S. Army Strategic Communications Command, Fort Huachuca, Ariz.

The one-year contract with Federal Electric Corp., a subsidiary of International Telephone and Telegraph, calls for engineering and training services in support of the system as well as operation and maintenance of about 70 communications sites.

STRATCOM officials said the eventual goal of the program is to train Vietnamese military personnel to operate the sites and facilities.

Evans Assigned as Liaison Officer For STRATCOM at Fort Huachuca

A third assignment to Fort Huachuca, Ariz., has made Maj Robert H. Evans the liaison officer between the Army Communications System Agency (CSA) at Fort Monmouth, N.J., and HQ Strategic Communications Command (STRATCOM) at Fort Huachuca.

Maj Evans was Signal operations officer for I Field Forces during his recently completed second tour of duty in Vietnam.

He commanded the 68th Signal Company and the 16th Signal Battalion while serving at Fort Huachuca from 1958 to 1960. On his second tour (1965–66), he commanded Company C, 459th Signal Battalion.

Maj Evans has a BS degree in zoology. He has been awarded the Bronze Star Medal (with OLC) and Air Medal (with 7 OLC).

NLABS Developing Continuous Microwave Food Sterilization

By Dr. Ernest M. Kenyon

Canned meat products have had a borderline acceptance as military rations, due to poor flavor and texture, since they were first provided to soldiers during the Civil War. Still these foods, from the original canned bully-beef to those widely used in C-rations, have remained the backbone of combat meals.

Low acceptability of canned meat items is due primarily to the necessity of transmitting heat into the center of the can to insure the killing of spoilage microorganisms present throughout the product.

Generally this process results in greatly overcooking the portions of the product near the surface of the can, which causes the typical bitter flavor and soft texture.

Two new development efforts at the U.S. Army Natick (Mass.) Laboratories, commonly known as NLABS, are concerned with achieving what is expected to be a major breakthrough in solving this long-standing problem.

The first effort is the nearly completed development of a flexible plastic pouch as a substitute for the traditional tin can. The container, about 4½ by 7 inches and ½-inch thick, contains an individual portion of 6 to 8 ounces of food. Some of the many advantages over the tin can are the pouch is light in weight, fits easily in the soldier's pocket, and can be disposed of without littering the landscape.

Elimination of the metal container has opened the way to a major improvement in effectiveness of the heat sterilization process. Essentially transparent to microwave energy, the pouch permits the entire contents to be very rapidly and uniformly heated.

The product is subjected to ultra-high-frequency electromagnetic fields in a resonant cavity. Polar molecules, such as water, attempt to change direction each time the field alternates. At the frequencies used—2,450 MHz (2,450 million cycles per second)—the field reverses rapidly, causing the molecules to vibrate. Resulting collisions between molecules is translated into heat.

Because the heat is generated within the food, instead of being conducted from the outside, products can be sterilized in a matter of a few minutes—as compared to nearly an hour when the heat is applied only to the outside in the conventional method. With such short heating times, a continuous process is feasible and has been developed.

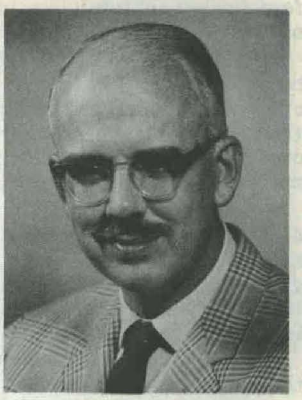
Conveyor speed and power level are regulated to provide the desired process time and temperature. Cooling is accomplished by a refrigerated platen under the final section of the conveyor or by immersion in a cold water reservoir. Pouches are overpacked after processing in a barrier film (aluminum foil plastic) laminate to provide protection and storage stability.

Figure 1—This photograph shows the microwave generating system which was modified to produce the processing system described.

Figure 2 is a schematic view of the continuous microwave processor.

Figure 3 is a view of the processor in operation, showing entrance valve assembly and the applicator.

Figure 4 shows typical heating curves for ration components.



Employed at the U.S. Army Natick (Mass.) Laboratories since their establishment in 1954, Dr. Kenyon is a senior project engineer in the Process Development Division of the Food Laboratory. He has served as assistant technical director of the Research and Development Division and as deputy director of Field Testing in the Office of the Quartermaster General, Washington, D.C. He recently retired from the U.S. Army Reserve with the rank of lieutenant colonel.

Dr. Kenyon has SB and PhD degrees from the Massachusetts Institute of Technology. He is a member of the Society of Xigma XI, Institute of Food Technology, International Microwave Power Institute, and the editorial board of the Journal of Microwave Power.

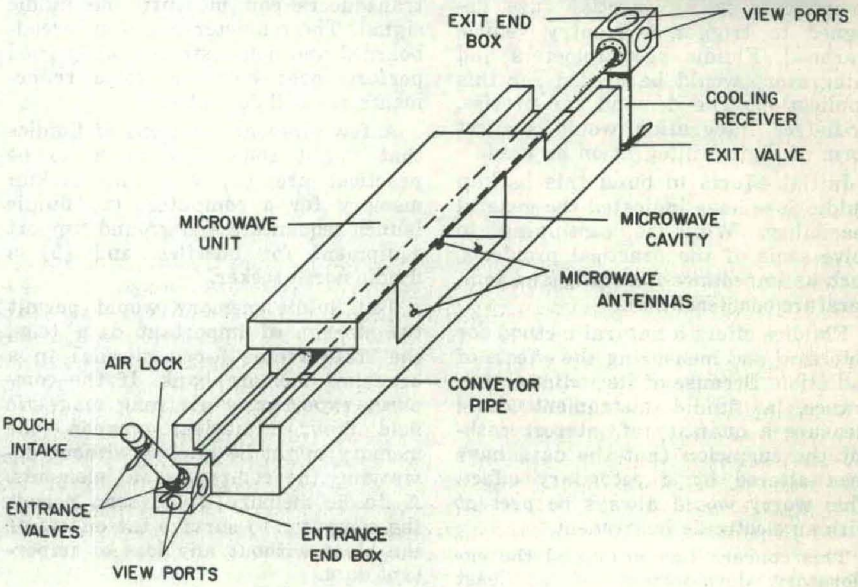


Fig. 2. Schematic of Continuous Microwave Processor

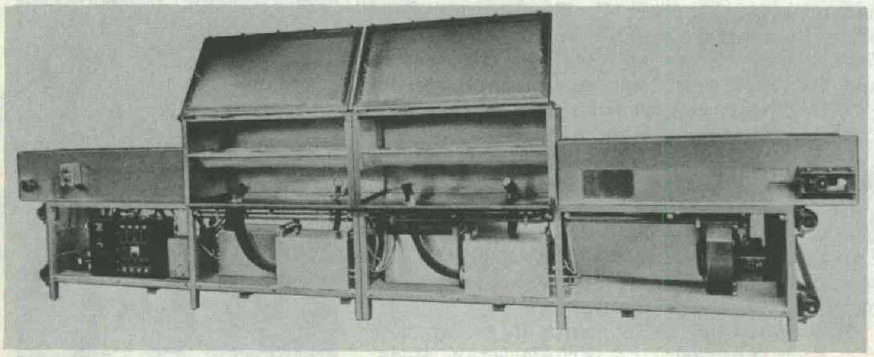


Fig. 1. Microwave Generating System

Processing equipment being used has a feed rate of up to two pouches a minute, with continuously controllable belt speed up to 10 feet a minute and varying power levels.

The air over-pressure used to prevent pouch rupture can be varied from zero to 40 pounds a square inch. Heating time varies from 3 to 7 minutes and cooling time from 1 to 2 minutes, depending on the products.

Several food products, typical of the meat components of various rations, have been processed by NLABS personnel and preliminary results have been very promising. The equipment will be used in continuing studies of a family of Army ration items of immediate military interest.

While the economics of this method have not been studied in detail, no significant change in processing cost is anticipated. Microwave heating is exceptionally efficient and reasonable in cost.

Research efforts to date have demonstrated the practicality of an operating system, utilizing for the first time microwave energy on a continuous basis to heat-sterilize ration components.

Considerable research remains to be done, including establishment of exact processes for a large number of products; also, measuring flavor and texture acceptance against counterparts made from fresh meats.

Microbiological studies will seek to establish the safety and the engineering data required for scale-up and quality assurance. Field tests will insure that nothing has been overlooked in the effort to achieve a major improvement in the quality of the combat soldier's food.

Fig. 3. Processor Entrance-valve Assembly.

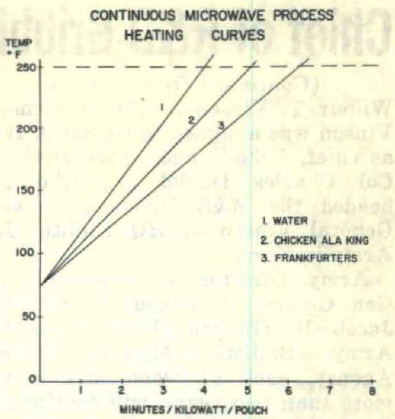


Fig. 4. Heating Curves for Ration Components

ECOM Reports on 10 Patents

Granting of 10 patents to ECOM scientists, engineers and technicians was announced Feb. 1 by the Army Electronics Command Patent Agency, Fort Monmouth, N.J.

Sol Schneider, a physicist and George W. Taylor, an electronic engineer, shared two patents, the first for a "Vacuum Tube Isolator, Circuit Protector and Voltage Regulator," and the second for a "Circuit Protecting, Gas-Tube, Discharge Interrupter."

The other patent recipients are Gottfried F. Vogt, supervisory electronic engineer, "Electronic Circuit for Simulating Servo System and Phase Control Therefore"; Dr. Larry U. Dworkin, electrical engineer, "Pulse Code Modulation Terminal with Improved Synchronizing Circuitry"; and

Charles M. DeSantis, physicist, "Low-Noise Traveling Wave Tube Amplifier"; Donn V. Campbell, electronic engineer, "Antenna with Adjustable-Ratio Dual Capacitive Loading"; Vincent W. Ball, photographic technologist, "Ball Shutter"; Adolf Reindl, "Synchronous Tactical Radio Communication System"; and

Elmer Freibergs, electronic engineer, "Microstrip Reciprocal Latching Ferrite Phase Shifter"; and Henry Riebsamen, engineering technician, "Foldable Antenna Structure."

WSMR Reactor Completes 4,000th Test Operation

When the fast-burst nuclear reactor at White Sands (N. Mex.) Missile Range recently completed successfully its 4,000th test operation, the claim was made that it is now the "granddaddy" of the five reactors operated by the Defense Department.

The WSMR Fast Burst Reactor Branch is an operational element of the Nuclear Effects Division, U.S. Army Missile Test and Evaluation Directorate.

Results of radiation effects tests permit evaluation of electronic systems and components, radiobiological studies, and determination of effects on materials for Department of Defense agencies and government contractors.

During the 4,000 WSMR tests, no release of radioactivity to the environs was ever involved, reactor group chief Armando De La Paz stated.

In continuous operation since it was activated in May 1964, except for scheduled maintenance and repair, the reactor is still using its first core. Plans call for a modification of the reactor to increase its operational capability as a nuclear research tool by providing for high-intensity radiation exposure of small-scale experiments.

The WSMR Nuclear Effects Division, headed by Glen E. Elder, evolved from a program started in February 1957. Scientists of the then White Sands Proving Ground Electro-Mechanical Laboratories performed the first transient radiation effects on electronics investigations, using the Godiva-I reactor at the Los Alamos Scientific Laboratory.

The reactor staff consists of Walter Bankes, Ted Luera, Rollan Tuttle, John Dodd and Don Welch. Health physics monitors are Eduardo Flores and Danny Miles and the health physicists are Harry Harrison and Don White. Military staff members are 1st Lt Paul Rohr, Sp/5 Lee Koller and Sp/4 George Eccleston.

TEST OPERATION 4,000 is entered into the log book by Sp/4 Lee R. Koller, reactor operator assigned to the White Sands (N. Mex.) Missile Range. Reactor Group Chief Armando De La Paz checks the notations indicating that the WSMR reactor, installed during May 1964, has completed more tests than the other five reactors operated by the Department of Defense.

Chief of R&D Gribble Announces Personnel Assignment Changes

(*Continued from page 1*)

Wilbur T. Vinson in March. General Vinson was assigned to OCRD in 1967 as chief, Nike-X and Space Division. Col Charles Daniel Jr., who has headed the M&S Division, succeeds General Vinson at HQ Eighth U.S. Army in Korea.

Army Director of Research Brig Gen George M. Snead Jr. and Dr. Jacob B. Gilstein, Director of the Army Ballistic Missile Defense Agency, each of whom has served more than two years, will continue in these capacities.

Retirement of Col James E. Wirrick set the stage for Lt Col (Col designate) Henry C. Evans Jr. to succeed him as chief of the OCRD International Office. Lt Col (Col designate) William Stephens succeeded Col Adkisson as chief of the Communications-Electronics and Space Division.

Col Walter A. Dumas was named chief of the Nuclear, Chemical and Biological Division, relieving acting chief Lt Col Cecil R. Sykes, who has reverted to his primary duty as chief, Nuclear Branch. Col Lauris M. Eek Jr. moved from deputy chief, Combat Materiel Division to head of the Management and Evaluation Division. He was succeeded by Lt Col (Col designate) Henry R. Shelton.

Col Donald R. Keith continues to serve as OCRD executive, a position he assumed last fall, with Lt Col Jack E. Fincham as his assistant. Likewise, in a study of advanced naval vehicles until 1961.

Col Clinton B. Haden remains OCRD chief of administration.

In other OCRD top-level positions, Dr. Marvin E. Lasser continues as Army Chief Scientist, a position he has filled since mid-1966. Col Guy E. Jester continues to report directly to General Gribble as chief, Information Systems Office and also the director of Army Technical Information.

Within the U.S. Army Research Office (USARO), a part of the largest of the OCRD directorates, Col Norman R. Rosen holds his dual job as Assistant Director of Army Research and commanding officer of USARO. Dr. Richard A. Weiss remains the Deputy and Scientific Director, a post he has held 12 years.

USARO division and office chiefs are: Laboratory Review Office, Col Robert B. Bennett; Research Technology Division, Lt Col Elmer H. Birdseye; Behavioral Sciences Division, Col Frank H. Duggins Jr.; Life Sciences Division, Col Donald L. Howie; and

Research Programs Office, Lt Col Donald W. Pulsifer; Studies and Analyses Division, Col George C. Muir Jr.; Environmental Sciences Division, Col Wallace H. Hubbard, acting since the recent death of Dr. L. S. Wilson; and Physical and Engineering Sciences Division, Dr. I. R. Hershner Jr.; Military Advisers, Col William Howe Jr.

MISSILES AND SPACE. Col G. O. Adkisson's scientific adviser in the Directorate of Missiles and Space is Dr. Richard L. Haley. Division chiefs are Col Pelham A. Felder III, Air Defense and Missiles; Col W. A. Dumas, Nuclear, Chemical and Biological; Lt Col W. C. Stephens, Communications-Electronics and Space; Lt Col John E. Steinke, Tactical Satellite Communications Management Office; Lt Col Gordon T. Carey,

ODDR&E Appoints Heebner To Tactical Warfare Program

Deputy Director of the Tactical Warfare Program, Office of the Director of Defense Research and Engineering (ODDR&E), is the new title of David R. Heebner as successor to Charles G. Fowler, now with the Raytheon Co.

Heebner has been assistant director, Sea Warfare Systems, ODDR&E, since 1968 when he transferred from Hughes Aircraft Corp. as manager of Navy Programs in the Ground System Group since 1961. He worked with Hughes in Ground Air Defense Systems and Undersea Warfare (1953–60) and under the Hughes Master Scholarship Program received an MSEE degree from the University of Southern California in 1955. He earned his BS degree in electrical engineering from Newark College of Engineering in 1950.

Granted a leave of absence from Hughes in 1960, Heebner served as a consultant for the National Academy of Sciences-National Research Council

TACRAC I Symposium Draws DoD, Industry Leaders

(*Continued from page 4*)

Agency, who spoke on "Technology Overview of Accurate Delivery of Indirect Fire," and Frances B. Paca, "Applications of Technology." Paca is chief, Intrusion Detection and Sensor Laboratory, U.S. Army Mobility Equipment R&D Center.

Lt Gen John Norton, CG of the U.S. Army Combat Developments Command and until recently deputy director of Project MASSTER, presented one of the symposium summary evaluations.

Leading speakers representative of other military services included Brig Gen John J. Burns, U.S. Air Force, "Introduction to Close Air Support," and Maj Gen William G. Thrash, Marine Corps, "Operational Environment of Close Air Support." Capt Albert A. Schaufelberger, U.S. Navy, spoke on "Operational Aspects and Considerations, Surface-to-Surface."

Dr. Lasser presided as chairman of a panel that included Maj Gen William S. Chairsell, Air Force; Dr. William F. Whitmore, Navy; Clyde D. Hardin and Victor L. Friedrich, both of the Office of the Assistant Secretary of the Army (R&D).

TACRAC's Steering Group is headed by David R. Heebner, Deputy Director of Defense Research and Engineering. Members are the chiefs of the military departments listed earlier.

Invitations to the TACRAC I Symposium were extended industry-wide to include small as well as major organizations. Industrial representation included numerous top-level executives as well as key managers and scientists and engineers with R&D responsibilities.

Army representation included Maj Gen John R. Guthrie, Director, Research, Development and Engineering, Army Materiel Command; Brig Gen Donald D. Blackburn, Director of Developments, Office, Chief of R&D; Brig Gen Curtis W. Chapman Jr., Director of Military Operations, Office of the Chief of Engineers; Brig Gen David S. Henderson, CG of the Institute of Land Combat, Combat Developments Command; and Brig Gen Conrad L. Stansberry, military assistant to the Deputy Director (Tactical Warfare Programs), Office of the Director of Defense Research and Engineering.

TACRAC's Management Group, chaired by General Bonesteel, includes Donald N. Fredericksen, Assistant Director of Defense Research and Engineering, vice chairman; Brig Gen C. L. Stansberry, ODDR&E (Tactical Warfare Programs), secretary; Col Robert Lazzell, Office, Chief of R&D, Army member; Capt Daniel W. Marshall, Office of the Chief of Naval Operations (Developments), Navy member; and

Col James Minish, Office of the Deputy Chief of Staff (R&D), Air Force member; Col Raymond Swigart, Office of the Deputy Chief (RD&S), Marine Corps member; Charles Revitski, Advanced Research Projects Agency, program manager; Roderick Dennehy, Research Analysis Corp.; James H. Henry, Institute for Defense Analysis.

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Newsmagazine Lists Highlight Articles Published in Past Year

Publication of a complete index of all articles published in the Army Research and Development Newsmagazine during the past year admittedly would be desirable. Space available permits a listing of headlines of only the more important highlight articles.

DECEMBER 1969—Judges Select Papers for 1970 Army Science Conference.
AMC Revamping Materiel Acquisition Process in PROMAP-70.
NASA Permits AMC Joint Use of Facilities.
Armed Services Explosives Safety Board Issues Facilities Manual.
ECOM Develops Simple Rechargeable Zinc-Air Battery.
Natick Laboratories' Freeze-Dried Food Research Contributes to Civilian Sales.
ARO-D Publishes Basic Research Accomplishments for FY 1969.
Small Arms Systems Agency Focuses on RDT&E Management of Small Weapons.
International Conference Slates Honor for HDL Fluidics Success.
Research Analysis Corp. Work Program Lists 37 Army Projects.
CRESS Separates From American University, Affiliates With AIR.
TACOM Developing Field Simulation System for Testing Vehicles.
Defense Department Credits 3 Army Men With $9 Million Cost Reduction.

JANUARY 1970—ODDR&E Increasing Role of 3 Military Services.
Budgetary Cutback Forces Project THEMIS Halt to New Efforts.
MBT Effort Reoriented to Unilateral Role.
AMC Probes Computers for Design and Engineering.
Weather Services Set Centennial Activities.
WSMR Installs Complex of Computer Aids.
Weather Services Centennial Points up Army's Pioneering Role.
Army Agencies Report on Mine-Countermine Research Results.
Army Medical Research and Nutrition Lab Yields Benefits Worldwide.
WES Test-Load Cart Simulates Superjet Traffic on Airfields.
Army Reports on Advance in Meningococcal Meningitis Control.
Battelle Economists Forecast R&D Trends.

FEBRUARY—ILIR Reports Indicate In-House Capabilities Relevant to Missions.
Army Outlines 5-Year DoD Food RDT&E Program at Joint Services Medical Research Conference.
Project THEMIS Chagas' Disease Study Pays Off.
BESRL Reorganized Into New R&D Center.
Army Schedules Shift of R&D Group, Europe, to London.
Institute of Surgical Research Enters 25th Year of Burns Research.
USAMRL Program Encompasses Broad Range of Scientific Disciplines.
USAETL Selects Winners of Scientific Leadership Achievement Awards.
Defense Communications Agency Spans 80 Countries in Decade.
WSMR Collecting Information Linked to Nuclear Effects Problems.
U.S. Armed Forces Emissaries Participate in Japan Student Science Awards.
TACOM System Promises Improved Armored Vehicles Vision.
Concept of 'Unzippable' Polymer Studied for Chemical Detector Devices.

MARCH-APRIL—Army Science Conference Keyed to Modern Soldier, Environment.
Budget Hits DoD Low Percent of Total Federal Level Since 1950.
HumRRO Develops SFTS to Reduce Helicopter Pilot Training Time.
Army Scientists Win Princeton University Study Awards.
Forrestal Award Winner Dr. Foster Discusses R&D Funding.
AMC Expands PROMAP-70 Training Effort.
Interservice Meet Deals With Gun Tube Erosion, Metal Fatigue.
Army Medical Research Unit in Panama Studies Tropical Diseases.
MERDC Selects 20 Employes for Commanding Officer's Achievement Awards.
Chief of Staff Westmoreland Lauds USACSC on First Anniversary.
MERDC Modifies Management Methods in Response to R&D Resources Rollback.
Scientist Suggests Army War on Hunger to Foster World Peace.
TACOM Upgrading Vehicle Instrumentation.

MAY-JUNE—Army Science Conference Programs Arranged.
Symposium Accents Growing Criticality of Operations Research.
Dr. Siple Medallion Slated as Conference Feature.
4 Facilities Selected for Project REFLEX.
Lt Gen Betts Gives Section 203 Views to AFIP Board.
'Drake Debate' Features Pros, Cons of Defense Procurement.
24th Power Sources Conference Reviews Government Requirements.
ASAP Reviews Military Materiel Testing.
Watervliet Arsenal Dedicates $1.7 Million Antipollution Plant.
MERDC Presents 3 With Commanding Officer's Awards.
Budget Cutbacks Compel Termination of THEMIS Research Projects.
Joint Laser Safety Team Studies Effects of Radiation on Eyesight.
USAMRU Reports on Tropical Disease Research in Southeast Asia.
ISF Contestants Stimulate Faith in Talents of Young Generation.
300 Scientists in Phased-Array Antenna Field Attend Symposium.
AMMRC Develops Gradient Furnace to Grow Crystals for Armor Research.
Mobile Electric Power PM Addresses SAME on PROMAP-70 Progress.
AMC Creates Quality Assurance Task Force.
Electro-Polymerization: A New Photographic Technique.

JULY-AUGUST—Picatinny Team Wins Siple Medallions.
R&D Achievement Awards Recognize 52.
R&D Leaders Observe CIDS Demonstration.
STANO Division Monitors 55 Tasks.
Secretary Packard Outlines Weapon Systems Acquisition Policy.
DoD Approves New Army JSHS Advisory Council Members.
TACOM Announces Hybrid Engine With Reduced Exhaust Emission.
Joint Force Tests Capabilities of World's Largest Cargo Aircraft.
MICOM Investigates Laser Extermination of Aquatic Plants.
FAA-Army Engineers Design Aircraft Egress.
Night-Vision Devices Assisting Civilian Ecological Research.
Army Dental Research Supports National Interests in Oral Health.
Tests Show USAIDR Water Jet Device Effective for Orofacial Wounds.
TACOM Tests Concept to Improve Wheeled Vehicle Mobility.
Science Conference Speaker Outlines Academic-Army R&D Roles.

SEPTEMBER-OCTOBER—ASAP Slates Fall Meeting as MASSTER Orientation.
CERL Reviews Gains in Total System Plan on 1st Anniversary.
Blue Ribbon Defense Panel Report Considered for Potential Impact on R&D.
International Food Congress Recognizes Role of Natick Labs.
Chief of R&D Details Objectives for Army Aircraft.
DDR&E, R&D Chiefs Sponsor TACRAC.
Budgetary Cutbacks Contribute to OCRD Realignments.
TOPOCOM Applies ADP Techniques to Geographic Info Responsibilities.
USAARL Expands Research to Meet Needs Generated by Helicopters.
Project MASSTER Responds to AMC, CDC Needs for Army of the Future.
Free World R&D Discussed at KIST Meet.
Defense International Security Chief Discusses Risk of Further Cuts.
Cyclic Catalytic Reactions as Amplifiers in Chemical Detection.
Simulation of Electronic Systems to Measure Combat Effectiveness.
U.S. Army Engineer Topographic Laboratories Developing LRPDS.
SATCOM Accomplishments Reviewed on 10th Anniversary.

NOVEMBER-DECEMBER—Army Conference Focuses on Design of Experiments.
Top Priority Materiel Objectives Listed in 'Big Eight' Program.
HFR&D Meet Emphasizes Manned Control.
Chief of R&D Tells Attaches About R&D Civilian Benefits.
Congressional Authorization Acts Limits Major Weapons, RDT&E.
Conferees Weigh Army Role in Anti-Pollution R&D.
AMC Conducts Risk Analysis of New Army Equipment.
AMMRC Investigates Strengthening of Titanium through Texturing.
Secretary Laird Says Defense Budget Cuts Have Reached End for Security.
HumRRO Lists 42 Army R&D Projects in FY 1971 Work Program.
Persh Discusses Lightweight Structure Needs at AMMRC Symposium.
Secretary Packard Links Economic Growth to Defense-Supported R&D.
ASA (R&D) Johnson Views Austerity as Challenge for Progress.
AMMRC Develops Improved Ultrasonic Imaging Technique.
Cooperative Endeavors of M-I Complex Advance Night-Vision RDT&E.
USAGETA Develops Test Facility for Effects of Equipment on Efficiency.
Coliform Aerosols Emitted by Sewage Treatment Plants.
AUSA Speakers Stress Progressive Efforts to Offset DoD Cutbacks.
USAMRID Seeks to Develop Biological Warfare Defense.
AMMRC Scientists Envision Broadened Applications of Titanium.

MERDC Radiographic Standards Cut Engine Failures

Radiographic standards developed for aluminum alloy die castings have proved successful in eliminating failure of these castings as a cause of military standard engines (six versions ranging from 1.5 to 20 horsepower source) breakdown in the field. Research was started eight years ago.

Since development of the eight standards by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., no engine failures due to faulty castings have been reported.

Since 1962 approximately 20 million aluminum alloy die castings have been produced for the engines, including 3,500,000 critical castings controlled by the nondestructive testing.

The standards are used in nondestructive tests to determine the quality of the castings before they are used in engine manufacture. They include four illustrating the maximum acceptable limit for certain types of defects, and four illustrating defects that cause rejection.

A new Military Standard is being based on these eight standards.

The radiographic examination is applied to three of the five critical aluminum alloy die castings found in the military standard engine: the crankcase, flywheel fan, and flywheel fan housing. The other two critical castings, the cylinder head and cylinder barrel, are eliminated from radiographic examination because of their geometrical complexity, but are subjected to visual, chemical and dye penetrant examination.

Original Participants Mark Diana's 25th Anniversary

What heralded the multibillion-dollar competition between nations now known as The Space Age? In the minds of a group of U.S. Army scientists, the answer is: Project Diana, Jan. 10, 1946, when feasibility of almost instanteous communication between the earth and moon was demonstrated.

That historic experiment—pointing to the possibility of voice communication millions of miles through space, now the key to space exploration—was conducted by a small group of U.S. Army Signal Corps officers and civilians at Fort Monmouth, N.J.

Six of the original participants assembled at Forth Monmouth to commemorate the recent 25th anniversary of that epochal event, in which radar pulses were fed through a 40-foot-square "bedspring" antenna toward the moon. Two and a half seconds later the return signal established the success of the experiment.

Announcement to the world, however, did not come until two weeks later from Maj Gen George L. Van Deusen, Office of the Chief Signal Officer, HQ Department of the Army, Washington, D.C.

General Van Deusen, now retired, spoke at the anniversary ceremonies, as did Walter S. McAfee, a Negro astro-physicist who made the theoretical calculations for Project Diana. Dr. McAfee was promoted to scientific adviser to the Electronics Command Deputy for Laboratories Jan. 15, 1971. (See separate story, page 1.)

Others who took part in the project and are still employed in the Army's Fort Monmouth laboratories also attended the ceremonies, namely: Eugene D. Jarema, Gilbert Cantor and Peter Devreotes. Present also was one of the prime planners for Project Diana, Dr. Harold A. Zahl, retired ECOM Director of Research, who still resides near the laboratories.

Maj Gen Walter E. Lotz, CG of the Fort Monmouth and the Electronics Command, presided at the ceremonies, which were attended by a number of prominent New Jersey officials. In a message of congratulation, Governor William T. Cahill proclaimed Jan. 10 as "First Contact With the Moon Day."

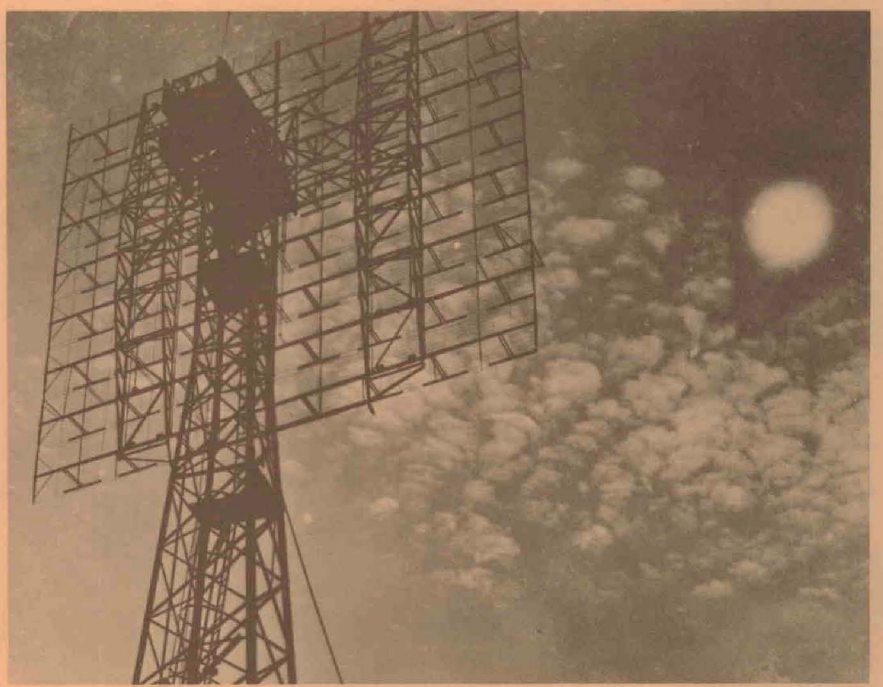
Deputy Secretary of Defense David Packard sent congratulations, as did Secretary of the Army Stanley R. Resor, Army Chief of Staff William C. Westmoreland and Maj Gen George E. Picket, Assistant Chief of Staff for Communications-Electronics.

General Lotz noted that congratulatory messages were received from the Institute of Electrical and Electronics Engineers, the Armed Forces Communications and Electronics Association, and from State Representative James J. Howard, whose district includes Fort Monmouth.

Participating dignitaries included George Zuckerman, representing the New Jersey Conference of Mayors, Freeholder Axel B. Carlson and Mayor John Gassner of Wall Township.

Project Diana was memorialized with an historical marker placed Oct. 23, 1963, at the site of what is now the U.S. Army Electronics Command R&D Laboratories, Fort Monmouth.

(For background information on Project Diana and some of its successor accomplishments by U.S. Army scientists, see the November 1963 edition of the *Army Research and Development Newsmagazine.*)



DIANA CAKE CUTTING participants commemorating 25th anniversary of initial Diana contact with the moon included scientists, engineers and military men who were engaged in original experiment. From left are Gilbert Cantor, Eugene D. Jarema, Maj Gen George L. Van Deusen (USA, Ret.), Dr. Harold A. Zahl, Dr. Walter S. McAfee and Peter Devreotes. Knife used in the cutting was from a dipole replica of original Diana antenna that returned moon signal.