ARMY RESEARCH AND DEVELOPMENT

MONTHLY NEWSMAGAZINE OF THE OFFICE OF THE CHIEF, RESEARCH AND DEVELOPMENT
Vol. 10 No. 2 • February 1969 • HEADQUARTERS, DEPARTMENT OF THE ARMY • Washington, D.C

Corps of Engineers Moving Toward Operation of Facility To Aid Construction Methods

What is expected to become the U.S. Government's most advanced center for basic construction research is rapidly taking shape as a Corps of Engineers activity—the U.S. Army Construction Engineering Research Laboratory being built at Champaign, Ill.

The Construction Engineering Research Laboratory (CERL), located in the Interstate Research Park adjacent to the University of Illinois, is being established to apply the broad systems approach to the study of complex construction problems; also, to serve as a central repository for information conducive to more rapid progress in over-all technology.

Objectively, CERL results are expected to serve effectively the U.S. Army Corps of Engineers' responsibilities for all its widespread construction activities in general.

Technological progress generated through CERL, however, will not be limited in application to Corps of Engineers activities, which may range from a road or schoolhouse to the most sophisticated space-support or

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Wikner Succeeds McMillan As MACV Scientific Adviser

Keynote speaker at the 1968 Army Science Conference, Dr. William G. McMillan, has resigned as scientific adviser to the Military Assistance Command in Vietnam (MACV) and has been succeeded by Dr. Nils F. Wikner.

Dr. Wikner's resignation as deputy director for Science and Technology, Defense Atomic Support Agency (DASA), Washington, D.C., set the stage for the appointment of Dr. John A. Northrop as his acting successor.

Recognized as one of the top U.S. scientists, Dr. McMillan has served for many years on a succession of high-level consultant and study committee assignments for the Department of Defense, including consultant to the President's Scientific Advisory Committee (PSAC).

After serving in Vietnam since 1966 as the first MACV scientific ad-

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Department of Defense Posture Statement Outlines Projections of R&D Activities to Meet Objectives

Major defense proposals contained in the FY 1970 budget and the rationale supporting them are outlined in an "Annual Posture Statement" submitted to the President by former Secretary of Defense Clark M. Clifford. It is titled "The 1970 Defense Budget and Defense Program for Fiscal Year 1970-74."

Prepared as of Jan. 15, shortly before former Congressman Melvin R. Laird became Secretary of Defense, the statement treates many topics of primary concern to the Army research and development community with respect to ongoing and proposed R&D and procurement of weapons systems.

The proposed budget requests $8.174 billion in FY 1970 for research, development, test and evaluation, including contingency development of systems already approved for deployment. This is about $170 million higher than the original FY 1969 request of $8.0 billion and about $500 million more than was appropriated.

Discussion of the proposals in the 155-page report, supplemented by four pages of financial summaries, is organized into six categories: Research, Exploratory Development, Advanced Development, Engineering Development, Operational Systems Development, and Management and Support.

Research is defined as "all the work

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Hershner Heads TARC; 4 New Members Chosen

Dr. I. R. Hershner Jr.

Acting Assistant Secretary of the Army (R&D) Charles L. Poor appointed four new members to The Army Research Council (TARC), effective Jan. 1, and named Dr. I. R. Hershner Jr. chairman to succeed Dr. Maurice Apstein.

New members are Dr. Hermann Robl, deputy chief scientist, Army Research Office-Durham, N.C. (ARO-D); Dr. Robert E. Weigle, chief scientist, Watervliet (N.Y.) Arsenal; Dr. Lester W. Trueblood, director, Earth Sciences Laboratory, Natick (Mass.) Laboratories; and Dr. Fernand P. de

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AMC Selects Dr. Kaufman As Successor to Dr. Siu

Secretary of the Army Stanley R. Resor has approved appointment of Army Munitions Command Chief Scientist Dr. J. V. Richard Kaufman as deputy director for Plans, Research, Development and Engineering Directorate, U.S. Army Materiel Command, Washington, D.C.

Paperwork to reassign Dr. Kaufman was being processed through the U.S. Civil Service Commission as the *Army Research and Development Newsmagazine* went to press. Dr. Kaufman, long recognized as one of the U.S. Army's top scientists, has been employed at Picatinny Arsenal, Dover, N.J., in various capacities since 1949.

Dr. Kaufman succeeds Dr. Ralph G.H. Siu, who ended an illustrious 24-year career as an Army scientist by resigning to accept a Presidential

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Army R&D Newsmagazine

Vol 10 No. 2 • February 1969

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Published monthly by the Army Research Office, Office of the Chief of Research and Development, Department of the Army, Washington, D.C. 20310, in coordination with the Technical and Industrial Liaison Office, OCRD. Grateful acknowledgment is made for the valuable assistance of Information Offices within the U.S. Army Materiel Command, U.S. Continental Army Command, Office of the Chief of Engineers, and Office of The Surgeon General. Use of funds for printing of this publication has been approved by Headquarters, Department of the Army June 6, 1967.

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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Submission of Material: All articles submitted for publication must be channeled through the technical liaison or public information officer at installation or command level.

By-lined Articles: Primary responsibility for opinions of by-lined authors rests with them; their views do not necessarily reflect the official policy or position of the Department of the Army.

DISTRIBUTION is based on requirements submitted on DA Form 12-4. Army agency requirements must be mailed to the U.S. Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, Md. 21220.

Distribution on an individual name basis is restricted to members of the U.S. Army Atomic Energy and R&D Officer Special Career Programs. Members of the U.S. Army Reserve R&D Unit Program receive distribution by bulk lot sent to their individual units. Otherwise, distribution is made only to the Army installation, office or organizational element to which the requester is assigned.

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Iberall Study Prods Thinking on Research Programs

Some viewpoints relating to fundamental questions of continued concern to leaders of Army research and development that are meriting increasing attention are presented in a report on a U.S. Army contract-supported study.

The report is titled "Advanced Technological Planning for Interdisciplinary Physical Research," and was published in June 1965 under contract with the Army Research Office, Office of the Chief of Research and Development, Department of the Army.

Authored by A. S. Iberall of General Technical Services, Inc., the 225-page report (including appendix and summary) presents his views on the philosophic fundamentals and the function of science, managerial and research directors' points of view, and the practice of applied science.

In view of current discussions of many of the principles detailed in the report, excerpts from other reports and on other subjects will be published in future editions of the Army Research and Development Newsmagazine, *The first follows:*

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Philosophic Fundamentals: The Function of Science

What is science? Science may be regarded as the summation of all human activities that are devoted to explaining things. Science is a condensation, in which many facts of empirical observation are correlated by fewer statements of abstraction. It is never exact. In a variety of ways, with greater or lesser precision, it makes statements that agree more or less with some class of physically observable phenomena. Good science has great generality and great precision; bad science lacks both.

Three levels of science can be recognized. The most primitive is a heuristic level in which the scientist attempts to name things and put them into some order. Most science is at this level. The second is a phenomenological level in which the scientist attempts to describe what the named things do on the basis of empirical observation. The third and most abstract level of science is analytic. From an extensive series of empirical observations, inferences are drawn that lead to hypotheses of sufficient generality that have specific, quantitative, and analytically characterizable implications in situations that are complex and remote from the situations from which the inferences were drawn.

Thus science is the grand totality of logical steps required to bring physical observations into correspondence with verbal or symbolic abstractions. A prime requirement is that the number of logical steps in the chain of reasoning be quite large and not self evident. Its essential characteristics are that it be *public, demonstrable, reproducible,* and *communicable.*

For clarity, one may consider a contrasting definition for philosophy to be the summation of all human activities devoted to explaining things before there is an adequate foundation of empirical observation. Philosophy is thus the precursor to science. It is an essential and enormously difficult activity in any field before it can be adequately qualified or quantified. Its subsequent role is as caretaker of the unknown.

What are the methods used in science? The fundamental problem tackled by science is a concentrated human-directed search for knowledge of form and function in a tangible universe. This search is known as research. In its search for logical organizing structures, modern science makes use of a number of specialized methods.

First is the deductive, discursive method illustrated by Aristotle or Euclid. Empirical observations are summarized in simple verbal abstractions, and these simple sentences are scanned according to logical rules for their implications.

Second is the dialectic method illustrated by Socrates, and in the metaphysical formalization by Marx. The verbal-logical consequences of selected observations are debated until a conclusion is formed. A countering set of observations are debated until a dissimilar conclusion is forced. The conflicting conclusions are reconciled by an attempt at a superior hypothesis.

Third is the inductive method, discussed by Roger Bacon and illustrated in Darwin. With no attempt at premature abstraction, a weight of observation is sought and built up until it forces an inference.

Fourth is a metaphysical method exemplified by Occam, and Einstein. A mystical principal is selected, which should guide the choice of abstraction from a wide sequence of diverse observations. Illustrative principles have been simplicity, symmetry, mathematical elegance, categorical or moral imperatives.

Fifth is rational empiricism exem-

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New CE Facility to Aid Construction Methods

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missile defense facility projects. Through CERL, the Corps expects much to be achieved that will help to modernize the construction industry and strengthen U.S. economic growth.

When CERL becomes operational, starting in June this year but not on a full-scale basis for at least two years—depending upon completion of a 3-phase construction program—research will encompass design, construction techniques, and improved use of building materials.

Initially, CERL will be staffed with about 130 personnel, absorbed principally from the Construction Engineering Laboratory of the Ohio River Division Laboratories of the Corps of Engineers. These personnel will begin the move from Cincinnati to Champaign this summer. The total staff is expected to reach about 260 by FY 1972.

The first phase of the laboratory construction program, started in February 1968 and now nearing completion, consists of two laboratory structures totaling approximately 100,000 square feet. The completed CERL will have about 265,000 square feet and use a 100-acre test area.

Organizationally, CERL will consist of an Engineering Development Division comprised of Project Systems, Special Projects and Data Analysis Branches; also, a Laboratories Division composed of Construction Systems, Materials, Power, Environmental, and Test and Evaluation laboratories.

To perform its mission for the Army, as well as for other elements of the Department of Defense and Federal Government agencies, CERL will work closely with construction and engineering research laboratories throughout the nation—those operated by the Corps and those serving public and private interests.

Presently, the Corps of Engineers operates such construction-oriented research installations as the Waterways Experiment Station, Vicksburg, Miss.; Ohio River Division Laboratories, Cincinnati; Coastal Engineering Research Center, Washington, D.C.; and Rock Island (Ill.) District Paint and Corrosion Laboratory.

Emphasized by the Chief of Engineers' announcement of the progress of construction on CERL is a policy of avoiding competition with producers in developing new building materials. CERL will "seek better ways to apply building materials to the total construction process, with an eye toward lower maintenance costs."

Through the total systems approach, the Corps of Engineers is aiming to make CERL responsive to the challenge of facilitating the work of architects and engineers in fitting together hundreds of thousands of separate bits and parts procured from widely distributed manufacturers.

"Using its diversified construction program as a base," it was explained, "the Corps can allocate relatively small amounts of research, development, test and evaluation funds to finance this research effort, including design, systems analysis, systems engineering, production and assessment, built-in preventive maintenance and modernization that would greatly reduce the rate of obsolescence."

Funds to help organize and establish CERL are being provided by the Army Chief of Research and Development on a decreasing scale for the first four years. These funds will be used for rental payment, purchase of new equipment and relocation costs of personnel and equipment. Additional funds are expected to come from laboratory test progress.

CERL's total systems approach to construction technology research involves establishment of an interdisciplinary team of systems managers. Primarily, their function will be to monitor "outside developments to keep the Corps from wasting its resources 'reinventing the wheel.'"

Decision to establish CERL under an annual renewal lease agreement with the University of Illinois Foundation followed an in-depth study. Directed by the Chief of Engineers, the study was conducted with assistance from the Building Research Advisory Board of the National Academy of Sciences, which rated proposals submitted by 20 universities out of 46 selected as the best qualified to receive invitations.

Ectoparasites of Panama Work Honored by Republic of Panama

Ectoparasites of Panama was recognized by the Republic of Panama as a meritorious scientific publication by the recent conferring of an honor upon Dr. Vernon J. Tipton, who coedited the work as a lieutenant colonel in the U.S. Army.

The award, presented at the Field Museum of Natural History in Chicago, recognized Dr. Tipton with the "Order of Vasca Nunez de Balboa in the grade of "Caballero" (equivalent to the title of knight).

Dr. Tipton served with the Army Medical Service until he retired to become a professor in the College of Biological Sciences at Brigham Young University in Utah. While in the Army he did extensive research on ectoparasites in Madagascar, Malaya, Japan, Venezuela and Panama.

AMC Selects Dr. Kaufman as Successor to Dr. Siu

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appointment as associate administrator of the new Law Enforcement Assistance Administration, Department of Justice, directly under Patrick V. Murphy. Dr. Siu also is establishing and will direct a new National Institute for Law Enforcement and Criminal Justice.

In his new assignment, Dr. Kaufman is one of two deputy directors under Maj Gen Richard H. Free, who heads the Directorate of Research, Development and Engineering. Brig Gen John R. Guthrie is deputy director, Operations.

Dr. Kaufman will also succeed Dr. Siu in serving as acting director of the Army Materiel Command's Advanced Materiel Concepts Agency (AMCA) until the search ends for a man with extremely precise qualifications.

Graduated from Dickinson College, Carlisle, Pa., with a BS degree in chemistry, Dr. Kaufman achieved the distinction of a PhD in inorganic chemistry from Massachusetts Institute of Technology without first receiving a master's degree. Under a Secretary of the Army Research and Study (SARS) Fellowship, he studied at the University of Reading in England in 1959-60. He is a member of Phi Beta Kappa and of Sigma Xi.

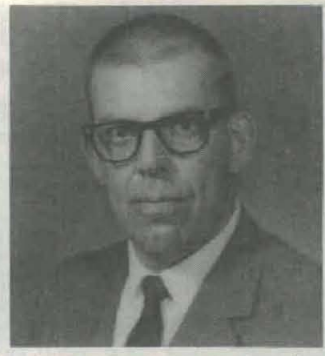
Selected as one of the original members of The Army Research Council (TARC) when it was organized in January 1964 as a body of Army key scientists to develop a 5-year Army Research Plan (ARP), Dr. Kaufman served through the 1966 TARC sessions.

Until promoted to chief scientist of the Ordnance Special Weapons-Ammunition Command in 1962, he was deputy chief for explosives research in Picatinny Arsenal's Propellants and Explosives Laboratory. He is the author of numerous publications in scientific journals.

Dr. J. V. Richard Kaufman

Dr. Hermann Robl

Dr. Lester W. Trueblood



Dr. Fernand P. de Percin

Dr. Robert E. Weigle

Hershner Heads TARC; 4 New Members Chosen

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Percin, chief, Regional and Special Projects Branch, Environmental Sciences Division, Army Research Office (ESD, ARO), Arlington, Va.

TARC was established in January 1964 to aid the Assistant Secretary of the Army (R&D) and the Chief of R&D in formulating plans, policy and programs for Army basic research and priority exploratory development. TARC activities are coordinated by the Director of Army Research, currently Col George M. Snead Jr. Lt Col Sylvester L. Wilhelmi, Research Plans Office, ARO, is executive secretary.

TARC members also represent the Department of the Army in their respective areas of scientific specialization on the five Joint Discussion Forums that assist the Director of Defense Research and Engineering.

Two TARC members are appointed for their broad knowledge and experience in each of five major disciplinary areas: Physical and Mathematical Sciences; Engineering Sciences; Environmental Sciences; Life Sciences; and Social and Psychological Sciences.

TARC is reorganized annually, with five of the 10 members (each appointed for a 2-year term) retiring and five remaining to provide holdover continuity of experience for TARC long-range planning objectives. Quite often, however, members may be reappointed two or three times.

Members who retired Jan. 1 are Dr. Apstein (past chairman), associate technical director, Harry Diamond Laboratories, Washington, D.C.; Dr. Hoyt Lemons, chief, Geophysical Sciences Branch, Environmental Sciences Division, Army Research Office; Dr. Kay F. Sterrett, chief, Research Division, U.S. Army Terrestrial Sciences Center, Hanover, N.H.; and Willard R. Benson, deputy director, Nuclear Engineering Directorate, Picatinny Arsenal, Dover, N.J.

Holdover members, in addition to Dr. Hershner, are Dr. Thomas E. Sullivan, chief, Materials Sciences and Technology Branch, Physical and Engineering Division, ARO; Col Donald L. Howie, chief, Life Sciences Division, ARO; Dr. E. Kenneth Karcher Jr., chief, Social Sciences Branch, Behavioral Sciences Division, ARO; and

Dr. Leon T. Katchmar, deputy director, Human Engineering Laboratories, Aberdeen (Md.) Proving Ground; Col William H. Meroney, director, Walter Reed Army Institute of Research, Washington, D.C.; and Dr. J. Post Hallowes, director, Physical Sciences Laboratory, Army Missile Command, Redstone Arsenal, Ala.

Disciplinary Areas. Current composition of TARC with respect to the five disciplinary areas into which its activities are divided are: Dr. Robl and Dr. Hallowes, Physical and Mathematical Sciences; Dr. Sullivan and Dr. Weigle, Engineering Sciences; Dr. de Percin and Dr. Trueblood, Environmental Sciences; Col Howie and Col Meroney, Life Sciences; Dr. Karcher and Dr. Katchmar, Social and Psychological Sciences.

During its first year of operation, TARC (then chaired by Dr. Ralph G. H. Siu) was concerned primarily with matters pertinent to developing the first 5-year Army Research Plan, a massive document that outlined far-reaching concepts of selecting and organizing basic research activities.

Deputy and Scientific Director of Army Research Dr. Richard A. Weiss succeeded Dr. Siu as chairman and TARC then began to launch into deep consideration of some selected areas of exploratory development. This trend was broadened under the third chairman, Dr. Gilford C. Quarles, chief scientist, Army Corps of Engineers, and Dr. Apstein.

The ARO Research Plans Office cooperates closely with TARC and currently is largely responsible for updating the Army Research Plan. The office is headed by Lt Col E. H. Birdseye.

The total program with which TARC is concerned was funded at $3.062 million in FY 1969 and is at a level of $3.319 million for FY 1970.

BIOGRAPHICAL SKETCHES. Academic and experience qualifications of the seven holdover members of TARC were detailed, except for Dr. Hershner, new chairman, in the February 1968 *Army R&D Newsmagazine.*

Dr. Hershner is one of the original key staff members of the Army Research Office, established in March 1958. Since 1960 he has served as chairman of the Army Mathematics Steering Committee for matters related to the Mathematics Research Center, U.S. Army, located on the campus of the University of Wisconsin. He was one of the key figures in activities leading to creation of the MRC.

Dr. Hershner has been chief since 1959 of the Physical Sciences Division, currently redesignated the Physical and Engineering Sciences Division, and was among the principal planners whose efforts brought about establishment of the Army Research Office.

He has BS and MS degrees in mathematics and physics from the University of Nebraska and a PhD from Harvard University. Until he joined the staff of the Office of the Chief of R&D, Department of the Army, he was professor and chairman, Department of Mathematics, University of North Carolina. Earlier he taught at the University of Chicago.

Dr. Robert Weigle was appointed to TARC in 1967 but resigned to accept a position with the National Bureau of Standards. His return in 1968 as chief scientist at Watervliet (N.Y.) Arsenal, where he had served in positions of progressive responsibility since 1959, made him eligible for reappointment to TARC.

Like Dr. Hershner, Dr. Weigle is a veteran member of the Army Mathematics Steering Committee. In 1963 he was one of two U.S. representatives to the NATO Arms Conference in Paris. He has BCE, MS and PhD degrees in mechanics and nuclear physics from Rensselaer Polytechnic Institute in Troy, N.Y. His achievements in research and as a supervisor of research have earned him a Presidential Citation and the Army's Meritorious Civilian Service Award

Dr. F. P. de Percin transferred to the ARO Environmental Sciences Division from the Natick (Mass.) Laboratories in 1960 after serving seven years as chief of the Polar and Mountain Section, Environmental Protection Research Division. For five years previous he was chief of the Quartermaster R&D Field Office at Cameron Station, Va.

From 1961 to 1963 he was with the National Science Foundation as associate program director for physical science facilities, and since then has been employed continuously with ARO.

Graduated from Harvard with a PhD degree in physical geography in 1958, he has an MS degree in meteorology from California Institute of Technology and a BS degree from Rutgers University. He also has studied at Penn State, Maryland, and Catholic Universities.

Professional affiliations include the American Association for the Advancement of Science (Fellow), American Meteorological Society, Royal Meteorological Society, Association of American Geographers, American Polar Society, Arctic Institute of North America, and Research Society of America.

Dr. L. W. Trueblood served six years with ARO and was chief of the Regional Branch, Environmental Sciences Division, when he accepted his present position as director of the Earth Sciences Laboratory, Natick (Mass.) Laboratories.

Known as a lecturer and author of numerous technical publications, he started his Army career as a geography consultant to the Secretary of War. Thereafter he served about eight years as a research specialist for Southeast Asia, Geographic Branch, G–2, HQ DA. Then he was with the Army Map Service, Corps of Engineers for nine years, six as chief of the Engineering Strategic Intelligence Division.

Dr. Trueblood received a BS degree from Indiana State Teachers College and earned MA and PhD degrees in geography and international affairs at Clark University, Worcester, Mass. He is a member of the Association of American Geographers, American Geographical Society of New York, and the Royal Geographical Society of London.

Dr. Hermann Robl was promoted to his present position as deputy chief scientist, Army Research Office-Durham, N.C., and raised to the highly esteemed status of PL–313 in 1962, less than seven years after emigrating from his native Austria. He was one of the outstanding European scientists brought to the U.S. under the Operation Paper Clip program

After four years at the University of Vienna as an assistant professor of physics, he received his doctorate and remained there in this capacity until he came to the U.S. as a visiting adjunct professor of physics at Duke University. He was a visiting assistant professor at Duke (1959-60) and visiting associate professor for the next five years. In Austria he received the Theodor Koerner Presidential Award in 1953.

Dr. Robl presented an award-winning technical paper at the 1959 Science Conference at the U.S. Military Academy, West Point, N.Y., and in 1964 was a recipient of an Army R&D Achievement Award. That led to his selection in 1965 for a Secretary of the Army Research and Study Fellowship.

Known for numerous technical publications, he authored an article titled "Evolution of Gaussian Distribution of Coherent States" in 1968 in *Physical Review*.

Wikner Succeeds McMillan as MACV Scientific Adviser

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viser, he has returned to his duties as a faculty member at the University of California at Los Angeles and as a member of the Physics Division of RAND Corp.

Dr. Wikner had served with DASA since Sept. 1, 1966 in the deputy director assignment, following more than a year of duty as scientific assistant to Dr. Theodore B. Taylor, whom he succeeded as deputy director. Prior to his departure for Vietnam he was presented the Decoration for Exceptional Civilian Service for outstanding contributions to the defense nuclear weapons effects research and test program.

Qualifications of Dr. Wikner for his new MACV responsibilities include a 1957 PhD degree from the University of California in Berkeley; a year with Aerojet Corp. as a physicist in charge of reactor physics, nuclear analysis and the critical assembly program for the Army's gas-cooled nuclear power plant development; and nine years with the General Atomic Division of General Dynamics Corp.

In the latter assignment Dr. Wikner was concerned with nuclear power reactor developmental programs, nuclear explosives, and ballistic missile systems. He is the author of numerous publications in professional journals and coauthor of a book *Slow Neutron Scattering and Thermalization with Reactor Applications.*

MACV SCIENTIFIC ADVISER Dr. Nils F. Wikner receives Decoration for Exceptional Civilian Service from Vice Adm L. Mustin, DASA director.

Dr. Northrop earned his doctorate at Yale University in 1951 and shortly thereafter joined the professional staff of the Los Alamos Scientific Laboratory. He progressed until he became responsible for the laboratory's entire nuclear vulnerability test program, and supervised all subsequent underground nuclear weapons effects tests for the Department of Defense.

Dr. Northrop's DASA assignment makes him responsible for both staff and technical advisory roles, participating actively in directing military and civilian scientists engaged in the research, development and testing activities of the Department of Defense nuclear energy program.

Col Hospelhorn Follows Gilman as SENLOG Deputy

Col Cecil W. Hospelhorn is the new deputy to Brig Gen Mahlon E. Gates, CG of the U.S. Army Sentinel Logistics (SENLOG) Command that supports the Sentinel System, a defense being developed against the threat of Communist Chinese ballistic missiles.

Until reassigned he headed the SENLOG Command Materiel Requirements Directorate, after serving as CO of the 26th General Support Group of the Tuy Hoa Sub-Area Command in Vietnam. He succeeds Col James W. Gilman.

Col Hospelhorn has a bachelor's degree from Illinois State University and a master's degree in international affairs from George Washington University. He is a graduate of the Command and General Staff College (C&GSC), the Army War College, and recently completed the management course for executives at the University of Pittsburgh.

Commissioned in 1944 upon graduation from the Engineer Officers Candidate School at Fort Belvoir, Va., he has served three years as an instructor in the Department of Airborne Operations and Army Aviation at the C&GSC, and as assistant chief of staff, G-4, HQ 24th Infantry Division in Germany.

During World War II, he served with the 869th Engineer Aviation Battalion in the Pacific. Later he was with the 11th Airborne Division at Fort Campbell, Ky., and in Japan, followed by duty in Korea in 1950.

Col Hospelhorn's decorations include the Legion of Merit with two Oak Leaf Clusters, the Air Medal and the Commendation Ribbon with Medal Pendant. He holds a Master Parachutist rating.

Col C. W. Hospelhorn

Col Poole Directs WRAIN

Col Drusilia Poole, ANC, new director of the Walter Reed Army Institute of Nursing (WRAIN), Washington, D.C., recently completed requirements for a PhD degree at the University of Texas.

A native of Tennessee, she attended Martin College at Pulaski, later receiving a bachelor of arts degree in sociology at Scarritt College in Nashville. She holds a master's degree in nursing from Yale University.

Prior to her studies at the University of Texas, she was director of the Department of Nursing Science at the Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Tex.

DoD Posture Statement Outlines Projections of R&D Activities

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devoted to increasing our knowledge of basic natural phenomena and the solution of a variety of long-term scientific problems relevant to our future national security."

Stressing the need for a balanced research effort across the entire spectrum of science and technology, the report states that such an effort is essential to "effectiveness of our weapons systems a decade from now."

Expressed is the belief that "Without a vigorous research program, we would surely lose the technical superiority we now possess. The research program also provides a link between the Department and the academic community, a vital tie which keeps open a unique source of new ideas and technologies. . ."

The research budget request is $443 million for FY 1970 as compared with $419 million in 1969, but the increase of about six percent is attributed to higher research costs rather than addition of new projects or expansion of ongoing activities.

One exception to that statement, however, is a $5 million growth in the THEMIS program ($33 million as compared to $28 million) to provide for the starting of about 25 new projects.

The original THEMIS plan to establish new centers of academic excellence throughout the nation called for addition of 50 new projects each year for four years, but the 1969 growth also was cut back to 25. With 25 added in FY 1970 the total would be about 150.

Noted is that a review of THEMIS projects for the first two years found all but six were producing useful results in meeting envisioned objectives.

Funding for the over-all Department of Defense research program is shown by the following table (figures denote millions of dollars):

	FY 1968	FY 1969	Proposed FY 1970
Engineering Sciences	80	97	98
Physical Sciences	87	89	96
Environmental Sciences	59	65	69
Biological and Medical Sciences	31	33	33
Behavorial and Social Sciences	8	12	13
Nuclear Weapons Effects Research	44	45	50
In-House Independent Lab Research	32	31	33
THEMIS	27	28	33
Joint Service Electronics Program	*	6	7
Support from Other Appropriations	10	13	11
TOTAL RESEARCH	378	419	443

* This was included in other programs prior to FY 1969.

In discussing the importance of the DoD Exploratory Development Program, the report requests an increase in 1970 funding to $1,012 million as compared to $980 million asked ($912 actually available) in FY 1969.

"Every comprehensive study of weapons systems developments," the report observes, "resulted from Defense-supported innovations rather than from other sources. We are convinced that our Exploratory Development activities will require increased support during the next several years, and the FY 1970 budget represents a first step in this direction."

As proposed, about $190 million of the FY 1970 budget for Exploratory Development would support the Advanced Research Projects Agency (ARPA), an element of the Office of the Director of Defense Research and Engineering. The remainder would be equally divided among the Army, Navy and Air Force.

Army Exploratory Development, it is noted, "focuses in part on materials, devices and techniques useful to front-line troops in a wide variety of the conflict situations that might occur in the future.

"It also includes specific projects in support of the current effort in Southeast Asia. Examples of the kinds of developments included are new night-viewing equipment, better burn treatment techniques, new small arms and even nuclear effects studies."

Advanced Development funding proposed for FY 1970 is $1,271 million, as compared to $976 million in FY 1969. This phase "encompasses all the efforts to develop the component and subsystem hardware for use in experimental tests required to determine the potential military utility of various projects, their specific military applications, and the cost estimates associated with alternative applications . . ."

Funding requirements for Advanced Development may vary considerably from year to year as new projects are started and older projects are either dropped or moved on into Engineering Development or Operational Systems Development. Problems related to basic components and technology of new or improved weapons systems must be resolved preliminary to a decision to start full-scale development.

The report lists 10 Advance Development projects, accounting for $221 million of the additional $295 million requested for FY 1970, as follows:

Heavy-Lift Helicopter. This is a new aerial-crane-configured Army helicopter with a load capability in the range of 20 to 30 tons. The increased funding (from $1 million in FY 1969 to $20 million in FY 1970) will provide for Contract Definition, which will include some advanced component technology effort.

• *Surface-to-Air Missile Development* (SAM-D). This is an ongoing advanced development of a follow-on to the HAWK and HERCULES systems for the defense of theater forces. It is designed to counter both aerodynamic and tactical ballistic missile threats.

The increased funding (from $60 million in FY 1969 to $75 million in FY 1970) would permit the initiation of Engineering Development when a final decision to proceed to that stage is made later this year.

• *Nike-X Advanced Development.* This ongoing program is directed to the development of a more advanced antiballistic missile technology, i.e., beyond that required for the presently approved SENTINEL System. Funding has been increased (from $137 million in FY 1969 to $175 million in FY 1970) to support new developments in interceptor and discrimination technology and a greater effort on the very important systems studies.

• *Project MALLARD.* This project is a cooperative effort of the United States, United Kingdom, Canada and Australia to develop and procure a common tactical communications system for their respective Armies and associated Air Forces and, where appropriate, their Navies.

The increased funding (from $8 million in FY 1969 to $21 million in FY 1970) will permit the program to enter the modeling and simulation testing phase, where work will be carried out on construction and test of functional models of the most promising subsystem designs.

• *Underseas Long-Range Missile System* (ULMS). This program is a further revolutionary step in the Fleet Ballistic Missile Program, aimed at countering possible improvements in Soviet antisubmarine war-

(Continued on page 29)

Reed Takes OCRD Post as PL-313 Scientific Adviser

Logistically speaking, the PL-313 incumbent of a newly established position of scientific adviser to Brig Gen Thomas W. Mellen, Director of Developments, Office of the Chief of Research and Developments, HQ DA, has just about a perfect record.

Harry L. Reed Jr., 41, and a 1950 graduate of Massachusetts Institute of Technology who assumed that position Jan. 27, has successfully demonstrated an unusual flair for making the right moves at the right time during the past 18 years. Logistics, as any military man knows, is the science of delivering what is needed when and where it is needed.

Less than 15 years ago (1954-56), Reed took the first long step up the success ladder as an enlisted man. The military draft caught up with him about four years after he started his career as an Army scientist when the ink was hardly dry on his BS degree certification from the Massachusetts Institute of Technology.

During the 4-year interim, he was well indoctrinated with the advantages of being an Army career civilian scientist. Assigned as a mathematician, he worked in the ENIAC (the now famous name of the Army's first computer and the beginning of the current multi-billion-dollar computer industry) Section, Computer Laboratory, Ballistic Research Laboratories, Aberdeen Proving Ground.

When induction into the Army temporarily ended that way of life to which he had become pleasantly accustomed, Pvt Reed made his first right move—that is, if his acceptance of a civilian job at BRL is not considered the first right move. Anyway, he enrolled in what was then the Army Scientific and Professional Program and is now the Enlisted Scientists and Engineering Assistants Program.

Harry L. Reed Jr.

In every rather amazing success story, Lady Luck may be suspected of dealing a winning hand in the poker game of living in a highly competitive world. Pvt Reed's assignment, after two months of basic military training, eventually advanced him to chief of the Theory Branch, Exterior Ballistics Laboratory, Ballistics Research Laboratory, Aberdeen Proving Ground.

Chief of the BRL Exterior Ballistics Laboratory at that time was a young man who since has become well known to the Department of Defense scientific community—Acting Assistant Secretary of the Army for R&D Charles L. Poor.

When Mr. Poor was promoted to chief of the then newly established BRL Future Weapons Systems Agency in 1958, he selected Mr. Reed, by that time backed by two more years as a civilian scientist at BRL, to accompany him as a physical scientist and later (1960-63) as deputy chief of the Special Projects Group.

Five years later, Reed was promoted to chief, Guidance and Control Evaluation Branch, Weapons Systems Laboratory. In August 1967, Reed became acting chief of the Ballistic Measurements Laboratory and remained in this position until promoted to his present duties.

Meanwhile he had achieved GS-15 status and gained broad recognition for weapon system engineering studies as well as for supervising research programs in ionospheric studies, reaction kinetics, electronic instrumentation, milimeter radar and radiometry, infrared signatures, optical contrast and correlation techniques, and propagation in a turbulent medium.

Army Electrical Anesthesia Research Progressing

Pioneering research in the use of electricity as an anesthetic to induce artificial "sleep" is, after nearly 15 years of experimentation supported by the U.S. Army Medical R&D Command, approaching the phase of testing on humans—tentatively scheduled to begin in mid-1970.

Currently being investigated under contract by the Marquette University School of Medicine, Milwaukee, Wis., the method involves passing an electric current through a selected part of the brain to induce sleep.

Based on long-sustained animal experiments, major advantages foreseen for the method when the technique is perfected for use on humans include more rapid and effective action than the drug-induced anesthesia presently used, the Office of The Surgeon General of the Army has stated.

Experiments upon monkeys have supported feasibility of the technique in testing to date. Upon application of the electric current, the patient is quickly prepared for surgery. Postoperative recovery is more rapid than at present and the transient side effects of current anesthetics are not experienced by the patient.

Research activities at Marquette University are concentrated in two areas: (1) the possible long-term psychological and structural changes in the brain are being evaluated and (2) the proper amount and type of current to produce the desired result are being precisely determined.

In the current experiments, highly trained monkeys are subjected to electrical currents for time periods ranging from 15 minutes to 10 hours. The objective is to determine whether the current causes them to forget their former training; also, to see if future learning capacities are impaired. Pathological studies of brain tissue also are performed.

Over the next 18 months, as a preliminary to testing on humans, some 20 researchers will study the monkeys to determine possible harmful side effects from electrical anesthesia. Positive results will set the stage for limited testing on humans.

WSMR Scientist Presents Papers at Albuquerque

Two technical papers favorably received at a symposium on fast-burst nuclear reactors sponsored Jan. 28-30 in Albuquerque, N. Mex., by the University of New Mexico and the American Nuclear Society were presented by a White Sands Missile Range scientist.

Armando De La Paz, chief of the WSMR Nuclear Effects Directorate's Fast-Burst Reactor Division, and former chairman of the Army Nuclear Reactor Safety Review Committee in Washington, D.C., presented the papers, "Fast-Burst Reactor Experiment Irradiation Experience" and "A Standard for Fast-Burst Reactor Operation."

Graduated from Tulane University with BS and MS degrees in chemical engineering, he completed nuclear studies at the University of Pittsburgh and the Massachusetts Institute of Technology. As an officer in the U.S. Navy (1956-60), he served with the Naval Reactors Group.

Air Conditioner OKd for Production

Limited production has been approved for an 18,000 BTU/hr. trailer-mounted air conditioner designed to meet urgent combat requirements to cool electronic systems. Developed by the U.S. Army Mobility Equipment R&D Command at Fort Belvoir, Va., it employs a 5KW gasoline engine-driven generator mounted on a 3/4-ton trailer.

Maj Gen Schweiter Assigned as USACDC Deputy

Assignment of Maj Gen Leo H. Schweiter as deputy CG, U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., was announced Jan. 22.

A native of Wichita, Kans., and honor graduate of Kansas State University, he recently returned from Vietnam, where he commanded the 173d Airborne Brigade and later was chief of staff, XXIV Corps.

Before going to Vietnam in August 1967, he served as assistant commander of the 101st Airborne Division at Fort Campbell, Ky., following 30 months in the Office of Deputy Chief of Staff for Military Operations at HQ DA in Washington, D.C., and two years in the Office of the Special Assistant for Counterinsurgency and Special Activities, Joint Chiefs of Staff.

In World War II he served with the famed 101st Airborne Division and fought in the heroic defense of Bastogne. His combat jumps include leaping into Normandy the night before D-day and later into Holland.

After the war he served with this division until it was inactivated. He was then assigned to the 82d Airborne Division.

In July 1950, General Schweiter was sent to X Corps in Korea and participated in the amphibious landings at Inchon and Wonson. Subsequently he commanded a battalion in the 32d Infantry Regiment, 7th Infantry Division.

Upon his return to the U.S. he commanded the Provisional Reconnaissance Troop, Sky Cavalry, the Army's first air cavalry unit which evolved into the famed 1st Cavalry Division (Airmobile) now serving with distinction in Vietnam. Subsequently he served with the U.S. Army Europe, Chief of Staff of the 8th Infantry Division, and as commander of the 2d Airborne Battle Group of the 504th Infantry, 82d Airborne Division, and (later) the 5th Special Forces Group (Airborne), 1st Special Forces.

The often decorated general has been awarded the Distinguished Service Medal, Silver Star with Oak Leaf Cluster for gallantry in action, and Legion of Merit. Twice he earned the Purple Heart for wounds received in action. He also wears the Bronze Star Medal with three Oak Leaf Clusters for subsequent awards, Distinguished Flying Cross, and the Army Commendation Medal. He has both the Combat Infantryman Badge and Master Parachutist Badge.

Among his foreign decorations are the Order of Orange Nassau from the Netherlands for action in World War II. The South Vietnamese government has presented him with several awards including the National Order of Vietnam, 5th Degree, and the Vietnamese Cross of Gallantry with Palm.

Maj Gen Leo H. Schweiter

General Schweiter earned his bachelor of science degree from Kansas State College, and a master of arts degree from the University of Missouri where he served as an instructor before coming on active duty. He is a member of the National Honor Society, Phi Kappa Phi. Military schooling includes the U.S. Army Command and Staff College, 1950, Fort Leavenworth, Kans., and the Army War College in 1958.

Dr. Ernst Heads Belvoir SRSA As First Woman to Hold Office

Dr. Gertrud E. Ernst, a research microbiologist in the Materials Research Support Division, U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va., was installed Jan. 25 as the first woman elected president of the Belvoir Branch, Scientific Research Society of America.

Listed in the current edition of *Who's Who in the South and Southwest*, known as the author of various scientific papers, and accorded several honors for her research, Dr. Ernst earned her doctorate at the University of Vienna. She entered U.S. Civil Service in 1957 and has been employed at the MERDC since 1964.

Stanley Segal, employed in the Army Night Vision Laboratory at Fort Belvoir, was elected vice president. John D. Grabski, of the MERDC Fuels Handling Equipment Division, became secretary and Fred Myers, Army Topographic Laboratories, was installed as treasurer.

CDC Studies FAMECE Concept for Combat Engineer Units

Military materiel envisioned for the future U.S. Army includes FAMECE (Family of Military Engineer Construction Equipment), a concept embodying development of a single power pod. Expected to increase significantly the capability of airmobile equipment, FAMECE simultaneously will alleviate the logistical burden of supply parts by reduction of makes and models.

Complete with various work attachments, the common power pod, an innovative concept, would perform the functions of such equipment as the nontracked bulldozer, front loader, grader, scraper, dump trucks and soil stabilization machines—each currently powered by one engine.

The U.S. Army Combat Developments Command's Engineer Agency is conducting a study of this concept at CDC Headquarters, Fort Belvoir, Va., in conjunction with the Army Materiel Command's Mobility Equipment Research and Development Center.

Maj Joseph A. Lupi, CDC Engineer Agency project officer for FAMECE, explained that the concept calls for attachment of the rubber-tired power pod to the various work attachments without special tools or equipment in less than 30 minutes. Generally, this CDC family of equipment is not envisioned as replacing full-tracked construction equipment, but air mobility not presently attainable would be achieved.

FAMECE components will be designed for movement fast enough to match normal convoy travel speed; also, to work on steep inclines. Present engineer road equipment speed is generally below convoy speed and many items must be moved on trailers.

The power pod and individual attachments would be light enough to be lifted and transported by helicopters of the 1970s and also could be paradropped. Much of the existing military earthmoving construction equipment is too heavy and cumbersome for air transportation.

Training requirements would be significantly reduced and a single operator would be capable of using the common power pod with all its construction attachments.

Initial CDC planning calls for FAMECE to be employed by combat engineer units in forward areas. Further studies of the concept will evaluate the operational, economic and productive feasibility for use by other engineer units in all areas under all conditions of terrain and climate.

Melioidosis Persists as Problem to Troops in Vietnam

American servicemen seem to encounter in each conflict on foreign soil at least one disease for which they have no immunity. In Vietnam, it is melioidosis; 18 years ago, in Korea, it was epidemic hemorrhagic fever.

Melioidosis is an infectious disease that may first be recognized as an acute pneumonia. Localized extrapulmonary forms occur in subcutaneous tissue, bones, joints, kidneys and other organs.

The disease is caused by a gram-negative bacillus, Pseudomonas pseudomallei, found in the damp soil of tropical areas in Southeast Asia. In endemic areas melioidosis occurs in sheep, goats, swine and horses. No evidence exists that livestock or other animals serve as a major maintenance host; rather, it is evident that the Pseudomonas pseudomallei exists in nature as a saprophyte.

A British medical officer in Burma in 1911 isolated the previously undescribed gram-negative motile bacillus that causes melioidosis. Physicians with the French troops later found the same causative organism among their casualties in Indochina (now Vietnam), while serving there from 1948-54. They favored the theory that infection occurred through contamination of breaks in the skin with infectious soil.

The first case of melioidosis in American troops in Vietnam was recognized in 1965. Over 130 cases have since been diagnosed and treated. The disease may remain dormant for months or even years; individuals have become symptomatic long after returning from Southeast Asia.

The Department of Defense recently published a Technical Bulletin to describe the epidemiology, clinical features and management of patients infected with melioidosis. Valley Forge General Hospital, Phoenixville, Pa., and Fitzsimons General Hospital, Denver, Colo., were designated as treatment centers for Army patients.

Since the organism seems to be so widespread in the Far East, American troops are warned to avoid local fruits, vegetables and untreated water; also, to cleanse thoroughly all scratches, cuts or burns to minimize the possibility of infection.

Army Hospital Boasts Modern Electron Microscopy Lab

William Beaumont General Hospital in El Paso, Tex., is using for Army Medical Corps research one of the most modern electron microscopy laboratories in the United States.

Scientists can detect cell structures almost 1,000 times smaller than the conventional light microscope, with amplification power of about 1,300 times the subject under study, is able to reveal. Magnification power of the electron microscope is approximately 1,000,000 times.

The basic difference between the light microscope and the electron microscope is that the latter instrument uses electrons instead of light. Electrons accelerated by 50,000 or 100,000 volts in a high vacuum are deflected by electromagnetic lenses in the same fashion light is deflected by glass lenses or prisms.

The William Beaumont electron microscopy laboratory is headed by Dr. Bernard E. F. Reimann, an electron microscopy research scientist since 1948. Since last year he has been an associate biology professor at New Mexico State University at Las Cruces, N. Mex., where there is an electron microscope. He has been teaching general electron microscopy and interpretation of ultra-structure. He also is an associate in civil engineering to the Graduate School at the University of Texas at El Paso.

The Beaumont electron microscopy laboratory is part of its Pathology Service. The mission is to provide direct diagnostical support to Pathology Service on biopsies and autopsies, to teach ultra-structure and its procedures to pathology residents, and to support research projects through Research and Development Service.

Project UpStage Advances With WSMR Field Center

Preliminary work on the Project UpSTAGE experimental missile development program is under way at White Sands (N. Mex.) Missile Range.

Project UpSTAGE is a follow-on to U.S. Army programs which were a part of Project Defender, the Advanced Research Projects Agency's continuing series of research experiments in ballistic missile defense.

O. J. Ritland, vice president and general manager of launch operations for the McDonnell Douglas Astronautics Co., named R. L. Woods to manage a new field center for the UpSTAGE activities and appointed P. P. Gessner administrative manager. About 35 full-time employes are expected to staff the center by early 1970.

Vincent Boudreau, chief of the Aerospace and Defense Systems Division, said the WSMR office of the project probably will be maintained at Launch Complex 38.

McDonnell Douglas operated a field center at WSMR for over 20 years until September 1967, when PreSTAGE, an advanced study for UpSTAGE, was concluded successfully. The company has participated in such missile programs as Nike Ajax, Nike Hercules, Nike Zeus and Honest John.

Establishment of the field center followed a recent award to McDonnell Douglas of a $25.8 million contract by the U.S. Army Missile Command, Redstone Arsenal, Ala., to design, develop and flight test the UpSTAGE experimental missile configuration.

The UpSTAGE program will be under the technical management of the Nike-X Development Office, Huntsville, Ala., a field agency of the Advanced Ballistic Missile Defense Agency.

MICOM Assigns Matthews as Project Manager for LCSS

Project manager responsibility for Land Combat Support Systems (LCSS) at HQ U.S. Army Missile Command, Redstone Arsenal, Ala., has been assigned to Lt Col Frank A. Matthews, who served in the Pershing Project Manager's Office since July 1968.

The LCSS involves test equipment designed to provide rapid detection of malfunctions in specified components of designated land combat tactical missile systems under field combat conditions.

Lt Col Matthews came to Redstone after three years duty as chief of the Inventory Control Center at the U.S. Army Alaska Support Command. His first duty station in the Army was Fort Sill, Okla., followed by assignments in Germany, Redstone, Aberdeen (Md.) Proving Ground, Picatinny Arsenal in Dover, N.J., Korea, Pueblo Army Depot, Colo., and Fort Leavenworth, Kans.

Graduated from the University of California, Berkeley, with a bachelor's degree in chemistry, he earned a master's degree in engineering science from Purdue University.

Lt Col F. A. Matthews

AMMRC Invention Facilitates Study, Design of Metals

Invention of an instrument to facilitate study of metals and design of alloys with optimum strength and other properties was announced recently by the Army Materials and Mechanics Research Center.

F. R. Larson, chief, and A. G. Martin, an electronic engineer in the Metals Laboratory at the Watertown (Mass.) installation, reported that the instrument used in conjunction with an X-ray diffractometer will directly plot pole figures indicating preferred orientation in polycrystalline metal specimens.

The instrument plots data in finished form concurrently with the scanning of the specimen, as compared to present methods requiring slow analysis and hand plotting of recorded data, or separate processing of data by a conventional computer and printer.

Larson and Martin said that a notable feature of this instrument is its ability to work with a specimen having a prepared surface inclined with respect to the rolling, transverse and normal directions of rolled sheets or the axial direction of wire.

The specimen used in this application of the instrument consists of layers of material bonded together and ground at an inclination of 54.7° with respect to the reference directions. An analog computer immediately converts the information on this tilt, on the varying orientation of the specimen, and on the intensity of diffracted X-rays as obtained from the diffractometer to an output for an x-y-z plotter.

The result of this procedure is a plot of X-ray intensity in terms of eight discrete levels on a stereographic chart. The only additional step required after the specimen is scanned is joining of like symbols by manually drawing contour lines.

Instant plotting of X-ray intensities versus specimen orientation serves to establish the pole figure indicating grain orientation as rapidly as the specimen can be scanned. Use of the new instrument, it was stated, will speed up metallurgical research on titanium alloys or other metals and enable the most efficient strengthening by texturing.

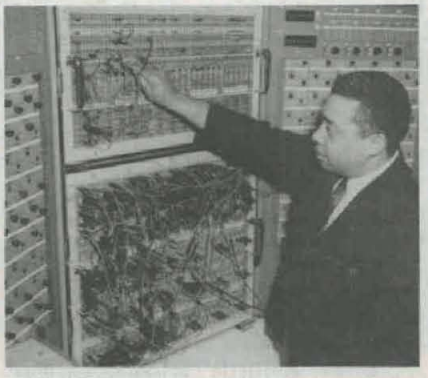
Picatinny Installs Hybrid Computer to Update R&D Work

Updated "real-time" information and data services for many research, development and production programs are being provided at Picatinny Arsenal by a new hybrid computer in the Engineering Sciences Lab, Feltman Research Laboratory.

The new system, installed at a cost of $1 million-plus, is an EAI (Electronic Associates, Inc.) 8900, the first of its kind ordered under monitorship of the recently reorganized Computer Systems Support and Evaluation Command (CSSEC) headquartered at Fort Myer, Va.

Under command of Col Anderson Q. Smith, the CSSEC has Army-wide advisory and monitoring responsibility for procuring Automatic Data Processing Equipment.

Consisting of an EAI 8800 analog computer, an EAI 8400 digital computer and an EAI 8930 linkage rack, the system makes it possible to hybridize the real-time speed and graphic display of analog with the accuracy, control and memory of the digital computer.



ANALOG ANALYSIS Section Chief A. Gerald Edwards checks analog portion of hybrid computer in Engineering Sciences Lab at Picatinny.

The system can accomplish a broad diversity of functions related to research, development, test and evaluation activities at the arsenal. It can operate in a time-shared, batch-processing mode and in a high-speed repetitive-operation, on-line, real-time mode.

In addition to a variety of data reduction applications, the system can be used in support of research on interior and exterior ballistics, for fuze simulation and analysis, stress analysis, studies of 2- and 3-dimensional temperature gradients, and for evaluation of services proposed by contractors and manufacturers.

The curve-follower unit of the system accepts strip-chart records or X-Y plots on graph paper, oscillograms, oscilloscope photos, and other similar curves on records that have black-on-white or white-on-black contrasts between background and curves. The analog magnetic tape unit accepts 7- or 14-track tape and operates at speeds from 1-7/8 ips to 120 ips. Digital magnetic tapes, 7- or 9-track, can be used in standard IBM form and is IBM 360-compatible.

An experienced staff of scientists and engineers is available for programing and consulting services at the arsenal. A. Gerald Edwards is chief of the Analog Analysis Section, Engineering Sciences Laboratory.

PICATINNY ARSENAL'S TECHNICAL BOARD, which recently received its charter from Arsenal Commander Col Roger Ray, is chaired by Picatinny Technical Director H. William Painter (seated at right). Abraham L. Dorfman, assistant to the technical director (seated left) is executive secretary. Board members are (standing, l. to r.) Victor Lindner, deputy director, Ammunition Engineering Directorate; James A. Barker, director, Quality Assurance Directorate; and Willard R. Benson, acting deputy director, Nuclear Engineering Directorate. Leonard H. Eriksen, director, Feltman Research Laboratories, also a member, was not available for photo. The board, which meets monthly will be assisted by ad hoc groups from the arsenal; it has broad responsibilities in management of the arsenal's scientific and technical resources, including responsibility for its long-range technical posture.

41 Complete First MAR-I Course at WSMR

Forty-one soldiers completed the first 36-week course at White Sands Missile Range, N. Mex., that qualified them as specialists and technicians on a digitally controlled phased-array radar system linked to the Sentinel System antiballistic missile defense.

Eleven officers, 17 warrant officers and 13 enlisted personnel received certificates of completion from Maj H. G. Davisson, WSMR commander. The course was conducted for the Sentinel System Evaluation Agency (SENSEA).

The classroom and on-equipment-training area has been the Sentinel System's Multi-Function Array Radar (MAR) site located near U.S. Highway 70 midway between the White Sands main post area and Holloman Air Force Base. The facility is the only one of its kind now in operation in the Army and its operating characteristics are similar to radars planned for deployment in the Sentinel System.

Students participated in six phases of training, namely the system test-operations officer course; MAR I receiver-transmitter and data processing technicians course; MAR I receiver-transmitter specialist course; MAR I data processing specialist course; phased array off-line repair technician and specialist courses; and tactical support equipment technician-repairman course.

The training qualified graduates to participate in test program activities of the Sentinel System at WSMR, at Kwajalein Missile Range in the mid-Pacific and at other Sentinel research and development activities.

Most of the students have been reassigned to research and development functions within SENSEA at WSMR. Others have been assigned to Army Air Defense Command (ARADCOM) activities, and some have been transferred to overseas areas.

FIRST GRADUATE of MAR I training course at WSMR, Capt Milton D. Pedersen, receives certificate from Maj Gen H. G. Davisson, WSMR commander. Assisting is Maj. J. L. Kintigh, former MAR-I Test Branch chief.

Simulator Provides Hawk Missile Training at MICOM

Advanced Hawk Missile System training costs can be reduced greatly by a newly acquired device that provides realistic combat situations, eliminating need for expensive practice runs with actual targets, the Army Missile Command reports.

Designed to provide constant and repetitive training on the Hawk weapons system—a rocket-propelled ground-to-air missile for defense against low-altitude targets—the simulator system was developed under contract with the Belock Instrument Corp., Long Island, N.Y.

The Hawk missile homes on target reflections from an illuminating ground radar that locates and tracks the target. The simulator provides a synthetic display of moving targets that can be identified, tracked, fired upon and scored. Even the firing of the missile is simulated.

The blip on the radar scope will not be considered as an electronic "ghost," but a target to be tracked and destroyed in spite of its attempts to jam the scope presentations.

When the missile burst is heard on the speaker and the target disappears, the only sensations missed by the soldier-trainee are the roar of the rockets at launch and the trail leading up into the sky.

The entire Hawk defense team can play the problems out as they would a game so that when and if it becomes necessary to face an actual defense situation, crew action will be the repetition of familiar tasks.

The complete simulator is housed in a lightweight air-transportable shelter that can be moved easily by helicopter or by a 2-1/2-ton truck. The shelter can be loaded and moved as a unit, requiring only cabling and power connections to the Hawk system for operation.

Advanced transistorized and miniaturized circuit techniques reduce the size, weight and power requirements of the simulator, capable of supplying a total of six individual targets, each of which can be independently controlled.

Simulated targets can be supplied in conjunction with a complete presentation, including typical ground clutter, or they can be injected into the normal Hawk radar presentations. This permits a mixed presentation of the operational Hawk radar display with the synthetically produced targets superimposed.

The targets can be maneuvered at will during a problem and are automatically removed when the defense team scores a "kill."

A wide variety of specialized jamming effects also can be injected into the radar displays. This provides great flexibility in training the Hawk defense team in electronic counter-countermeasures, and in seeing through jamming signals that might be carried by unfriendly targets.

HIGH-POWERED AMPLIFIER traveling wave tube is used as the symbol of authority of the chief of the Multi-Array Radar (MAR-I) Test Branch in a change-of-command ceremony at White Sands Missile Range N. Mex. Col Frank J. Wasson Jr. (center), commander, Sentinel System Evaluation Agency, officiated as Maj Jerry L. Kintigh (left) was succeeded by Maj Terry M. Carlton as head of MAR-I. The tube is one of 805 such instruments used in MAR-I transmitters. Maj Kintigh was reassigned to Kwajalein Island.

Sulfamylon Acclaimed for Role in Burn Treatment

Increased effectiveness of treatment to control infection of burn wounds, proved in more complete recovery of scores of patients wounded in Vietnam, has been announced by the Office of The Surgeon General.

Techniques now in use were developed by the Army Medical Department's Surgical Research Unit at Brooke General Hospital, Fort Sam Houston, Tex. The unit has gained world renown for major advances in treatment of burn patients during the past decade.

Natural protection of the skin is lost when an individual receives a severe burn. Until 1964 it was primarily infection, rather than burn trauma, that caused death. Many second-degree burns, previously converted to third degree through infection, are now healing spontaneously through use of Sulfamylon.

First used in Germany in topical therapy of war wounds in the 1940s, Sulfamylon is now used to control burn-wound sepsis in Vietnam, with a reduction in mortality, on the average, from 60 percent to 13 percent. The medication has been in use since 1964.

The most dramatic results have been obtained among those patients receiving burns ranging over 30 to 60 percent of their body. Clinical treatment includes the use of topical Sulfamylon burn creme, debridement, use of skin grafts as physiological dressings, and intensive use of physical and occupational therapy. While all steps contribute to the recovery of the patient, the increased effectiveness of burn treatment cited can be traced directly to the use of Sulfamylon.

Serious burn patients wounded in Vietnam generally are sent to the 106th General Hospital in Japan prior to evacuation by special burn flight to the Brooke General Hospital Burn Center. A burn flight team has been dispatched to Japan for that purpose.

Results of the medication are clearly illustrated by cases presented in a paper written by five Army medical officers who helped evaluate Sulfamylon.

A 6-1/2-year-old boy was admitted on the ninth postburn day with a 41 percent total body surface burn—32 percent third degree. Removal of the several-day-old dressings revealed a massively infected wound. The child was critically ill and surgical debridement was considered impossible due to the degree of bacterial growth. The burn creme appeared to suppress the infection promptly; four days later, surface cultures of the abdomen burn were almost sterile.

Another case involved a 32-year-old Marine Corps helicopter pilot who was burned in a helicopter crash. A 61 percent burn (28 percent third degree) involved deep leg and lower trunk burns, plus head, full-length arm and hand burns. The patient received Sulfamylon burn creme treatments for 3-1/2 weeks and skin graft resulted in ultimate recovery.

Army Evaluates Use of Adenine To Increase Life of Banked Blood

Addition of adenine, a normal body constituent, can improve the survival of stored red blood cells and greatly increase the shelf life of banked blood, the Office of The Surgeon General of the Army recently announced.

Army studies repeatedly have shown that the 24-hour post-transfusion survival of adenine-fortified blood is superior to that of cells stored with conventional solutions. Adenine blood is undergoing further clinical evaluation in Vietnam.

ADP Systems Personnel Lauded at WSMR Conference

Army personnel who have wrestled mightily with multifarious and exceedingly complex problems of establishing a technical information and data system satisfying, to a reasonable degree, the requirements of all concerned recently got an indirect pat on the back.

General Frank S. Besson Jr., commanding general of the U.S. Army Materiel Command, tossed out the accolade at the recent AMC Commanders' Conference in Washington, D.C., and it was cited at the seventh meeting of the Senior Automatic Data Processing Executives in February.

The conference of the ADP experts and some managers of systems under development was held at White Sands (N. Mex.) Missile Range. General Besson was quoted as describing the executives group as "hard-hitting, tough and effective." It was credited with "significant contributions" to improvement in management of ADP systems throughout the Army Materiel Command.

The group consists of senior ADP executives of AMC, the U.S. Army Logistics Management Systems Agency, major subordinate commands of the AMC, and key commodity centers and arsenals. Organized in May 1968, its purpose is to exchange ideas and discuss ADP policies, procedures and plans for future programs.

Edward J. Jordon was reelected chairman at the WSMR conference. He is director, Management Systems and Data Automation, HQ U.S. Army Munitions Command, Picatinny Arsenal, Dover, N.J.

Conferees reviewed major ADP equipment augmentation and modernization policies, alternate site and back-up planning, communications programs, and computer-aided design and control of machine tool projects. One of the highlights was a tour of the new WSMR Range Control Center and a real-time demonstration of capabilities in the Computer Center.

Members of the executives group present at the conference included Brig Gen Victor L. Cary of the AMC, Col John P. Downing Jr., James P. Smith and Harry N. McClain of the Army Missile Command at Huntsville, Ala., C. W. Minnick of Rock Island (Ill.) Arsenal, T. C. Parrotta and Eugene P. Vigna of Aberdeen (Md.) Proving Ground, Ray Regiani of the Army Tank-Automotive Command at Warren, Mich., William D. Kettner of the Army Logistics Management Center at Fort Lee, Va., Robert L. James of the Army Aviation Materiel Command at St. Louis, Mo., David L. Grobstein of Picatinny Arsenal and D. J. McCune, Ammunition Procurement and Supply Agency, Joliet, Ill.

EXTENSIVE TEST FIRING OF 35-foot-long, 175mm barrels of the M107 Self-propelled Vehicle is entering the final phase of a program calling for firing a total of 16,200 rounds at Aberdeen (Md.) Proving Ground. As of mid-January, some 12,400 rounds had been fired, using six new auto-frettage-process gun tubes fabricated at Watervliet (N.Y.) Arsenal, U.S. Army Weapons Command. The objective is to determine if auto-frettaging, highly successful as a technique of strengthening smaller gun tubes, can be equally effective in improving the Army's largest weapons.

Long-Range R&D Program Directed to Modernizing Defense Language Program

Modernization of instructional materials and proficiency measurement systems to support the Defense Language Program is the goal of an intensified long-range research and development effort, the Army reports.

Single-manager responsibility for this program has been delegated by the Department of Defense to the Secretary of the Army. Implementation is being accomplished by the Defense Language Institute under jurisdiction of the Deputy Chief of Staff for Personnel.

The total DLI Resources Development Plan that R&D activities will support is projected over a 20-year period. Other elements of the plan include continuing DLI internal improvement activities.

Responsibility for monitoring this R&D program is delegated to the Behavorial Sciences Division, Army Research Office, Office of the Chief of Research and Development. The need for intensified research, analysis and evaluation in developing a systematic approach to the problem was recognized in the 1966 Haines Board report as well as in the Army's Combat Developments Objectives Guide.

Department of Defense Directive 5160.41 dated Oct. 19, 1962 (revised as of Oct. 5, 1968) and Army Regulation 350-20, June 11, 1963 (with Change 2) provide general guidance for administration and conduct of the Defense Language Program.

Currently this program involves more than 100,000 U.S. personnel enrolled in command-operated foreign language courses in addition to those in the various DLI schools.

FY 1970 programed requirements for foreign-language training reflect a total of 11,949 U.S. military personnel to be enrolled as resident students in DLI schools in Washington, D.C., Monterey, Calif., and El Paso, Tex. (temporary school) and under contract in commercial language schools. About 2,700 foreign military personnel are programed for English language training in the DLI school at San Antonio, Tex.

"Seriously outdated," however, is the criticism made of many of the teaching methods and the techniques of evaluating effectiveness of much of this training. Critics contend that improvement of methodology could shorten training time and achieve better results.

Minimum time for basic Russian language training, for example, is currently 47 weeks. Methods have been termed unrealistic in respect to current needs for advancement of the state-of-the-art. Recent developments indicate that use of tape recordings, programed instruction, and "pattern drill" technology are not properly exploited.

Basic redesign of some language training systems is required in the interests of efficiency to meet present and anticipated requirements, some study reports state. In languages such as modern Chinese, it is claimed that "no systematic documentation to reflect changes of the past 30 to 40 years" has been made available.

Under the heading of "Scope and Objectives" of the DLI program being developed under the current modernization effort, involving an adequate capability of teaching a second language to both U.S. and foreign Military personnel, it is envisioned that no less than 12 years will be required to complete the program's first cycle.

"Since this entails unacceptable delay in improving instruction," one study states, a branching program of development provides for early "quick fix" exploitation of techniques that will immediately improve existing systems; also, for research and exploratory actions leading to basic redesign of the instructional system.

The base of research will support development tasks to organize available knowledge from all sources and to acquire new knowledge, with the DLI serving as a clearinghouse in the state-of-the-art to support efforts.

The DLI will provide a preliminary library research, secure bibliographies, maintain a library for research in progress, and insure continuing communication between research conducted for the Defense Language Program and research in progress elsewhere.

The long-range plan states that when available information has been assembled and key research requirements resolved, specific strategies can be selected for experimental development. At this point developmental effort will branch into complementary directions, concentrating first on immediate exploitation within existing programs.

The development plan calls for a gradual step-up of the research effort through increased RDT&E funding from $400,000 currently to about $1.5 million in Fiscal Year 1973. Among numerous proposed tasks are:

- Development of a new generation of language training systems.
- Interim modernization of existing courses.
- Development of specialized courses.
- Development of priority effort in Vietnamese and Thai languages.
- Development of refresher maintenance courses.
- Design and development of overseas language training program materials.
- Development of materials for U.S. Armed Forces Institute support.
- Provide support for linguistic and pedagogic research.
- Identify requirements and specifications for instructional devices.
- Develop new proficiency tests (training effectiveness measurement).
- Develop new language training aptitude tests.

Dentists Eye Laser for Tooth-Decay Control Technique

National Children's Dental Health Week, Feb. 2-8, brought forth a rash of newspaper articles about progress in dental research expected to lead eventually to methods of eliminating tooth decay.

One technique described by Dr. Fred M. Johnson in an address to a branch of the American Nuclear Society in Las Vegas, Nev., would use the near instantaneous heat of a narrow and intense laser beam.

Experiments he has been conducting as an employe of Xerox Corp. in Pasadena, Calif., involve application of a sodium chemical solution to the teeth and permanently fuzing it to the enamel with a laser beam. Resultant hardening of the enamel prevents food particles from entering and decaying the teeth, he said.

Hopefully, a laser instrument for this purpose will be ready for marketing to dentists in 1971.

Methods for complete control of tooth decay are generally conceded to be 10 to 20 years away, although animal experiments in the use of enzymes to prevent decay have yielded encouraging results. One of the most promising of these is dextranase. Apparently it attacks a metabolic product of the specific streptococci associated with caries.

Several of the studies in progress involve multiple use of fluorides to prevent formation of decay. Scientists are experimenting with combining fluoridation of water with two other uses of fluoride—direct application of a solution to the teeth, and regular brushing with a fluoridated dentifrice. This triple approach is reported to have resulted in reductions in decay as high as 90 percent.

Former Marine Serves as Edgewood Audiologist

Audiology, one of the newer medical sciences, involves the conservation and improvement of hearing without medicine or surgery, and it serves to explain why former Marine Capt Gerald R. Bearce is now an Army captain in the Medical Service Corps.

In addition to that rather infrequent change, Capt Bearce is unusual on still another score—he is one of a scant dozen or so men in the Army with an MOS (Military Occupational Specialty) in audiology. The latter fact accounts for his switch from a Marine Corps to an Army uniform.

When the Army established an MOS in audiology about two years ago, he explains, the action opened the door for Capt Bearce to return to military duty, because at that time it seemed that neither the Navy nor the Air Force recognized a need for an audiologist—at least not in his case.

Edgewood (Md.) Arsenal's Army Environmental Hygiene Agency presented the opportunity and the challenge for research desired by Capt Bearce, who was graduated from the University of Wichita in Kansas in 1964 with a master's degree in education, with specialization in audiology.

Assigned currently as project officer for what the arsenal's information officer has termed "a revitalized program in audiology," Capt Bearce is concerned primarily with preventive medicine measures that will eliminate or reduce hearing losses caused by noise. In this respect, he differs from most other Army audiologists, who usually are assigned to Army hospitals in a clinical capacity.

The Army hearing conservation program he heads encompasses Army installations and the Defense Supply Agency. Capt Bearce commented:

"Conservation of hearing is synonymous with prevention of hearing loss. Under the Army hearing conservation program, we will be working continually to identify and eliminate this painless and invisible occupational health hazard."

Modern industrial development has contributed greatly to increasing the magnitude of this health hazard, and weaponry in the military services has similarly added to the problem for many of those in uniform. Danger of loss of hearing due to intense noise exposure is continually changing.

"Too much noise for too long a period may result in permanent damage to hearing, often only to sounds of a particular frequency," Capt Bearce explained. Loss may be due to temporary failure of organic mechanisms.

With specialized equipment, the audiologist can measure the amount of noise produced by a single piece of machinery or in an entire factory, as well as the amount of temporary or permanent hearing loss sustained.

In some cases, the audiologist may recommend changes that will reduce the potentially harmful noise output of equipment or machinery; in others, hearing protectors may be recommended to reduce the sounds of harmful intensity. The protectors also enable people to hear human speech better in a noisy environment.

The U.S. Army can attribute its success in attracting a man of Capt Bearce's professional capabilities in one of the newer sciences to an announcement that appeared in the Journal of the American Speech and Hearing Association, of which he is a member. The announcement called attention to the Army's establishment of an MOS in audiology.

AUDIOLOGIST Capt Gerald Bearce measures intensity of sound produced by circular saw operated by Sp/6 Drexel Murphy at the Army Environmental Hygiene Agency, Edgewood Arsenal, Md. Both men are wearing protectors to guard against hearing damage from high-intensity sound.

COLED-V Seeks Ammo/Equipment Performance Data

Nearly everyone in the U.S. Army in Vietnam is encouraged to get into the act with respect to a project designated COLED-V (Combat Loss and Expenditure Data), involving collection of information on how well hardware and ammunition supplies hold up in the grind of battle.

The U.S. Army Combat Developments Command initiated this project to collect and maintain a cross-reference of as much data as possible on combat and routine use or wear-and-tear of materiel. The purpose is to establish a basis to predict more accurately current and future needs.

Commanders at all levels in Vietnam are reported to be responding diligenty to the COLED-V requirement for information on ammunition and equipment losses and expenditures following all engagements. Results of the first year, which ended recently, have been good and more intensive effort is projected.

One of the new efforts to stimulate responsiveness to COLED-V is the plugging of the program through Armed Forces Radio-TV Service in Saigon. AFRTS is making a short film on COLED-V for feature runs throughout the year to keep new personnel properly informed.

Data are being collected on all aspects of ammunition expenditures and hardware losses, operational factors, kinds of mission carried out, units involved, terrain features, weather, daylight or darkness conditions, location and so forth.

The MACV Data Collection Center forwards much of this information on data cards to HQ U.S. Army Combat Developments Command, Fort Belvoir, Va. It is turned over to the Research Analysis Corp., an Army contract agency in McLean, Va., for processing and analysis.

Army efforts to tally ammo/equipment use, losses and related factors date back through military history, but not on as extensive and detailed a scale as in COLED-V, CDC reports.

Tabulations are envisioned as having a big impact upon future logistics and supply operations, involving the systems approach to planning that interlocks military doctrine, hardware and organization, to achieve improved combat effectiveness.

STRATCOM Employes Cited For VE Savings at Huachuca

Achievements in the Army-wide Value Engineering Program recently earned six civilian employes of the Army Strategic Communications Command at Fort Huachuca, Ariz., citations for "significant contributions."

Savings resulting from their ideas and suggestions enabled STRATCOM to exceed its VE objective, as set by the Department of the Army, by 100 percent for FY 1968, it was reported. Their total saving was $2,682,350.

George D. Daley, a specialist with the Communications Engineering Department, was credited with an idea good for first-year savings of $1,365,000; Frank M. Parr, $975,000; Merrill G. Stiles, $258,000; Eldon F. Davidson, $39,000; Ramelon Suwarno, $37,000; and John A. Bodnar, $7,600.

3 Army Scientists Coauthor AAAS Meet Paper

Three scientists of the U.S. Army Terrestrial Sciences Center (formerly the Army Cold Regions Research and Engineering Center), Hanover, N.H., coauthored a technical paper featured at the Antarctic Research Symposium.

The symposium was one of many conducted Dec. 26-29 at the 135th meeting of the American Association for the Advancement of Science in Dallas, Tex. Dr. C.C. Langway, A.J. Gow and B. Lyle Hansen coauthored "Deep Drilling into Polar Ice Sheets for Continuous Core," terming their paper an "extended summary" of activities that led to a phenomenal achievement Jan. 29, 1968.

On that date drilling technology developed during many years of Army experimentation yielded an ice core containing rock fragments that was taken from just above bedrock under the Antarctic Icecap at a depth of 7,101 feet. (See March 1968 edition of the *Army R&D Newsmagazine* for a detailed account and the significance of this feat.)

This dramatic climax of collecting ice cores in 15-foot lengths to a depth nearly a mile and a half below the icecap surface—with recovery exceeding 99.7 percent of the footage drilled—rewarded an effort made by Army researchers as part of the U.S. Antarctic Research Program administered by National Science Foundation.

Dr. Langway returned from Antarctica to present the paper. Currently he is on loan to the National Science Foundation for a research project of considerable worldwide interest if the effort yields the anticipated discoveries.

The AAAS paper describes in detail the techniques that produced the drill hole that reached the Antarctic bedrock in 1969 for the first time. It involved the use of an electromechanical drill that is suspended in the hole by its electrical cable, as well as other methods of deep-core drilling.

Significance of the deep-core drilling program is that the cores recovered, when preserved for detailed study by scientists after being returned to the United States, indicate historical developments in glaciology dating back thousands of years.

Scientists are seeking to determine the relationship between Northern Hemisphere glaciation and that of Antarctica in the history of the ice ages. The core samples taken at Byrd Station in Antarctica, about 700 miles from the South Pole, are being compared with cores obtained from similar drilling of the Greenland Icecap.

Through such studies, researchers are trying to establish trends in the history of the ages that may indicate possible future happenings—such as a dramatic change in the frozen mass of the Antarctic Icecap that contains about 70 percent of the world's fresh water. Such a change would affect man's environment by altering sea level, rainfall, river flow, lake levels and other factors.

The paper presented by Dr. Langway described some of the findings of the studies to date and new equipment being developed for future deep core drilling—such as an electrical property-measuring device, a camera to observe bottom bed-slip, and remotely operated collection devices for solids, liquids or gases.

ECOM Researchers Report On Transistorized Circuits

Development of a new method of preventing failures in transistorized circuits was reported by three Army scientists at the 1969 Symposium on Reliability held in Chicago Jan. 22 under sponsorship of the Institute of Electrical and Electronics Engineers.

Army Electronics Command researchers Bernard Reich, Edward B. Hakim and Gregory J. Malinowski coauthored a paper titled "Failure Mechanisms in RF (radio frequency) Power Transistors Under Operating Conditions."

The paper notes that the method described has been used previously to improve the reliability of equipment that had been troubled by the burnout of RF power transistors. Essentially, it uses an infrared radiometer to detect hot spots in transistor chips to anticipate potential failures.

Information thus obtained can be used for redesign of equipment to eliminate heat-producing conditions. The studies also permit determination of the operational limits of power transistors in circuits and design to allow for the worst conditions.

Army Reviews Development Tasks at CDC Conference

Fifty development tasks were reviewed at the Army Small Arms Conference, sponsored by the U.S. Army Combat Developments Command (CDC) through its Infantry Agency at Ft. Benning, Ga., Feb. 4–7.

The conference served as a management tool in the Army Small Arms Program, designed to ensure that highly effective weapons systems are available when needed by the Army.

Objectives, tasks and priorities for research and development and procurement of small arms are outlined in this program, involving the Army Materiel Command, the Combat Developments Command and the Continental Army Command.

The conference served to review product improvement in the current small arms systems and the introduction of new equipment into the Army over the next five years. Long-range objectives discussed are geared to development of systems for the Army of the future, through the 1990s.

Conferees discussed the full scope of small arms and ammunition up to 60-caliber as well as pistols, shotguns and the Infantry grenade launcher.

Participants, in addition to CDC's weapon experts, included representatives of the Army Assistant Chief of Staff for Force Development, U.S. Army Materiel Command, and Continental Army Command.

WSMR Designates Col Martin as Deputy Commander

Col Allen C. Martin, chief of staff at White Sands (N. Mex.) Missile Range since July 1967, has succeeded Col John J. Kiley Jr. (now retired) as deputy to Maj Gen H. G. Davidson, WSMR commander. Col William H. O'Connell is the new chief of staff.

Col Martin entered military service in 1940 following graduation from Auburn University with a BA degree in business administration. He is also a graduate of the Command and General Staff College (1957), the Armed Forces Staff College (1960), and the Defense Language Institute (1965). He was chief, Army Section, Military Group, Quito, Ecuador, 1965–67.

Col Allen C. Martin

During World War II he served in New Guinea and the Phillipines. Other assignments have included G–4, HQ U.S. Eighth Army, Japan (1948-50); G–3, MAAG, Taiwan (1957-59); U.S. Army Command, Okinawa (1960-62).

Col O'Connell is a graduate of the University of Omaha and also attended Texas A&M. He served in World War II and the Korean War and was assigned to WSMR following a tour of duty in Vietnam.

Top ISF Winners Visit Tokyo for Japan Science Awards

Primary education in foreign travel problems and Japanese customs was part of the experience gained by three outstanding American high school science students who represented the U.S. Army, Navy and Air Force at the 12th Japan Student Science Awards in Tokyo, Jan. 16–18.

In spite of a 12-hour delay because of icy runway conditions in Indianapolis, Ind., before taking off for Japan, Army representative Don E. Baker arrived in time to exhibit his International Science Fair (ISF) basic research project, titled "Irradiative Computer Component Microminiaturization."

Now a freshman at Rose Polytechnical Institute in Terre Haute, Ind., he earned the 10-day trip as the Army winner of the sixth annual triservice "Operation Cherry Blossom" while a senior at Northwest High School in Indianapolis.

Baker was selected along with Navy and Air Force representatives during the 19th ISF last May 12–18 in Detroit, Mich. The ISF is administered by Science Service, a nonprofit organization dedicated to the advancement of science.

Baker worked on his research project for two years. His concept involved making computer parts smaller and, thereby, decreasing the cost, complexity and size of computers. Toward this end he experimented with concentrated sunlight to subdivide the biochemical semiconnector diodes to produce smaller components.

"If computers could be made smaller and cheaper, the common man could own them, and cars could be installed with them to prevent accidents," the young scientist theorized in explaining his concept.

Eugenia Born, the U.S. Navy representative selected as alternate at the ISF, exhibited "Radio Wave Probing of the Brain." Now a freshman at the University of Chicago, she worked on her project while a senior at Broadway High School, St. Louis, Mo.

Loren Sprouse, a senior at Braymer (Mo.) High School and the Air Force representative, exhibited "Bacterial Decomposition of Animal Wastes in Mineral and Water Cycles."

Escorted during their visit by Lt Cmdr Joan Reece, USN, Office of Naval Research, and Howard Weisbrod, coordinator for Science Service, the American students were welcomed at Camp Zama by Col Charles W. Cook, commander of the U.S. Army R&D Group, Far East. They later met with Brig Gen John A. Goshorn, CG of the U.S. Army, Japan.

The Student Science Awards at which they displayed their exhibits is sponsored by the *Yomiuri Shimbun*, one of Japan's largest newspapers.

During their action-packed visit to Japan, they toured the Tokyo Museum at Ueno, the U.S. Embassy, a Japanese High School, the Science Museum at Kitanomaru, the world-famed Sony electronic equipment factory, and Yomiuriland—Japan's answer to Disneyland, U.S.A.

The unforgettably pleasant aspect of the trip, according to all three young scientists, was the opportunity to learn a little about Japanese culture and customs as guests of prominent Japanese families—described as a mutually heart-warming experience conducive to respect and esteem.

ARMY REPRESENTATIVE to the Japan Student Science Awards Exhibit in Tokyo, Don E. Baker, adjusts component of his miniature computer.

CDC Sets LR-QR Criteria for Headgear of Crewman

Issuance of a Letter Requirement-Quick Reaction (LR-QR) calling for development of a new armored vehicle crewman's protective headgear has been announced by the Army Combat Developments Command, Fort Belvoir, Va.

An LR-QR is a Department of the Army-approved process implemented by the Combat Developments Command to speed handling of combat-oriented developments actions. Intended to provide troops with individual clothing and equipment items except small arms in the minimum feasible time, an LR-QR calls for a single in-process review for the agencies involved when a prototype is considered suitable for fielding.

The item is sent to the field, following the expedited in-process review, to be judged in action. The concept is to provide an adequate, safe product responsive to immediate needs, improving it later if necessary.

CDC criteria established for the new crewman's protective headgear require that it be lightweight and compatible with restricted interiors of not only current armored vehicles, but also those under development. In particular, it must meet the needs of the U.S.-Federal Republic of Germany Main Battle Tank (1970s).

Other criteria include bump protection, comfort for wearing 24 hours or longer without interfering with normal crew functions, provision for greatly improved communications requirements, and a quick-disconnect device to permit instantaneous disengagement from the vehicle's radio.

The helmet also features an electrostatic wireless audio frequency link between crew members and communications equipment, and protective filter safeguarding, even against laser radiation. Equally effective in cold and warm-wet climates, it also has a face shield to guard against wind chill.

All of these features are envisioned in a helmet that ideally will not weigh more than 1.5 pounds and will be so generally acceptable that it will eventually replace the combat crewman's helmet in use since 1959.

Ride Dynamics Testing Aided By New Camp Roberts Courses

Two Ride Dynamics Research Facility test courses have been constructed at Camp Roberts, Calif., by the U.S. Army Tank-Automotive Command (ATAC) to simulate the tank-testing terrain at Aberdeen (Md.) Proving Ground and Fort Knox, Ky.

The 400-foot-long, 16-foot-wide concrete courses were designed by the ATAC Mobility Testing Laboratory to provide activities on the West Coast with carefully controlled, varied but rigid profiles for evaluating ride characteristics of vehicles weighing up to 60 tons.

Tests will be made of suspension component loadings to collect data for evaluation of computer simulations. Comparative tests of various vehicles also are planned, along with evaluation of driver response and tests of vehicle instrumentation.

Military or civilian personnel desiring to use the test facilities should contact B. Bonkosky, Frame, Suspension and Track Division, Mobility Systems Laboratory, U.S. Army Tank-Automotive Command, Warren, Mich. 48090.

Redstone Foundry Bows Out to March of Progress

Technology once troubled, but only temporarily, by an unusual problem of how to control the twitching of a monkey's tail for a space flight requirement is being phased out at Redstone (Ala.) Arsenal.

The foundry, long staffed by exceptionally skilled metal craftsmen, will close its doors forever—another victim of the march of progress.

In the early days of the missile program, Redstone's counterpart of Vulcan's forge specialized in turning out the lightest, toughest hardware possible for prototypes and experimental missiles.

The need was clear; no one else could do the job. But the success of the early missile programs spawned a much greater depth of capability in industry. Missions changed, too, at Redstone, over the years.

Finally came the day when a detailed survey showed the continued operation of the foundry could no longer be justified on the basis of economics or need. One of its final projects, for example, was the casting of a room full of lead bricks to be used in a research laboratory—a long step away from the precision required 10 years ago when it came time to make a mold and cast a couch to carry America's first successful voyager into space.

Her name was Able. She was a temperamental rhesus monkey who flew with a tiny squirrel monkey named Baker in the nose cone of a Jupiter missile in May 1959. Paul Laney, who was selected to make the mold for the form-fitting couch for monkey Able, recalls his experience with the deep satisfaction that comes to a man who has met a challenge.

Mold-making is a delicate business, particularly for a monkey's space ride. It involves using an exact model —or the real thing—to make an impression in damp sand. It takes a steady hand and a cooperative subject, which Able and Baker definitely were not.

"We finally had to anesthetize them to make the molds," Laney said. "Even then they wouldn't hold still. We'd get all set and then they'd move an arm or a leg just enough to ruin the mold. Their tails twitched, too. That was the worst."

Working with the greatest patience, Laney finally got his mold. The monkey couches were just one of the Redstone foundry's many challenging assignments—unusual, perhaps, but at least Laney and his coworkers knew what the desired end product was.

In the early days of the missile program, it was not uncommon for the men in the foundry, who constituted one of the many Post Engineer service functions to the laboratories, to go through an entire process, make a pattern, then a mold, cast, sand blast, polish and deliver without ever knowing in what classified project their product was destined to be used.

Roy G. Ashcraft, who began work in the foundry as a pattern maker in 1954, is chief of the operation until operations cease. Ashcraft's long service is typical of the 12-man foundry work force. All have worked there for more than a decade.

All were offered other jobs at the arsenal. Laney will be working for a private firm. Ashcraft will be doing plans and programs documentation. Others will work at such diverse tasks as Logistics and Quality Production.

Like Laney, some of the skilled men have elected to take jobs elsewhere and continue their traditional craft.

Picatinny Announces CO Change

Col Roger Ray, Picatinny Arsenal commander since September 1967, has received orders reassigning him to Washington, D.C., about the first of July in the Office of the Secretary of Defense.

Col William A. Walker Jr., a graduate of the U.S. Military Academy with an MS degree from the University of Virginia, (also a graduate of the Army War College), presently serving in Washington, D.C., has been named to take over as commander at Picatinny Arsenal.

CE Outlines Civil Works Budget Proposals

Civil Works Program budgetary proposals of the U.S. Army Corps of Engineers, as submitted to Congress in outgoing President Johnson's final message, request $1,162,000,000 as compared to actual appropriations of $1,218,272,500 in FY 1969.

In addition, $43,785,000 of Corps of Engineers Civil Works funds has been placed in budgetary FY 1969 reserve to supplement the 1970 program.

Army Corps of Engineers Civil Works Program responsibilities include nationwide water resources development; construction, operation and maintenance of federal flood control projects; and planning, surveying, construction and operation of numerous other facilities such as river and harbor improvements projects, beach erosion control, navigation improvements, conservation of resources, and hydroelectric plants.

The broad break-out of FY 1970 budgetary proposals calls for $769,420,000 for general construction; $245,700,000 for operation and maintenance; $40,400,000 for general investigations; $74,600,000 for flood control along the Mississippi River and its tributaries; $22,980,000 for general expenses; $5,000,000 for flood control and coastal emergencies; and $3,900,000 permanent appropriations.

The budget provides for 195 continuing construction projects, 13 continuing land acquisition programs, 11 new construction starts, one land acquisition start, two special projects, nine reimbursements and five rehabilitation projects; also, for continuation of planning on 57 projects, initiation of planning on 16 others, and four restudy projects.

MERDC Appoints Chief of Technical Research Support Office

Appointment of Andrew Weber as chief of the Technical and Research Support Office, has been announced by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

Backed by nearly 30 years of military-civilian service with the Army Corps of Engineers, Weber had been serving as acting chief of the office, which provides services not only for the center but also for tenant agencies. Services include computation and analysis, developmental fabrication (machine, woodworking, paint and model shops), instrumentation, and photography.

Andrew Weber

Weber received a BS degree in civil engineering from the University of Virginia in 1939 and entered Civil Service with the Corps of Engineers in Baltimore, Md. He served in the Navy from 1943 to 1946, and since then has been associated with the R&D Center at Fort Belvoir. He has served in many different capacities in various branches and departments, earning "Outstanding" and "Sustained Superior" performance awards.

Major RDT&E, Procurement Contracts Exceed $442 Million

Awards for the Common Aperture Multifunction Array Radar (CAMAR) system and modifications to the Sentinel antiballistic missile defense system orders accounted for a substantial share of Army RDT&E and procurement contracts totaling $442,582,830 from Dec. 9 to Jan. 9.

Western Electric Co. received the largest of this amount in five contracts totaling $57,621,414 for CAMAR and Sentinel System work, and for engineering services for the Nike Hercules missile system.

Eastman Kodak Co. was issued a $24,699,272 modification to a contract for explosives and for support services. Honeywell, Inc., will receive $22,364,329 in three contract definitizations for nose fuzes and metal parts, and a contract for electronic equipment.

Two modifications and a new contract totaling $21,966,014 went to Chrysler Corp. for M60A1 combat tanks, cargo trucks and ambulances. Hercules, Inc., received a $20,939,203 order for propellants and explosives.

Bell Helicopter Co. will be paid $19,614,160 on contracts and modifications for UH–1H helicopters and parts and for modification kits for the XM35 weapon system for AH–1G helicopters.

Raytheon Co. gained contracts, definitizations and modifications totaling $16,235,117 for Sparrow 3 missile modification kits, multiplexers and spare part kits, metal parts for fuzes, high-power illuminators and repair of radar sets for the Hawk system.

Metal parts for 105mm projectiles are being furnished by AMF Co. under two contracts totaling $15,418,636. Sperry Rand Corp. will receive $14,592,908 under a contract modification for production of ammunition and components.

National Gypsum Co. gained a $12,581,522 modification to a contract for ammunition and components while General Motors Corp. obtained an $11,858,875 order (three contracts) for diesel engines, transmission components, M16A1 rifles and test equipment.

Olin Mathieson Chemical Corp. is receiving $11,394,070 on two contracts for 60mm and 81mm projectiles. Harrington and Richardson, Inc., is furnishing M16A1 rifles and test equipment under an $11,335,842 contract definitization. Philco-Ford Corp. was issued three contracts for $10,591,378 for electronic equipment and for operation and maintenance services in Vietnam and Okinawa.

Contracts under $10 million. LTV Electro-Systems, Inc., $8,084,062 for AN/PRC–25 radio sets; Lear Siegler, Inc., $7,805,375 for parts for 105mm shell fuzes; Kaiser Jeep Corp., $7,332,237 for 5-ton trucks; Harvey Aluminum Co., $7,089,397 for loading, assembling and packaging ammunition and components, and for maintenance and support services; and

Mack Trucks, Inc., $6,278,168 (two contracts) for tractor and dump trucks and for diesel engines for 5-ton trucks; Mason and Hanger, Silas Mason Co., Inc., $5,934,750 for ammunition and components; Amron-Orlando Corp., $5,677,412 for parts for 40mm cartridge fuzes; Goodyear Tire and Rubber Co., $5,565,584 (three contracts) for truck and bus tires.

Contracts under $5 million. Northrop Corp., $4,910,000 (two contracts) for parts for 2.75-inch rocket warheads and for 152mm canisters; Union Carbide Corp., $4,831,207 (two contracts) for dry batteries; Thiokol Chemical Corp., $4,082,642 for ammunition; and

Medico Industries, Wilkes Barre, Pa., $4,012,800 for parts for 2.75-inch rocket warheads; Kennedy Van Saun Corp., Danville, Pa., $3,858,140 for parts for 105mm projectiles; Hughes Aircraft Co., $3,751,495 (two contracts) for engineering services for the AN/TSQ–51 air defense control and coordination system and for AN/VVS–1 laser range finders for M60A1E2 tanks, and

Talley Industries, Inc., $3,682,350 for parts for 4.2-inch projectiles; AVCO Corp., $3,621,832 (two contracts) for turbine engines and repair parts for helicopters; Hazeltine Corp., Little Neck, N.Y., $3,506,000 for ground interrogator sets that elicit responses from airborne transponders; and

Texas Instruments, Inc., $3,500,000 for electronics equipment; System Development Corp., $3,461,524 for R&D efforts on the computer-aided-command problem; Kaiser Steel Corp., $3,274,000 for small-caliber ammunition boxes; and

Lehigh, Inc., Easton, Pa., $3,249,760 for metal parts for 2.75-inch rocket warheads; Batesville Manufacturing Co., $3,211,600 for parts for 750-pound bomb fuzes; Delco Remy Division of General Motors Corp., $2,691,979 for storage batteries; and

AVCO Economics System Corp., $2,660,596 for renovation and production of ammunition components and for equipment installation services; Chimera Corp., Kearney, Neb., $2,431,620 for generator sets; Standard Container Co., $2,423,742 and Youngstown Steel Door Co., Elmira, N.Y., $2,371,731 for small-arms ammunition boxes; Chamberlain Manufacturing Corp., $2,355,280 for parts for 105mm projectiles; Stevens Manufacturing Co., Ebensburg, Pa., $2,330,532 for semitrailers; and

Alcan Aluminum Corp., Riverside, Calif., $2,303,694 for 66mm rocket motors; Radio Engineering Labs, Long Island City, N.Y., $2,200,000 for shelters for use with the Integrated Wide-Band Communication System; Lockheed Aircraft Corp., $2,177,150 for YO–3A aircraft; and

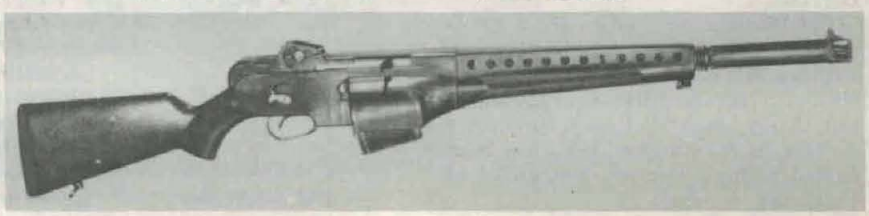
Bogue Electric Manufacturing Co., Patterson, N.J., $2,049,116 for generator sets; Gould Marathon Battery Co., St. Paul, Minn. $2,014,000 for dry

WECOM Orders Continued Development of SPIW

Continued development of the Special Purpose Individual Weapon (SPIW) and its ammunition will be done under a letter contract by the Army Weapons Command to AAI Corp.

AAI was one of four organizations selected by the Army in the spring of 1963 for initial experimental design and development of a hand-held weapon for use in Special Forces and Infantry units as a possible next-generation rifle replacement.

Evaluation tests of the prototypes produced under this program have been conducted by the Army during the past five years, and the AAI prototype weapon was selected for continued refinement of both the weapon and point-fire ammunition. Under the terms of the contract, 20 new versions of the SPIW concept will be delivered to the Army for testing.



batteries; Honeywell, Inc., $2,000,000 for electronic repair parts.

Contracts under $2 million. Gibbs Manufacturing and Research Corp., Janesville, Wis., $1,985,400 for parts for 2.75-inch rocket fuzes; Whirlpool Corp., $1,971,913 for 152mm canisters; Action Manufacturing Co., Philadelphia, Pa., $1,951,196 for parts for 750-pound bomb tail fuzes; and

Bell Aerospace Corp., $1,936,342 for gear box assemblies for UH–1 helicopters; Pace Corp., Memphis, Tenn., $1,917,163 for parachute signals; Bauer Ordnance Co., Warren, Mich., $1,900,537 for hydraulic rammer assemblies for M109 howitzers; and

Cargill Detroit Corp., Clawson, Mich., $1,796,312 for white phosphorous production equipment; Consolidated Box Co., Inc., Tampa, Fla., $1,786,795 for 4.2-inch mortar containers; Martin Marietta Corp., $1,739,075 for work on the Pershing weapon system test program; and Emerson Electric Co., $1,736,250 for XM28 helicopter armament subsystems; Norris Industries, Inc., $1,705,037 for 152mm projectiles; General Time Corp., $1,662,120 for parts for M423 rocket fuzes; Hayes-Albion Corp., $1,508,580 for parts for 2.75-inch rocket warheads; and

University of Wisconsin, $1,420,000 for operation of the Mathematics Research Center, U.S. Army; ITT Corp., $1,408,645 for repair parts for image intensifier assemblies; Curtiss-Wright Corp., $1,358,085 for parts for aircraft engines; FMC Corp., $1,350,000 for M113A1 personnel carriers; and

Boeing Co., $1,244,583 for transmission assemblies for CH–47 helicopters; Phalo Corp., Shrewsbury, Mass., $1,115,629 for cable and adapter assemblies; Bolt, Beranek and Newmann, Inc., Cambridge, Mass., $1,077,727 for design and installation of interface message processors; B. F. Goodrich Co., $1,051,881 for 2-1/2-ton truck tires; Heckethorn Manufacturing Co., Dyersburg, Tenn., $1,017,045 for hand grenades.

Dental Study of 40,000 Inductees Related to Combat

Dental studies of approximately 40,000 inductees into the Army will be made by the Medical Service Agency of the Combat Developments Command to determine dental diseases and conditions detrimental to their combat effectiveness.

The 2-part study is being conducted at the Army Medical Center, Fort Sam Houston, Tex., and some of the results of Phase I were announced in mid-January.

Based on a survey of 1,000 inductees, it was found that 25 percent of the tooth decay was centered in seven percent of the total. X-rays, comprehensive examinations and the most modern data correlation techniques substantiated this ratio.

Results of the study conceivably may result in changes in the induction and preparation for overseas replacement, as well as resolve some of the dental problems currently experienced in frontline units.

For example, the Medical Service Agency leaders have expressed the belief that the seven percent accounting for the most tooth decay could be identified and cared for properly by dental officers in Army Reserve units or at induction centers, by municipal hospitals under contract, by Veterans Hospitals, or by a national preventive dentistry program. This would release about 25 percent of Army dental care resources for more extensive care of active Army men.

3 Contracts Push Project AGILE

Three contracts totaling approximately $1.8 million were awarded to Stanford Research Institute in mid-January to conduct classified research for the Advanced Research Projects Agency in support of Project AGILE, a study of techniques in remote area conflict.

ARPA is an agency of the Office of the Director of Defense Research and Engineering. The U.S. Army Missile Command, Redstone (Ala.) Arsenal, manages the program for ARPA. MICOM's Procurement and Production Directorate issued the contracts.

SAM-D Motor Meets Objectives During Firing Tests at MICOM

All performance and integrity objectives were achieved by the solid-propellant motor for the Army's new SAM-D missile in its recent first full-scale firing test at HQ U.S. Army Missile Command.

Project officials said the test at Huntsville, Ala., was designed to test both the propellant system, a modified slotted-tube grain configuration, and the unique shear-spun maraging steel motor case.

The motor was developed and tested by Thiokol Chemical Corp. under contract to provide the high-energy propulsion system for Martin Marietta Corp., which is responsible for development of the missile and its shipping-launching canister. Raytheon Co. is prime contractor to the U.S. Army Missile Command for the over-all SAM-D system.

The SAM-D air-defense missile system, now in advanced development, is intended for battlefield and U.S. continental defense against high-performance aircraft and short-range missiles. A sophisticated phased-array radar will detect and track multiple targets, and will simultaneously track and issue guidance commands to the intercepting missiles in flight.

The highly mobile system will be mounted on tracked or wheeled vehicles. Missiles capable of delivering either conventional or nuclear warheads will be carried in multiples on launcher vehicles and launched directly from their individual closed canisters.

Executive Order Expands Military Cash Awards Law

Expansion of authority to reward military personnel on a basis comparable to civilian employes of the Department of Defense by giving them cash awards for cost-cutting suggestions, inventions or scientific achievements benefiting the U.S. Government has been announced.

The Executive Order signed Dec. 3 by former President Lyndon B. Johnson puts into effect the inter-departmental awards phase of the program authorized in the military cash awards law of 1965 (PL 89–198). The order states:

"An executive department or agency that adopts or uses the suggestion, invention, or scientific achievement of a member of the armed forces who is not under its jurisdiction may recommend to the Department of Defense or to the Department of Transportation, as appropriate, a cash or honorary recognition of the number and shall justify its recommendation with appropriate documentation and explanation of how the suggestion, invention, or scientific achievement contributes to the efficiency, economy, or other improvements of the operations of the Government of the United States. Awards shall be made under regulations to be prescribed by the Secretary of Defense or the Secretary of Transportation, as appropriate.

"The regulations of the Department of Defense and Department of Transportation may include designations of officials to whom authority for receiving, evaluating, and making awards may be assigned."

In line with Department of Defense implementation of PL 89–198, the Army has recognized military authors of outstandingly meritorious technical papers on the same basis as those presented by civilian scientists and engineers at the 1966 and 1968 Army Science Conferences at the U.S. Military Academy, West Point, N.Y.

Iberall Study Prods Thinking on Research Programs

(Continued from page 2)

plified by Locke, or Bridgman. Metaphysics is cut as short as possible. Observations are gingerly categorized in a hierarchy of levels of validity. Attempts are made to treat the mathematical-verbal apparatus that transforms observation into inference very formally.

Sixth, commonly used currently, is a free-wheeling—may we say illogical?—eclectic empiricism in which all methods are combined, quite ruthlessly, in an attempt to squeeze conclusions out of observations. The better current scientific results tend to withstand the rough handling of more than one method. The poorer scientific results are reviewed repetitiously by all methods in an attempt to squeeze out a better theoretical base.

Science, thus, has become a game, or a theory of games, in which many styles (or arts) of play are used. Its intrinsic nature is that research is a tough game in which any competently trained person can come up with results. Complacency in science is a virtue to be encouraged in one's competitors. Strategic breakthroughs on the research frontier would seem to become increasingly probable when many independent investigators are engaged in the search or play.

What are the problem levels in science? Research is frequently described as fundamental, basic, or applied. Against the (heuristic) classification of the levels of science above, how is this second classification to be regarded? If by basic is understood of or at the base, and by fundamental pertaining to the base, then problems may be classified. Science must be looked at as a series of hierarchical pyramids, so that at each level it can have a base. Basic science deals with the problems of laying a foundation for science, whether heuristic, phenomenological or analytic. Not in all fields is science equally advanced, and it is a narrow view that equates "basic" with only one type of approach, regardless of what it is. Fundamental science deals with the elements of basic science. Actually the implication in fundamental science is that it never gets very far up in the pyramid of the problems of science. However, one may never gainsay the need for fundamental contributions that broadly cover a field.

Beyond the basic and fundamental levels, the applied level of science starts with attempts to take the fundamentals and apply them coherently and consistently.

One might summarize by the following ideas:

"Pure" science (some would call this basic science, theoretical science, abstract science, foundational science, fundamental science, etc.) deals with creating the chain of scientific argument through any coherent field independent of any application.

"Applied" science deals with applying science and scientific method to directed problem areas.

The applied scientist is no more or less of a scientist than the fundamental or basic scientist. He too may act trivially or profoundly on trivial or profound problems. Usually, he may be more scientist than the basic scientist in a heuristic field, and less scientist than the basic scientist in an analytic field.

An essential conclusion is that every field has its needs for the development of a basic science, for fundamental contributions to its science, for the attack by applied scientists, on both large and small problems, and on both fundamentally necessary, and extraneously luxury type problems.

What is the distinction between science and technology? Another question which merits clarification is the difference between science and engineering. This difference is frequently smeared over and leads to confusion of the nature of science and its role.

"Engineering" is the large totality of skills and background that are needed for the good practice of a field, according to the established art and science of the day. Thus the construction engineer, the clinical doctor, the courtroom lawyer, the builder, the machinist are all "engineers" (the additional requirements are that the level and number of skills must be considerable, and the professional responsibility exists for resulting work).

Science is the large totality of logical steps required to bring physical observations into correspondence with verbal or symbolic abstractions. A prime requirement is that the number of logical steps in the chain of reasoning be quite large and not self-evident.

Both of these skills are further to be distinguished from those of the "skilled artisan" whose craft involves mastery of a large number of steps of manual skill.

What are the aims of research? A case is stated that true research cannot be directed. This is an incomprehensible point of view. The researcher always has an end, whether it be to do what his boss says, to do what will most likely receive sponsorship, to do what is most timely or popular or fashionable, or even the so-called nonutilitarian philosophy of choosing to work on the problems that cannot possibly have practical value.

With regard to the research, there are three possible points of view, the researcher's, the sponsor's, and the view of the bystander, society. The researcher is concerned with those ego-satisfying elements that represent his interests; the sponsor and society are concerned with their own problems. If the researcher can convince the sponsor or society that he must be unfettered, more power to the successful selling ability of the researcher, but it has nothing to do with science—the general subject of research—only the ego needs of the scientist.

Therefore, a strong sponsor need not concern himself with the undirected wishes of an individual researcher, but may clearly and distinctly state the problem areas that are to be explored and explained by research. This conclusion must be taken even more seriously by a government agency which carries with it a broad responsibility to the public. An individual company president may violate this rule in favor of prejudice for his own pet ideas, favorite nephew, or other quirk; a public official may not. The limitations for applying the rule are concerned only with the limitations of science and scientists in carrying out the task.

In the particular case that society has a vested interest, and undertakes a sponsored interest in research, then must its problems and philosophy govern the directions that research takes. It has always been true, historically, that society chooses those paths for science and technology that suit its own needs.

Thus it will be accepted, for this presentation, that science has directed ends. While a frivolous science might be concerned with a catalogue of the sounds of love, it is more significant that economic or social or defense ends be served. Thus, basically, it must be realized that science is a servant and a service to a master, whether the master be company, or government, or industry, or field, or institution.

* * *

"In completing one discovery, we never fail to get an imperfect knowledge of others of which we could have no idea before, so that we cannot solve one doubt without creating new ones."

Joseph Priestley

ECOM Simulator Simplifies Meteorological Problems

Solutions to problems involving complex forces of the atmosphere are being simplified by a simulator which provides meteorological researchers a new capability through manipulation of some 200 controls and dials at the U.S. Army Electronics Command Laboratories, Fort Monmouth, N.J.

Designed and fabricated by the Atmospheric Sciences Laboratory of ECOM, through a contract with the Texas A&M Research Foundation, the system—known as the Low Level Meteorological Simulator—is in the feasibility study stage of development.

The simulator makes electronic analogies, or comparisons, when voltages are set on the arrays of controls in proportion to the meteorological values obtained from observations. The simulator weighs the relationships of the atmospheric factors to produce answers to meteorological problems.

ECOM scientists stressed that the simulator is not intended to provide general weather forecasts. Being used for advanced research, it is proving practical to provide information on atmospheric interactions which heretofore have been in the problem area of "too complex and time-consuming to attempt."

Capabilities of the simulator as a research tool include solutions to problems dealing with wind speed and direction, air temperature and humidity in 12 atmospheric layers, ranging from the surface up to 3,300 feet. It also analyzes problems on soil temperatures to a depth of six feet as well as moisture evaporation from the earth's surface.

Dr. Donald Swingle and Abraham Golden are among the leaders in the simulation program. Swingle is chief of the Techniques and Exploratory Technical Area and Golden is leader of the Atmospheric Simulation Team.

Members of the team include Anatole Samusenko, an electronic engineer; Capt Michael Hudlow, who has a PhD degree in meteorology; and technicians Charles Dresser and George E. Spaeth, the latter a Drexel Institute student working on the project under a cooperative arrangement.

CSC 'Challenge and Change' Report Available to Public

Challenge and Change is the title of the 1968 annual report of the U.S. Civil Service Commission submitted to the President by John W. Macy Jr. as the outgoing chairman, since succeeded by Robert E. Hampton.

Grateful acknowledgement is made to John D. Weaver, a free-lance writer whose work has appeared in various national publications, for his contributions to the concept and text of the report, and to George L. Baka, former president of the Federal Artists' Association, for his art work. Baka is assistant chief of the Exhibits Service, Office of Information, Department of Agriculture, but worked on the report strictly on his own time and of his own volition.

Mr. Macy's foreword states in part: ". . .The heart—and the hope—of a civil service composed of people *with* heart and hope, people dedicated to the best that is the United States of America—emerge in the text of this very human treatise.

"We hope it will do its bit to banish the timeworn image of the dry and dreary bureaucrat, who exists today largely only in fiction.

"We also hope it will give to those who read it, be they Federal employes or interested members of the general public they serve, who want hope and help, a combination of both of these. For hope and help are what everybody needs, every day, from the powerful to the pitiable.

"This report is meant to give it to them. Not only those seeking jobs or job advancement, but those seeking faith and continued future confidence in the people, the human beings, who make up the Federal Government."

Chapter headings in the report are: Keeping Abreast of Tomorrow; In Search of Quality; Opportunity Unlimited; Paying for the Job; From Dissent to Dialogue; Training Comes of Age; Partners in Progress; and A Chronology of Highlights. Appendices give the "vital statistics."

The report is available for $1.25 through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

* * *

"Organization of itself has no dynamic. The dynamic is in the individual. . . . He must fight, for the demands for his surrender are constant and powerful."

William H. Whyte

MICOM Centralizes Control of Classified Material

Security safeguarding of classified material at the U.S. Army Missile Command, Redstone Arsenal, Ala., is being strengthened and simplified.

Centralization of secret documents is providing the answer to the control problem. The Research and Engineering Directorate reports that this policy will reduce the number of custodians from 98 to under 20.

Consumption of aspirins formerly attributable to problems of maintaining records of accountability is expected to reflect a sharp decline, corresponding to the decrease in the number of custodians. Simple: Fewer people, fewer headaches.

Under the new arrangement now being put into practice, persons requiring access to secret material will borrow daily from one of the central locations. They must return it by 4:00 p.m. or check out the material for 30 days. Each engineer, for example, will be allowed to check out as many as 25 documents at one time for a month.

Illustrative of how the simplified security system operates is the Ground Support Equipment Laboratory, the first to implement the change. GSEL until recently had several offices for secret material and 12 employes responsible as custodians. One custodian now has all secret material in the Program Coordination and Administrative Office.

The new security procedures are scheduled for full implementation as rapidly as is feasible. The result will be clear-cut responsibility for records files and, in general, improved efficiency and security.

WEST POINT, '38, CLASSMATES, Maj Gen Frank M. Izenour (left), CG, U.S. Army Test and Evaluation Command, and Lt Gen Robert A. Breitweiser, commander-in-chief, Alaska, discuss past, present and future. General Izenour visited Alaskan Command Headquarters at Elmendorf Air Force Base following a recent inspection trip to the Fort Greely Arctic Test Center, about 100 miles south of Fairbanks. The rugged terrain and climatic conditions in the Alaskan Command are attracting arctic research, test and evaluation teams from military and civilian agencies.

Kudos

EXCEPTIONAL SERVICE. *Dr. James L. Martin* recently received the Decoration for Exceptional Civilian Service (DECS), the Army's highest civilian employe award, for services as technical director of the Army Materials Research Agency (now the Materials and Mechanics Research Center) Watertown, Mass., from 1962 until retirement in 1966.

Brig Gen Felix J. Gerace, CG of the Natick (Mass.) Laboratories, presented the award. Dr. Martin started his career as a melter's helper at Watertown in 1935, progressed to director of the Watertown Arsenal Labs in 1948 and served as director of the Ordnance Materials Research Office from 1952 to 1962. Then he became director of the newly created Army Materials Research Agency, which was redesignated the AMMRC in 1967.

MERITORIOUS SERVICE. *Dr. Robert B. Watson* earned the Meritorious Civilian Service Award (MCSA) for service as chief of the Physics, Electronics and Mechanics Branch, Physical and Engineering Sciences Division, Army Research Office, Office of the Chief of Research and Development, since August 1960.

Dr. Watson, one of the Army's top laser experts, is responsible for the General Staff monitorship of the Army's basic and applied research programs in physics, nuclear physics, electronics, mechanics and ballistics; and exploratory development programs in surveillance, target acquisition, electron devices, aeronautics and high energy lasers.

"His broad scientific and technical knowledge and sound interpretive and analytical approach to problems in the research and development field have earned him the esteem of his fellow scientists within government and industry," the citation states. . . . His activities have enhanced and furthered cooperative efforts with other government agencies and the Quadripartite countries."

Harold R. Lohmann, chief of the Towed Artillery Section of the U.S. Army Weapons Command's Research and Engineering Division, was awarded the MCSA by Maj Gen O. E. Hurlbut, WECOM commander.

Employed at Rock Island Arsenal for 20 years, Lohmann was cited for his outstanding work in connection with design and engineering of the Airmobile Firing Platform for the 155mm howitzer, "a recent example of his outstanding ability and performance."

James C. Blake received the MCSA for achievements in R&D and as a professional engineer in successive positions of responsibility since 1957, when he joined the staff of the U.S. Army General Equipment Test Activity (GETA), Fort Lee, Va. He retired recently as director of GETA after 34 years of government service.

Long recognized as an authority on petroleum, oil and lubricant (POL) equipment and systems and materials-handling equipment, Blake holds two patents for container cleaning machines and supports. He designed the devices primarily for use by troops in the field.

OUTSTANDING SERVICE. *Dr. Jack Rheingold* received the Outstanding Civilian Service Award (OCSA) for his role in the development of hematology as a subspecialty within the Army Medical Service. The work was done while serving as a consultant to the Walter Reed General Hospital (WRGH), Walter Reed Medical Center, Washington, D.C. Brig Gen Frederic J. Hughes Jr., WRGH commander, made the presentation.

Dr. Rheingold is a clinical professor of medicine at the George Washington School of Medicine and president of the Medical Board of the Washington Hospital Center.

Martin J. Goland received the OCSA from Maj Gen O. E. Hurlbut, U.S. Army Weapons Command (WECOM) commander, for service as chairman of the WECOM Advisory Group at Rock Island Aresenal, Ill.

Goland is president of Southwest

ECOM Woman Engineer Beats 'Equality of Opportunity'

Equality of Opportunity for Mrs. Corleza Ware Holimon, a staff engineer in the U.S. Army Electronics Command, predated by a good many years the modern Civil Rights Movement.

In the early part of World War II, after receiving a BS degree from Virginia State College in Petersburg, she accepted a temporary job with what was then the U.S. Army Signal Corps Laboratories. Her plan then was to continue with graduate studies, but she now is rounding out 21 years of continuous employment at Fort Monmouth, N.J.

Faced with a critical shortage of scientifically knowledgeable civilians, the Army started her career by assigning her as a trainee in the Vehicular Radio Section. Simultaneously she was enrolled in a special 6-days-a-week technical training program established by the Army.

The payoff of this intensive effort came when she passed the professional equivalency examination to gain certification as a P–2, the Civil Service rating then given newly employed scientists and engineers.

Corleza Ware Holiman

Assigned for many years with the Armed Services Electro Standards Agency, Mrs. Holimon advanced until she became chief of the Electrical Indicating Instruments and Resistor Branch of the Electromechanical Section. The job took her all over the United States to inspect facilities of industrial contractors such as General Electric, Westinghouse Corp., and Weston Electrical Instruments.

When the Armed Services Electro Standards Agency moved to Dayton, Ohio, in 1962, Mrs. Holimon remained at Fort Monmouth as an employe of the Army Electronics Command, created as a part of the Army-wide reorganization that then consolidated five of the Army's seven Technical Services in the U.S. Army Material Command.

Currently she is a staff engineer in the Area Net Radio Systems Commodity Management Office, part of the Communications-Automatic Data Processing Commodity Management Area.

Until she moved from Asbury Park last summer with her husband, Albert L. Holimon, a stockbroker, and 7-year-old Albert Jr., she was active in musical circles. She studied organ under G. Howard Scott and was at one time organist at the Second Baptist Church of Atkins Avenue. She has also directed choral groups.

Mrs. Holimon is a member of Fort Monmouth's new chapter of Toastmistresses International, the Business and Professional Women's Council, Armed Services Management Association, and League of Women Voters.

Research Institute of San Antonio, Tex. He was cited for "leadership of highly qualified managers of science and technology from academic, industrial, nonprofit and governmental organizations."

LEGION OF MERIT. *Brig Gen Charles D. Y. Ostrom Jr.* was awarded the OLM for "exceptionally meritorious conduct in the performance of outstanding services" while serving as Director of Army Research, OCRD, from January 1967 to October 1968.

Chief of R&D Lt Gen A. W. Betts presented the award with a citation for "dynamic leadership . . . of the complete Army Research Program," during a recent visit to the U.S. Army Ordnance Center and School at Aberdeen Proving Ground, Md., which General Ostrom has headed since October 1968.

Col James E. Wirrick received the LOM for outstanding achievements as senior standardization representative, U.S. Army Standardization Group, Australia, from 1965 to 1968, prior to his assignment as CO of the U.S. Army Behavioral Science Research Laboratory, Washington, D.C.

He was cited for displaying a high degree of professionalism and leadership in developing an organization that was responsive to the requirements of the Chief of R&D for effective liaison with the Australian Army; also, at the same time, advancing the objectives of the American, British, Canadian, Australian Armies' Standardization Program.

Col Wirrick is one of the "charter members" of the U.S. Army Research Office, having served as assistant and then executive secretary of the Army Scientific Advisory Panel under the first two chiefs of R&D, Lt Gen James M. Gavin (1955–58) and Lt Gen Arthur G. Trudeau (1958–62).

Col Thomas N. Chavis, who retired Feb. 1 to end a 34-year Army career, was awarded the LOM for exceptionally meritorious service in the Office of the Chief of Research and Development, April 1966 to October 1968.

As assistant director of Army Research and the commanding officer of the U.S. Army Research Office, he displayed "unusual initiative, broad professional knowledge, and keen insight in maintaining the vitality of the Army's research base in the functional areas of the environmental, behavioral, physical and life sciences.

"Subsequently, as director of Missiles and Space, he exhibited exemplary leadership, untiring zeal, and outstanding managerial competence in a key position of great responsibility which included Army General Staff supervision of the advanced ballistic missile defense, air defense, space-related, and nuclear, chemical, and biological research and development programs."

Col Chavis has accepted a position with Defense Electronics Products, RCA, Moorestown, N.J.

Col John W. Leddon Jr. received the LOM for distinguished service with the U.S. Army Satellite Communications (SATCOM) Command-Pacific from November 1967 to August 1968. SATCOM Agency commander, Col George E. Rippey presented the award.

Since August 1968, Col Leddon has served as the SATCOM Agency's special assistant for Tactical Satellite Communications (TACSATCOM), a Department of Defense program designed to provide satellite communications for forces on land, sea or air.

Lt Col William S. Vargovick received the LOM in the Office of the Chief of Research and Development during retirement ceremonies that concluded 20 years Army service. He was honored for achievements in the U.S. Army Research Office and the Operations Research Advisory Group, OCRD, May 1965 to December 1968.

Col Arthur E. Britt received the LOM for exceptionally meritorious service from September 1964 to June 1968 as executive officer of the Army Medical Training Center, Fort Sam Houston, Tex. He is now chief, Hospitalization and Evacuation Branch of the Directorate of Plans, Supply and Operations, Office of The Surgeon General.

BRONZE STAR MEDAL. *Lt Col Robert T. O'Brien*, chief of the Communications Branch, Communications-Electronics Division, OCRD, received the BSM for his prior assignment as chief of the Welfare Branch, Personnel Services Division in Vietnam, October 1966 to July 1967.

Maj Robert E. Joseph Jr., assigned since September 1968 as a staff officer, Policy Branch, Management and Evaluation Division, OCRD, was awarded the BSM with "V" device for heroism while serving as executive officer of the 2d Battalion, 60th Infantry, 9th Infantry Division in Vietnam.

HumRRO Publishes Bibliography of Publications

Appreciation through better understanding of the mission and broad scope of activities of the Human Resources Research Office of the George Washington University, an Army contract agency, is stimulated by its new *Bibliography of Publications.*

This 287-page document is offered as a "comprehensive key" to the information materials HumRRO has produced over a 17-year period of research in the fields of training, training-device requirements, motivation and leadership.

Headed throughout its existence by Dr. Meredith P. Crawford as director, HumRRO is headquartered at 300 North Washington Street, Alexandria, Va. Operations are conducted through the various divisional offices at major Army training commands and a modest effort overseas.

Basically, the objectives of HumRRO in research for the Department of the Army are "to discover, develop, and apply human factors and social science principles and techniques so as to enhance the efficiency of both training and operational performance of military personnel." (Quoted from the foreword to the *Bibliography of Publications.*)

The bibliography's purpose applies to requirements of research and development personnel concerned with human factors problems, and operational personnel concerned with utilization of training and other research information and by-products.

Part I of the bibliography lists FY 1968 items chronologically under the research code name (work unit) or under the type of research effort other than work unit (exploratory study, basic research, technical advisory service) to which they relate, or under a general section if they are not directly related to a specific research effort or are related to several efforts. A supplementary listing of earlier publications is given.

Part II is a cumulative listing of all material for external distribution that has been published by HumRRO since its inception, including that published in FY 1968, arranged in the same order as Part I.

Part III is a listing of research by-products and experimental materials. Included in this section are such items as documents, materiel, manuals, and other materials that may be suitable for adaptation for operational use. By-products range from specific training programs and technical manuals to training items for equipment.

Requests for information concerning items in the bibliography of other aspects of HumRRO work may be addressed to the Director's Office at the Alexandria, Va., address of HumRRO or to any of the seven divisional offices throughout the U.S.

Dr. Stanley Kronenberg

Portrait of an Army Scientist, an 'Interesting Character'

Publication of *High Intensity Radiation Dosimetry with SEMIRAD*, the third in the Army R&D Monographs series, added to international acclaim of Dr Stanley Kronenberg as one of the U.S. Army's foremost research scientists at age 41.

One of his lesser claims to fame among his associates at HQ U.S. Army Electronics Command, Fort Monmouth, N.J., is that during the 15 years he has been employed there he has commuted 485,000 miles—most of the time in a 1954 automobile. His home in Skillman, N.J. (population 50) is 52 miles from where he works.

Designed and built by Dr. Kronenberg and his wife, Eva, over a period of some three years, the home is surrounded by 18 acres of land that serves to identify him with many suburbanites of the same staunch belief. "I have," he says, "the biggest poison ivy farm in the world."

Aside from the fact that he has published more than 25 technical papers dealing with nuclear and solid-state physics, is the holder of six patents for inventions, was a prize winner for his paper at the 1968 Army Science Conference, and a 1962 recipient of an Army R&D Achievement Award, Dr. Kronenberg has a reputation as an "interesting character."

In 1960, he received the Meritorious Civilian Service Award, the second highest tribute for excellence in job performance the Army bestows upon its civilian employes. Testimonials and accolades of many types adorn the walls of his laboratory, including citations for participation in nuclear testing operations in many parts of the world.

One of his personal favorites is the "Explorer's License" issued to him by Canada in December 1964 and signed by the Commissioner of the Northwest Territory. Without it he could not have conducted some of the experiments on which he was working with Canadian scientists.

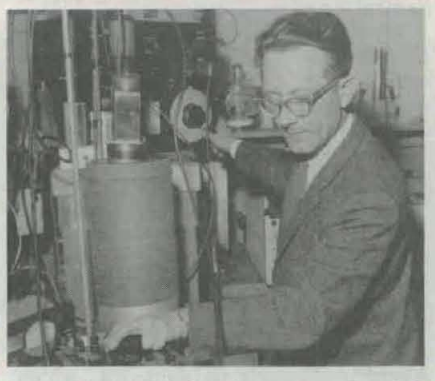
"Just think," he muses, "today even Christopher Columbus would have to get a license if he wanted to explore in Canada."

Born in Krosno, Poland, he moved to Vienna, Austria, with his family at the end of World War II, entered the University of Vienna, and in 1952 received a doctoral degree. The American Embassy in Vienna called him shortly thereafter, said he had been recommended by one of his professors, and asked if he would be interested in emigrating to the United States.

"That," he reminisces, "presented a small problem since a ticket was also available for my wife—and I had no wife. I quickly asked my college friend, Eva Kroupa, to marry me. Eva received her doctorate in physics when I received mine, and we had worked out formulae while at the university.

"Since I knew only half the formulae and she knew the other half, it was a particularly good idea to get married. You might say that if I did not marry her, I would not be able to function as a physicist."

Mrs. Kronenberg worked for a while at Forrestal Research Center in Princeton, N.J., as a research associate. In recent years she has been busy raising small Kronenbergs, Eric, now 8, and Olga, 5. Still she finds time to help her husband solve theoretical technical problems and, as an accomplished pianist, provides some of the family entertainment.



IN LABORATORY connected with his office in remote Evans Building 45, Dr. Stanley Kronenberg conducts experiments that he will document in his latest technical paper, "Directional Sensing of Nuclear Radiation."

Dr. Kronenberg's pet hobby is stamp collecting. Historically, his collection of Polish stamps ranks among the best in the U.S. It includes rare items from the Warsaw Ghetto mails and propaganda stamps used in Poland during World War II.

As a member of the American Philatelic Society's Expert Committee, with Poland as his field of expertise, he frequently is asked to evaluate the authenticity of Polish stamps, and can quickly detect forgery.

One of Dr. Kronenberg's early bids for national publicity was committed unintentionally—you might say a whimsical output of another of his hobbies, that of working as an amateur painter in oils and water colors.

About eight years ago, while working in the nuclear testing facility in the Evans Area of Fort Monmouth, in a specially constructed building known as "The Shield" because it housed, 3,500 curies of radioactive isotope cobalt 60, he got the feeling that the massive structure resembled an Egyptian tomb—"You know, Joe, like the pyramids." It must, he decided, be suitably decorated.

The Egyptian mural he painted on the interior walls attracted no small attention, and not only among fellow employes. LIFE Magazine sent a photographer to cover the mural story.

That perhaps gained him more publicity mileage than he gained as the

PHAROAH'S TOMB might bear such a mural. It was painted, whimsically, by Dr. Kronenberg because massive walls of "The Shield," Fort Monmouth nuclear testing facility, reminded him of interior of an Egyptian pyramid.

author of *High Intensity Radiation Dosimetry with SEMIRAD*, though Army Chief of Research and Development Lt Gen Austin W. Betts, in a foreword, acclaimed the monograph:

". . .It has been heralded by reviewing authorities in the U.S. Atomic Energy Commission and the nuclear science community as an important contribution to the advancement of knowledge in measurement of high-intensity radiation dosimetry. The Army is pleased to include the work of Dr. Stanley Kronenberg of the U.S. Army Electronics Command in the monograph series."

"Directional Sensing of Nuclear Radiation" is the title of a paper on which Dr. Kronenberg is now working. As chief of his division of the Institute for Exploratory Research, he has an office at the division headquarters and wears the title of Leader of the No. 1 Team in Division S.

His serious work as a physicist, however, he conducts principally in another laboratory in remote Building 45, where he still occupies the same desk assigned to him when he came from Vienna 15 years ago.

"See," he points out, "the coffee rings prove it! Since I got here, there have been seven major reorganizations. The place has been called a lot of different names. Everything changes, but nothing changes, really. The buildings are painted grey, or tan, or green, as they are now. The same parking lots surround the building, and on them are some of the same trucks. Yes, some of those were here when I came in 1953."

One of the major changes, as far as he is concerned, was made rather reluctantly, almost with the sadness of interring a dear old friend. This winter he decided to give the venerable Mercury some relief by putting a Karman Ghia into service as a commuting vehicle. Otherwise, life follows a rather set pattern.

"But here," he comments, "I can work well because we are a little removed from the mainstream of Fort Monmouth life. It is a good place to do my research, a good place to write. My work seems to have continuity and—well, I like to think its effect is felt in a lot of places."

'Digit Refit' Programing Corrects Computer Mismatches

U.S. Army Electronics Command automatic data processing personnel have gone a leap beyond the programers who use computers to match up boys and girls for dates. They are reconciling mismatches—numbers.

Special programing, known as "digit refit," has been worked out so that the computers iron out small errors that sometimes occur in the long alpha-numeric codes used in inventory records to keep track of new communications and electronic equipment and spare parts en route from production lines.

Joseph Bergman, ECOM director of Management Systems and Data Automation, reports that the result is greater efficiency and speed.

Information for the inventory records originates for the most part at Army supply depots located throughout the country. Transmitted over a special network, the data are checked automatically against the master records stored in computers of the ECOM Computation Agency.

"We have whole hierarchies of numbers," Bergman explains. "In this case, the one being automatically corrected is the MILSTRIP number. That means Military Standard Requisition and Issue Procedure.

"These numbers are 14 digits long, and it was noticed that in checking them out, the computers were rejecting many pieces of information that arrived with only a simple transposition or one incorrect digit.

"What we have done to get such mismatches together is to reprogram the computers so that when a MILSTRIP number comes in that ordinarily would be rejected, the computer makes substitute tries with the rest of the alphabet and numerals.

"When a match is made with the MILSTRIP number in the data bank, the wrong number is changed to the right one, automatically. The computer then confirms that it is correct by checking against two more pieces of data bank information, destination and quantity."

Rectifying computer errors by using people costs time and money. Bergman gives a lot of credit to systems analyst Bernard Kuchuk for working out the new program. While Berman makes no claim that this is the first time computers have been programed to match up records with superficial discrepancies, he does think it is the first use of the technique for automatic corrections in a large-scale military inventory system.

Digit refit programing does not, he recognizes, resolve all numerical problems. People must work out some of the errors. In a surprising number of instances, the digit refit does the job.

"In the case of the small MILSTRIP errors, what we're really telling the computers," Bergman explained, "is that an apparent mismatch may not actually be a mismatch. The probability of compatibility exists—so match them up."

McClellan CBR Agency Offers Range of Skilled Researchers

Research for chemical-biological-radiological support of modern warfare requires a capability for investigations in a wide variety of scientific disciplines, as attested by the CBR Agency at Fort McClellan, Ala.

More than a third of the officer and civilian personnel assigned to this U.S. Army Combat Developments Command (CDC) element have advanced degrees in 19 areas of specialty among the 51 key personnel.

Sophistication of much of the work done by the CBRA is typified by the 16-pound portable chemical alarm recently developed to give the field soldier the capability of automatically detecting most agents.

One of the agency's major areas of effort is the study of protective methods to enable operations in a contaminated area, such as necessary by medical personnel, without the burden of individual protective gear.

A recently completed study, CBR–75, examined chemical-biological and radiological aspects for the 1975 time frame. This will serve as input for CDC's extensive Army 75 study—how the Army of that year will be organized, equipped and fight.

A chemist, a biologist and a physicist perform special advisory functions to the CBRA commander and staff on P&D programs and problems. Col George W. Connell, CBRA commander, describes the trio as "top level civilian specialists in these disciplines." They also serve as project officers or assistants.

The primary orientation of CBRA effort, encompassing operations, doctrine, materiel, organization and evluation, is on defensive means to protect the future soldier against chemical, biological and nuclear threats.

NBS Schedules Polymer Meet In Gaithersburg, Mar. 10–12

An invitational Symposium on Thermodynamic Properties of Bulk Polymers will be held Mar. 10–12 at the National Bureau of Standards of the U.S. Department of Commerce in Gaithersburg, Md.

Sponsored by the NBS, the symposium will cover Physical States (qualitative and quantitative characterization); Changes in Physical State (mechanisms and kinetics); Elasticity of Elastomers; Special Methods for Determining Thermodynamic Properties; State properties and Their Derivatives for Common and Special Situations; and the Relationship between Thermodynamic and Molecular Properties.

Army Surgical Team Lauded for Vietnam Operations

The U.S. Army team concept in battlefield surgery is praised by Col Matthew D. Parrish, MC, a recent returnee from Vietnam, now a psychiatric consultant to The Army Surgeon General in Washington, D.C.

As an additional duty during his Vietnam tour, he edited the U.S. Army Vietnam Medical Bulletin, which provided an opportunity to learn how well the surgical team concept was proving itself.

Results, however, were little publicized, nor was the medical profession, in his opinion, being adequately informed that the Vietnam war is the finest training center in the world today for the operating surgeon. Any new wound on the battlefield may change the treatment priority of every other wound in the whole country, he stated.

The team concept, which Col Parrish publicized in a recent article in the Journal of the American Medical Association, begins with the death-delaying first aid given by the field technician or doctor at the site of injury, who considers that surgery will be available within minutes because the air ambulance delivery to a hospital is radio-controlled.

"In all history, there has never been a school of trauma surgery to equal Vietnam," Col Parrish states. "But this school does not merely train individuals; it trains teams integrated with their environment . . . the team which is expert in the surgical problems in Vietnam comes into being only in Vietnam. It is an integral part of the climate and the medical environment."

New members are substituted one by one into teams already practicing well in Vietnam. There is a whole new social and environmental atmosphere to be absorbed. The individual must adapt to extreme heat, dust, humidity, the monsoon rains and numerous other unfavorable factors.

With medical service in Vietnam normally limited to one year, members come and go. But the team system keeps on developing and improving to the benefit of the American soldier as well as the health care personnel who are returning to both military and civilian hospitals, Col Parrish states.

"I am not a surgeon," he explains. "I have only looked over shoulders and explored with surgeons their feelings and concepts."

Tandem Switch Training Center Established at Fort Monmouth

Operators for the Army's Tandem Switching System scheduled to improve communications in Southeast Asia are being trained at a new facility installed at the U.S. Army Signal School.

The Tandem Switch Training Center at Fort Monmouth, N.J., is similar to the installations comprising the Tandem Switching System in Southeast Asia, to provide the realism that assures success of the training program. The center's facilities include a 100-trunk switch.

Trainees are expected to assume operation of the system in Southeast Asia next fall. The system will interconnect 64 dial telephone exchanges to provide users in the area with automatic, more reliable communications with distant government telephones, similar to the direct dialing serving the U.S. long-distance system.

The Southeast Asia system will have direct access to the Automatic Voice Network (AUTOVON) now affording worldwide military telephone communication controlled by U.S. Army Strategic Communications Command.

Members of the initial class in the Tandem Switch Training Center, composed of the Signal School faculty, are being taught by an engineering team headed by Daniel Connolly of Stromberg-Carlson, system contractor. Graduates will serve as the nucleus for training Army and Air Force electronic specialists.

Army Utilizes College Grad Skills of GI at Picatinny

College graduates inducted into the Army and assigned to the Army Scientific and Engineering Assistants Program, currently numbering about 1,400, have a good example of how their skills are being utilized in Pfc Stephen Davis, credited with an assist in design of a new photocell test unit.

Davis is working as an electrical engineer in the Pyrotechnics Laboratory, Feltman Research Laboratory (FRL) at Picatinny (Dover, N.J.) Arsenal. He was assigned in September 1968, immediately after basic training at Fort Dix, N.J.

Pfc Stephen Davis

Working with Eugene Homentowski, a civilian employe at the FRL, Pfc Davis contributed to the design of a highly useful test unit that can probe electrical characteristics of photosensors used on flares. It also will be used to measure "dark" current, i.e., the short circuit output current of a photocell with no illumination.

The photocells will be part of a larger equipment system of electronic instrumentation required for a test range. The system will be used to measure dynamic illumination patterns of pyrotechnic items. The test unit is now in production at the International Rectifier Corp., El Segundo, Calif.

Pfc Davis holds an AAS (associate in applied science) degree from Adirondack Community College, Hudson Falls, N.Y., and a BS degree in electrical engineering from Clarkson College of Technology, Potsdam, N.Y.

When he finishes his duty as an Army enlisted man, he plans to study for a master's degree in electrical engineering. If one long-range objective of the Scientific and Engineering Assistants Program is achieved in his case, he ultimately will become an Army career specialist, either as an officer or as a civilian engineer.

SCIENTIFIC CALENDAR

Technical Symposium on Airbreathing propulsion for Advanced Missiles and Aircraft, sponsored by AFAPL, AFPL, and Naval Weapons Center, San Diego, Calif., Mar. 4-6.

Particle Accelerator Conference, sponsored by IEEE, Washington, D.C., Mar. 5-7.

14th Annual International Gas Turbine Conference and Products Show, sponsored by ASME, Cleveland, Ohio, Mar. 9-13.

Annual Convention of the American Society of Photogrammetry and the American Congress on Surveying and Mapping, Washington, D.C., Mar. 9-14.

3d Flight Test, Simulation and Support Conference, sponsored by AIAA, Houston, Tex., Mar. 10-12.

Aerospace Vehicle Flight Control Systems Conference, sponsored by AMC, SAE and NASA, Orlando, Fla., Mar. 12-14.

4th Congress of the International Federation of Automatic Control, Warsaw, Poland, Mar. 16-21.

6th Space Congress, sponsored by Canaveral Council of Technical Societies, Cocoa Beach, Fla., Mar. 17-19.

Conference on Nonmetallic Structures and Components, sponsored by AFML and the Aerospace Corp., Dayton, Ohio, Mar. 18-20.

Organic Chemistry Symposium, sponsored by The Chemical Institute of Canada, Peterborough, Ontario, Canada, Mar. 20.

IEEE International Conference and Exhibition, N.Y.C., Mar. 24-27.

Semiconductor Device Research Conference, sponsored by IEEE, Munich, Germany, Mar. 24-27.

Conference on Lasers and Optoelectrics, Southhampton, England, Mar. 25-27.

10th Symposium on Engineering Aspects of Magnetahydrodynamics, sponsored by MIT, Cambridge, Mass., Mar. 26-2Ω.

MICOM Truck Driver Steers Grateful Family of 9 Children Over Rocky Road to Education

In a way, and being strictly truthful, you might term John Washington, a 53-year-old truck driver with the U.S. Army Missile Command for the past 13-1/2 years, a fine example of the strength that is America. —those who overcome great adversity.

His contribution to that strength is a family of nine children, five of whom have college degrees, two of whom are now attending college, and two who graduated from high school but decided against going to college.

When he was seven years old, his father died. Now he owns and farms 135 acres of land in east Limestone County, 20 miles west of Huntsville, Ala., the same place he has lived since he was three months old. But the years along the way have been hard. There was no high school near his home for him and his brother. John recalls:

"The preacher who served our community church lived in Huntsville. He told my mother that my brother and I could live with him and go to school. My mother used to haul firewood to town to help pay our board.

"She would start out before daylight in a wagon with a lantern at her feet to provide a little warmth. She was having to work too hard to keep us in school—it was just too much for her, so after the 11th grade I quit to help her."

Perhaps that experience inculcated his deep convictions about responsibilities to children and the importance of getting a good education.

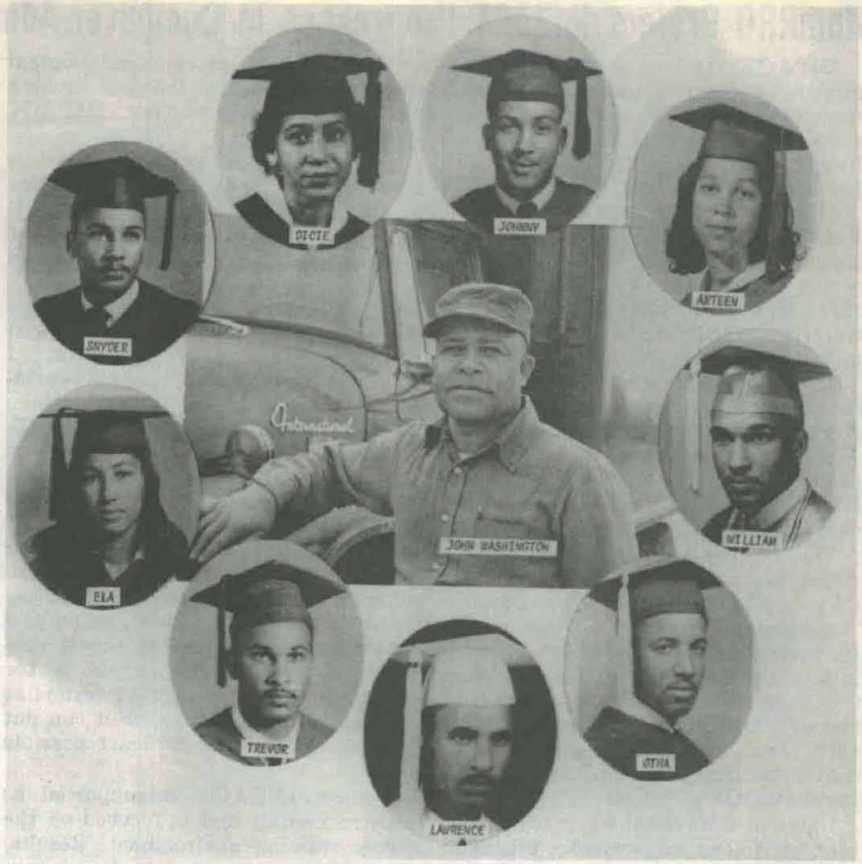
"I was strict with my children and started instructing them on how to behave when they were very small. I told them if they wanted to go to college, I'd help them. Then when the decision was made, I enforced it.

"One of the girls took a notion she'd like to quit after two years of college and go to take training as a beautician. I told her 'no' because she had decided to go to college and I was going to make sure she got that degree. And now she's glad she did."

The eldest son, Johnny W., is a graduate of Bethune-Cookman College, Daytona Beach, Fla., where he earned a degree in electronics. He is employed by a nationally known electronics firm in Camden, N.J.

William E., the second son, got his degree from Alabama A&M and is a draftsman for a national firm at its plant in Rome, Ga.

Then came the two who decided against college and are employed in Decatur, Ala. "When they get to be 18, have finished high school and want to kick off into something else, there's not much you can do about getting them to college," their father said.



EDUCATION OF FAMILY is exemplified by John Washington, center, a truck driver at the Army Missile Command, who successfully stimulated his nine children to get as much education as possible. Of those above, Johnny, William, Arteen, Dicie and Ela have graduated from college (Ela also has a master's degree). Trevor and Snyder are attending college. Lawrence and Otha are high school graduates who decided against continuing in college.

Two married daughters, Arteen Campbell and Dicie Craig, live in Athens. Both are A&M graduates and are teachers. Arteen teaches economics in Athens, and Dicie is a math teacher in New Hope. Another daughter, Ela M., lives at home. She has a bachelors degree from Alabama A&M, a master's degree in math from Atlanta University. She teaches math in Athens, Ga.

The two youngest, Trevor B. and Snyder W., are students at Alabama A&M. Trevor is studying electronics; Snyder is in data processing.

Washington came to work at Redstone in 1950 "to find some income in addition to farming to send all these children to school." He explained that he used to raise cotton but had to give it up because it meant taking the children out of school to help. So he leased his cotton land and now also leases the rest of the farm. Corn and cotton are the crops. With some of his share of the corn, he feeds hogs and sells them. He also raises a garden.

Washington had 15 months of military service in the Army during World War II. He took his basic training at the then Camp Lee, Va., followed by duty in Special Services at the Army War College in Washington, D.C.

The Washingtons have eight grandchildren ranging in ages from a few months through 12 years.

Last year, Washington received an Outstanding Performance Award for his work at Redstone in recognition of driving his truck 150,000 accident-free miles.

Since no government regulation provides for his main contribution to the good of the nation, it seems a good possibility that his children will give him their own Outstanding Performance Award for his steadfast dedication to raising good citizens—the hope of a better America and a better tomorrow for all of its people.

HumRRO Project IMPACT Progresses in Computer-Administered Instruction

IMPACT, the long-range HumRRO project in computer-administered instruction (CAI), has made great progress during its first 18 months, Dr. Robert J. Seidel, project director, reported in mid-January.

(HumRRO is the Human Resources Research Office of The George Washington University, a contract agency of the Department of the Army since 1951. HumRRO conducts research in training, training-device requirements, motivation and leadership.)

Twelve individual student stations have been constructed at the HumRRO headquarters building in Alexandria, Va., and are being connected (in a remote mode) to the HumRRO–IBM 360/40 computer located in the same building.

The *Instructional Decision Model*, which is the heart of the IMPACT CAI system, is being developed and a "breadboard" version will be ready for testing early this year. This model is actually a set of rules for matching the presentation of specific subject-matter (selecting and sequencing) with trainee capabilities (student characteristics and responses to earlier material).

Detailed behavioral objectives have been set for an experimental program of instruction—a course to teach the COBOL computer language to Army military and civilian programers. The IMPACT staff has completed that portion of the instructional content that will be used in the first student testing of the prototype IMPACT system.

Dr. Seidel said software development, consisting of a modified version of the IBM Coursewriter language, is progressing rapidly. This language has been modified for use with cathode ray tubes in each student station.

The IMPACT research team is headed by Dr. Seidel, a psychologist with HumRRO Division No. 1 (System Operations), and his principal associate is Dr. Felix Kopstein, also a psychologist. The IMPACT team includes computer hardware and softeware specialists, instructional programers, applied mathematicians and behavioral scientists.

Project IMPACT is scheduled in four successive and partially overlapping cycles, a procedure HumRRO believes will produce most rapidly a maximum payoff. Results should provide the Army with the basis for specifying an optimum CAI system as well as a prototype system it can put into operation with the least possible delay.

Project IMPACT is supported as an Army study and is focused on the Army training environment. Results, however, are expected to be of considerable interest to the other military services and to civilian educators, since CAI is a promising technological development for *all* education and training.

Student Stations. Each station has a data-display system, consisting of a cathode ray tube (CRT), typewriter keyboard and light pen, the 12 stations also will have an auxiliary visual-display device to project still or motion-picture frames and sequences. The device is a screen onto which images are projected from a 16-mm random-access computer-controlled film projector.

Two stations also will have additional special features whose effectiveness is being evaluated. For example, one station will be equipped with an electronic tablet. This is an electronically sensitized sheet of glass that enables the computer to "read" what a student writes upon it. The IMPACT staff is also investigating the feasibility of voice input and output techniques.

Decision Model. The computer, with its enormous information storage and retrieval capability, permits many complex instructional decisions to be "computed" and transmitted almost instantaneously. To be effective in CAI, it must be programed to operate that is, it must have built-in patterns under appropriate decision rules—of the best ways to teach particular kinds of subject-matter to particular kinds of students. Taken together, these rules comprise a decision model of the instructional process.

The IMPACT staff has surveyed various aptitude, achievement and other diagnostic tests and has selected a suitable set of concepts, methods and techniques from the psychological literature for adaptation to IMPACT requirements.

The staff has analyzed the subject-matter structure of the COBOL language according to rigorous, formal (mathematical and logical) techniques. Together with other source material, this work has enabled the staff to begin the preliminary formulation of decision rules to use in individualizing instruction.

Course Objectives. Staff members also conducted an analysis of military and civilian programer jobs in the Army, thereby providing the basis for developing instructional objectives for the experimental course.

Instructional content to be used in the first student testing of the prototype CAI system is based on instructional objectives of the course.

Finally, the staff prepared criterion tests to evaluate how well the students attain the stated objectives.

Miller Heads Mars II Multiple Rocket Launch Project

Plans to study Mars II as an intermediate-range, multiple-artillery rocket system for the 1970s were announced this past month by the U.S. Army Missile Command, Redstone Arsenal, Ala.

Lt Col Wayne B. Miller is Mars II product manager and will have complete responsibility for the program, including development, procurement, production, testing, distribution and logistical support. The Product Management Office will be staffed from elements within the Missile Command.

Lt Col Wayne B. Miller

Mars II will be the Army's first attempt to combine multiple launch of rockets with some degree of guidance. The weapon system will include a mobile launcher, armed with several rockets, which can be fired in rapid ripples.

Considerable "in-house" work on Mars II has been conducted in laboratories at the Missile Command under management of the Advanced Projects Branch (MARS), Future Missile Systems Division, Research and Development Directorate. This branch is directed by John F. Pettit Jr.

Col Miller was chief of the Joint Sales Branch, Military Assistance Advisory Group, in Germany until assigned to Redstone Arsenal. He has served elsewhere in Europe and Korea and Japan. He holds the Army Commendation Medal and the Joint Service Commendation.

Graduated from the University of Oklahoma with a BS degree in marketing, he received an MBA degree in financial administration from Syracuse University.

DoD Posture Statement Outlines R&D Projections

(Continued from page 6)

fare capability. The objectives of the program are to develop a new design submarine and a new, longer-range missile, which will greatly increase submarine operating areas. The funds requested for FY 1970 will be used, primarily, to define the basic characteristics of the submarine.

• *Ocean Engineering System Development* (OESD). This program supports various deep submergence ocean vehicle systems: a Deep Submergence Rescue Vehicle, a Large Object Salvage System, a Deep Submergence Search Vehicle, a Small Object Recovery Device, and a Location Aid Device.

Most of the increase in funding (from $20 million in FY 1969 to $35 million in FY 1970) will be used to support the Deep Submergence Search Vehicle and the Small Object Recovery Device, both of which will be able to operate down to 20,000 feet. The Deep Submergence Rescue Vehicle, which will be able to operate down to 5,000 feet, also requires a modest increase in funding.

• *Advanced Manned Strategic Aircraft* (AMSA). This aircraft is being designed as a possible replacement for the B-52 G and H series in the 1978 and later time period. The increase in funding (from $25 million in FY 1969 to $77 million in FY 1970) reflects the decision to proceed with detailed design, wind tunnel testing and mockups up to the point of readiness to build a full-scale aircraft.

• *Subsonic Cruise Armed Decoy* (SCAD). This air-launched vehicle is designed to ensure the ability of the manned bomber force to survive in a much more advanced air-defense environment in the mid-1970s. The increase in funding over FY 1969 will permit a reasonable rate of development of this new system.

• *Advanced Ballistic Reentry System* (ABRES). This is a continuing long-range program for the advanced development of reentry and penetration technology and devices, with the results appearing gradually over a period of time in new reentry vehicles.

The $121 million request for FY 1970 (versus $105 million in FY 1969) will provide the necessary level of effort in the critical areas of the ABRES program, such as the development of reentry vehicles, new heatshields and hardening concepts, and penetration aids (decoys, chaff, electronic countermeasures, etc.).

•*CONUS Air Defense Interceptor.* This is a program to define an advanced Air Defense Interceptor or to develop modifications to modernize the existing interceptor. A request for authorization of a $28 million program was denied by the Congress last year. The FY 1970 request is for $18.5 million to perform comparison studies and complete Contract Definition of the selected system, or to perform Contract Definition of the F-106X fire control system and start engineering of airframe and missile modifications.

In discussing seven proposed Engineering Development programs for FY 1970 (three for the Air Force and four for the Navy), the report calls for $1,083 million funding in this category, compared with $725 million in FY 1969 and $811 million in FY 1968.

Four ED projects involve new aircraft, one pertains to an Advanced Surface Missile System, one calls for a Submarine Sonar Development, and one involves Hard Rock Silo Development.

"Engineering Development," it is explained, "includes all efforts on systems designed and engineered for operational use, but not yet approved for procurement and deployment. In this phase, large commitments are often made to individual programs and it is important that their specific usefulness be carefully measured before they are advanced to ED."

ARMY AVIATION. Disclosed in the report is a plan to initiate Contract Definition in FY 1970 for the design of a new Army Utility Tactical Transport Aircraft System (UTTAS). This aircraft will be able to carry about double the number of troops (plus a crew of three) currently carried in the UH-1 Huey helicopter, the workhorse of the U.S. Army in Vietnam.

The Huey was designed to carry 11 troops with a crew of two, but additional protective armor and the need for two side-door gunners reduced the payload to between six and eight men.

The report states estimated 10-year system cost of a UTTAS-equipped helicopter force "could be only a little more than half the cost of operating a UH-1 force with an equivalent lift capability over the same period of time."

Aircraft Procurement. The FY 1970 Army aircraft procurement program provides for attribution and continued modernization of the U.S. Army aviation units. The DoD plans to procure about 1,000 Army aircraft during the year.

Included in the FY 1970 program is the first large procurement of the AH-56A fire support "compound" helicopter. The first 15 aircraft are being bought in FY 1969 as part of a total package contract calling for 375 AH-56As over a 3-year period.

ARMY MISSILE FORCES. Based on successful test firings in recent months, the DoD has decided to proceed with the Lance Missile System. Initial deployment of the system is expected in the early 1970s.

The Lance Missile is being designed as a nuclear weapon system, although it can be adapted readily to carry a conventional warhead if desired at some future date without any modification of the propulsion system, it was stated. Deployment of this system will permit retirement of most of the older Sergeant and Honest John systems.

Air Defense. The Army has been working for some years on an improved version of the Hawk Missile System to achieve faster response time, better ECM (electronic countermeasure) capability and greater reliability. The improved Hawk will be more expensive per missile deployed, but will provide the needed capability with a smaller force—at about the same cost.

Because of these improvements and the introduction of the Chaparral/Vulcan, and because of a recent evaluation of air defense needs, it is now planned to reduce the permanent Hawk forces to some extent. The new plan for the 1970-74 period calls for about an equal number of Chaparral and Vulcan units per battalion, as compared to former emphasis on Vulcan.

The SAM-D, a potential replacement for both the Hercules and Hawk systems, continues in advanced development.

The Shillelagh/152mm gun on the M-60 tank is undergoing some modification. Accordingly, some of the Shillelagh-equipped M-60s included in the FY 1969 procurement program, plus some M-60 chassis which were to be used for other vehicles, will be configured with the 105mm gun.

In FY 1970 the plan is to buy only the 105mm gun M-60s, plus a number of armored vehicle-launched bridges and combat engineer vehicles that will use the M-60 chassis. Procurement is planned to maintain the M-60 chassis production line at the minimum sustaining rate, and to increase the number of 105mm M-60s over the level previously planned.

Procurement of the Sheridan armored reconnaissance vehicle is planned for continuance at the sustaining production rate in FY 1970.

MBT-70. The report states that the Main Battle Tank for the 1970s continues to present development problems, "making it impossible at this time to fix an initial procurement date." The FY 1970 budget proposes

(Continued on page 30)

DoD Posture Statement Outlines R&D Projections

(Continued from page 29)

funds necessary to continue required R&D and to proceed with a limited amount of advanced production engineering.

With respect to antitank missiles, the report states, funds are included in the FY 1970 budget for procurement of a large number of TOW missiles, a heavy wire-guided antitank weapon that can be used both from ground mounts and by the new AH-56A fire support helicopter.

Initial procurement of the new man-carried Dragon medium antitank missile has been deferred, pending results of further testing. The development problems being encounterd "are not considered to be very serious and we fully expect it to perform as designed," the report states.

NUCLEAR TESTING DETECTION. The DoD continues to share the responsibility for the maintenance of the four specific safeguards associated with the Limited Test Ban Treaty. The DoD portion is budgeted at $231 million in FY 1970, of which $186 million is for R&D. This compared with $219 million in FY 1969, with R&D at $172 million.

In support of the first safeguard—underground testing—the DoD has responsibility for provision of nuclear effects data relevant to the vulnerability and survivability of U.S. strategic offensive and defensive systems, as well as those supporting systems that may be required to operate in a nuclear environment.

The DoD program is accomplished by exposing system components (reentry vehicles, guidance systems, structures, electronics packages, etc.) and materials to the effects of nuclear detonations. The FY 1970 budget for this purpose is $48 million, an increase of $8 million over FY 1969, due in large part to tests associated with the Sentinel System defense against a Communist Chinese-oriented ballistic missile. These tests involve larger system components, and site construction is therefore more expensive.

In support of the second safeguard —maintenance of nuclear laboratory facilities and programs—the FY 1970 budget request includes $67.6 million, compared with $67.4 million in FY 1969. This safeguard is designed to provide answers to vital questions concerning vulnerability and survivability of military systems. A second objective is the development of nuclear effects simulators for laboratory and field use, as well as computer techniques for better prediction of effects. Also included in this category is research and exploratory development in new fuzing techniques, arming and control of nuclear weapons, new delivery techniques and weapon componentry.

The third safeguard, the report explains, concerns the maintenance of a capability to resume atmospheric testing on a timely basis, if a change in the situation should so require. This program provides for the maintenance of the scientific and operational facilities at Johnson Atoll (in the Pacific) and the support of Joint Task Force 8, which is responsible for the conduct of readiness exercises.

The program is now being reoriented to include tests pertinent to ABM (antiballistic missile) systems and effects on missiles and reentry vehicles in a dynamic situation. The FY 1970 budget includes $21.9 million in support of the readiness program, compared with $18 million in FY 1969.

The fourth safeguard involves the monitoring of the terms of the Limited Test Ban Treaty. Nuclear test detection also provides a means for evaluation of foreign nuclear weapons programs. Two distinct efforts are involved, the budget proposal states—the ARPA VELA Program and the Atomic Energy Detection System (AEDS). The FY 1970 budget includes $93.9 million for the support of this safeguard, compared with $92.7 million planned in 1969.

SPACE DEVELOPMENT. The DoD program is wholly integrated into the National Space Program. It is designed to apply space technologies to U.S. strategic and tactical weapons systems in order to increase their effectiveness, exploit the new potential in information systems made possible by satellite-based communications and sensors, and explore the usefulness of manned space systems for defense purposes. Despite these broad objectives, the DoD continues to exercise "great care to avoid any duplication of work already being done by NASA or other agencies engaged in the National Space Program." The FY 1970 request for $2,219 million is about the same amount originally requested for FY 1969 but about $135 million more than the amount actually provided for that year.

The largest share of the FY 1969 reduction in space projects (i.e., $85 million) was applied to the Manned Orbiting Laboratory (MOL) program, reducing it from $600 million to $515 million. The MOL, however, is still by far the largest project in the DoD Space Progam and almost $580 million is included in the 1970 budget for this effort.

(In the DoD MOL Program, the Army Corps of Engineers has for a number of years been concerned with design problems and with construction of the launch facilities. The Corps is completing work this year on the Saturn III launch facility at Vandenberg AFB.)

The DoD budget proposal states adequacy of communications is a major factor in effective use of U.S. Armed Forces overseas, and that this is currently dependent on a combination of leased and U.S. Government-owned wire, conventional radio, and satellite communications systems. It is explained:

"Experience with our present Defense Satellite Communications System (DSCS) and analysis of technically feasible advances clearly demonstrates the potential improvements in both strategic and general-purpose communications offered by this technique. Therefore, we have decided to proceed with major improvements to the DSCS."

Satellites in the improved system, known as DSCS Phase II, will be equipped with a single earth-coverage antenna and two steerable, narrow-beam antennas. The system will have new high-powered synchronous satellites, existing terminals modified to operate effectively with the new satellites, and new terminals having greater capacity and reliability and, in some cases, greater transportability.

The new system, it is explained, "could, for example, provide about 50 voice channels into a contingency area, several hundred channels within the area, and several wideband channels which might be used to transmit high-quality photographic material or high-quality secure speech. This capacity and the rapidity with which it can be installed represent a tremendous advance over our existing capability."

Plans call for launching the first satellite in the new system in early 1971, at which time all existing terminals will be modified. New terminals will be introduced about a year later. Procurement of items required for the system is programed to begin in FY 1970, accounting for an increase to $149 million as compared to $71 million in FY 1969.

The DSCS and the MOL projects, it is explained, "account for more than the total increase in the Defense Space Program in FY 1970."

STRATEGIC NUCLEAR FORCES. Twenty-five pages of the "Annual Posture Statement" with respect to the 1970-74 defense program are devoted to discussion of "U.S. vs

Soviet Intercontinental Strategic Nuclear Forces."

The report gives the estimate that as of Sept. 1, 1968, the Soviets had approximately 900 ICBM launchers operational, compared with 570 in mid-1967 and 250 in mid-1966—an increase of well over threefold in a period of a little more than two years. The rate of increase is expected to be "considerably smaller over the next two or three years. Beyond that point, our estimates become less firm."

Much of the discussion centers on the Sentinel System Antiballistic Missile Defense and the Chinese Communist nuclear threat. Estimates on the deployment of a Chinese ICBM have been revised; it is now believed that "an initial operating capability with an ICBM will not be achieved until 1972 at the earliest, and more likely later. . ."

The report contends that with respect to the potential Soviet ICBM capability of launching nuclear warfare, "our best alternative is to continue to base our policy of deterrence primarily on our 'Assured Destruction' capability.

"Even so, it could still be argued that some 'Damage Limiting' capability should be provided as a hedge against the possibility that deterrence might fail. . .but the prospects for even a *reasonably* effective 'Damage Limiting' capability against the Soviet ballistic missile threat are quite uncertain, because the USSR could make off-setting improvements in their missile forces which could seriously reduce the effectiveness of any extended ABM defense we might choose to deploy at this time.

"The provision of an effective 'Damage Limiting' capability against Communist China is quite another matter. As noted earlier, the Chinese strategic threat, at least through the mid-1980s, is expected to consist of a relatively small force of first-generation ICBMs.

"Against such a force, a thin ABM defense, such as our presently planned Sentinel System, is both technically and economically feasible and should be able to offer a very high degree of protection to our population and industry.

"The Sentinel System could, of course, be employed against a Soviet ICBM attack as well, but it would have little effect on the final outcome of that attack. Its existence, however, will contribute to our deterrent by complicating the Soviets' targeting problem and adding to the many uncertainties which are already inherent in planning a strategic nuclear attack.

"We remain convinced, however, that insofar as the Soviet threat is concerned, we should continue to give first priority in the allocation of our resources to the primary objectives of our strategic forces, namely, 'Assured Destruction.' Until technology progresses to the point where an effective ABM defense against the Soviet threat becomes feasible, our major hope for limiting damage if a nuclear war occurs is that it can be stopped short of an all-out attack on our cities.

"We try to bring this about by providing our forces with characteristics that will permit them to be used effectively in a limited and controlled retaliation as well as for 'Assured Destruction,' thereby being prepared for any type of Soviet attack. . . ."

In analyzing the probable results of a Chinese first strike with ICBMs in the 1975-80 time frame, the report states that "without the Sentinel System, we might suffer as many as 23 million fatalities. . . .With the Sentinel, we might be able to hold fatalities to one million or less. There should be no question about the technical feasibility of the system against the kind of Chinese ICBM threat shown above. . . ."

After discussing further the Soviet ICBM threat, the report states:

"Meanwhile, we propose to press forward energetically with the Sentinel program and the development of more advanced ABM technology. Until a workable agreement with the Soviet Union on these matters is achieved, we must keep open the option of deploying an ABM defense against the Soviet missile threat should such a defense prove to be both feasible and desirable at some future time."

APG Evaluates New Features of One Quarter Ton Truck

Bearing a strong resemblance to the U.S. Army's World War II internationally renowned "Jeep," a prototype 1970 model of the ¼-ton military truck is undergoing rigid tests at Aberdeen (Md.) Proving Ground.

Testing, however, will serve to evaluate many new features. Designed into the prototype are increased operational safety, greater reliability, improved durability and cost-reduction refinements.

Features include a dual hydraulic brake system, "deep-dish" steering wheel, a semitrailing-arm rear-suspension system, "lube-for-life" suspension and steering joints, improved transmission, greater visibility for the driver, redesigned lighting and a new fuel pump.

Redesign of the prototype evolved from several years of R&D effort by industry and the government monitored by the Army Project Manager's Office for General Purpose Vehicles in Warren, Mich., an element of the Michigan Army Missile Plant.

The new transmission is expected to last longer and require less maintenance. Tapered roller bearings are used in place of needle bearings at the transfer idler shaft and the ball bearing assembly for the transfer output shaft has been redesigned.

A mechanical fuel pump replaces the present electrical pump at a substantially lower cost, with possibility of vapor lock under extreme climatic conditions reduced by a vapor diverter chamber.

Even changing a flat tire will be easier and safer on the prototype due to use of a scissors-type jack that allows the operator to stand clear of the vehicle while hoisting the wheel to remove it.

New Model Army Quarter-Ton Truck

R&D Advances Aiding Supply Distribution for Military Operations

By E. J. Rodrick and D. P. Kane

Spectacularly successful though research and development activities may prove in maintaining the U.S. Army as the best-equipped, best-fed, best-trained and best-supported medically, the modern science of logistics presents the critical link to achievement of combat objectives.

Physical distribution of equipment and supplies required to support the modern Army in a military operation is a colossal task, particularly when they may be needed on battlefields in distant lands known for extremes of geographical, climatic and various environmental factors.

Every mode of transportation, every means of materiel handling, every advanced packaging and preservation technique, must be exploited to the utmost to insure the rapid and continuous flow of supplies from the manufacturer to the combat soldier, no matter how remote.

More than one mode of transportation is required normally—highways, railways, inland waterways, ocean shipping, airlift or any combination of these.

CONTAINERIZATION. Until World War II, packaged material was shipped in every known configuration. Boxes, cartons, drums, barrels, kegs, crates and reels of all sizes and shapes were used, often rather indiscriminantly.

This unstudied approach to the logistics problem was not conducive to efficient mechanical handling nor to economical utilization of cargo space. Handling and trans-loading of such cargo from one mode of transportation to another was costly, time-consuming and subject to damage and pilferage.

In the early 1950s, the Army became interested in containerization as a means of speeding the flow of military traffic by eliminating the delays inherent to the transportation of a multiplicity of assorted packages. A research and development program produced the well-known CONEX containers.

CONEX II, the general cargo container, is a reusable metal box 6′–3″ wide 8′–6″ long and 6′–10″ high, with a payload capacity of 9,000 pounds. The dimensions, payload and structural characteristics were carefully selected to achieve compatibility with the equipment and clearances associated with all of the modes of surface transportation then in use by the Army.

The supply distribution system based on the CONEX has been adequately supported by a wide variety of both military and commercial materials handling and transportation equipment. The inventory includes forklift trucks, cranes, CONEX transporters, and the vehicles associated with railway, highway, marine, amphibious and air operations.

Phenomenal growth of containerization in commercial transportation systems in all parts of the world followed rapidly in the years after this innovation. Soon it became evident that if efficient operation and interchange between modes and carriers were to be achieved, a high degree of standardization of container sizes and configurations was necessary.

Early in the 1960s, the United States of America Standards Institute (USASI) established standard dimensions and tolerances. A few years later, the American standards were adopted by the International Standards Organization (ISO) and *approved* as international standards —nominally 8 feet in width, 8 feet in height and 10, 20, 30 and 40 feet in length.

The ISO also has effected, or has taken into consideration, standardization of other features such as design criteria to resist static and dynamic loading, maximum allowable gross weight, testing procedures and techniques, and design of corner fittings to permit unrestricted lifting, tiedown, stacking and coupling.

Concurrently with the standardization of container sizes, container ships, special railway cars, highway vehicles and container handling equipment, all designed especially to transport and handle the ISO containers,

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RODRICK has been employed at MERDC since 1958 when he graduated from the City College of New York with a BS degree in mechanical engineering. He served in the Army from 1959 to 1961 with the 815th Engineer Battalion at Fort Bliss, Tex., and is presently a member of the 1621st Reserve Training Unit at the center.

KANE served as an officer in the Army from 1941 to 1946, including service in the European Theater of Operations. He holds a BS degree in electrical engineering from Carnegie Institute of Technology and has been employed at MERDC since 1967.

Eugene J. Rodrick

Donald P. Kane

CONEX Transporter

began to appear in all parts of the world.

In keeping with its tradition of exploiting fully all available transportation media, the U.S. Army designed a new container with the forward area flexibility of the CONEX and yet compatible in all respects with the ISO system.

The new containers, known variously as TRICON, 3-in-1, or CONEX, have the nominal dimensions of 8 feet in width, 8 feet in height and 6 feet, 8 inches in length, with an inside volume of 350 cubic feet and a payload capacity of 13,000 pounds.

The 8-foot width and height dimensions are ISO standards. The 6-foot, 8-inch length was selected so that three of these containers may be coupled end-to-end, with a short coupling space between, thereby forming an assembly 20 feet in length, an ISO standard dimension.

Each modular container is fitted with built-in coupling devices and ISO corner fittings arranged so that they may be selected at random for coupling. When coupled, the doors will be all on the side of the 20-foot unit; however, they may be on the same side or they may alternate.

The assembly of three modular containers has all the logistic advantages inherent to the popular 20-foot box. It may be loaded into the wells of containerships in 6-tier stacks and it is compatible with all the materials handling and transportation resources geared to the international, intermodal, containerized distribution system.

The U.S. Army is procuring 2,000 of the 20-foot containers and is making extensive use of commercial containerized shipping between the West Coast and Southeast Asia.

ROUGH-TERRAIN FORKLIFT TRUCK. A 4,000-pound high-flotation, lightweight, rough-terrain forklift truck is under development. The prototype being evaluated is 17 feet 4 inches long (including forks), 6 feet 8 inches wide, 8 feet 6 inches high, and is powered by a commercial 85-horsepower compression-ignition engine.

Use of new design concepts and optimum placement of the vehicle's loaded and unloaded centers of gravity made it possible to hold its weight to about 8,500 pounds, which is very low for its load capacity of 4,000 pounds at a 24-inch load center. Because of its high payload-to-weight ratio, the forklift is light enough to be transported by air, lifted and delivered by helicopter, and parachuted into combat areas.

High-flotation tires and a center-articulated chassis that permits the axles to oscillate about 12 degrees from the horizontal enable this vehicle to operate effectively on rough terrain, in sand, in mud and in snow.

Versatility is enhanced by a special kit that provides a simple general-purpose crane, which can replace the forks and be mounted on the lifting carriage, for loading and unloading high-sided cargo vehicles where forks cannot be used. A pintle on the rear of the vehicle provides for towing loads.

HANDLER AND TRANSPORTER. The 16-ton 6x6 earth-mover-type cross-country container handler and transporter is an articulated-steering, 2-wheel prime mover powered by a 240-hp diesel engine of commercial design and a tilting-bed trailer with four powered wheels. Designed primarily for self-loading, transporting and self-unloading of containerized cargo, it can be used for such purposes as the recovery of disabled vehicles.

This vehicle, the first of its kind, can load and unload one to three fully loaded CONEX containers without the help of other materials-handling equipment. The transporter is 40.7 feet long, 9.7 feet wide and 11.8 feet high (with (CONEX containers); curb weight is 44,000 pounds and rated off-the-road load-carrying capacity is 32,000 pounds.

Dimensions and capacity of the transporter will be upgraded in future models to accommodate the TRICON containers. Presently, it can carry a 20-ton payload on improved roads at military convoy speeds up to 30 mph, and it is equipped with a fully automatic 100-hp hydraulic-assist drive on the rear wheels.

Coupled with the use of sand tires, this drive makes the transporter especially suitable for rough and sandy terrain operation. Carrying rated payloads, the transporter can travel over sand dunes, climb a 40 percent slope, and ford streams 4 feet deep. The short turning radius of 44 feet permits it to be maneuvered easily through beach areas cluttered with equipment, weapons and supplies. Under certain conditions of operation, it can make U-turns on narrow roads.

Two men can load three containers in about 10 minutes. Actuation of a hydraulic cylinder tilts the bed until its rear end is on the ground. Cables from the hydraulic winches on either side at the front of the bed are attached to the skid runners of the container. The winches are then operated until the container is pulled fully onto the tilted bed. The bed is then leveled to facilitate pulling the container forward. This process is repeated until all three containers are loaded and tied down.

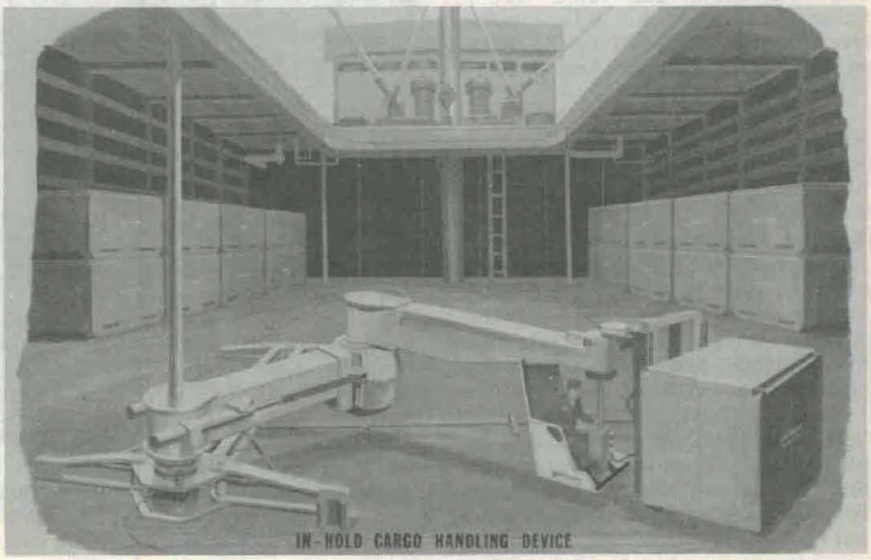
Unloading the containers requires only the unlatching of the tie-down chains, tilting the bed and driving away, causing the skid-mounted containers to slide down in the grooves to the ground.

LOT OPERATIONS. Prototype models of the following devices have been fabricated and are being evaluated to determine their potential for military LOTS operations.

The In-Hold Cargo Handling Device, under development, is a hydroelectric cargo handling tool for positioning cargo in the holds of ocean-going vessels. This 10,500-pound device, which will eliminate the need for pallet jacks, snatch-block rigging and small fork trucks, may be moved aboard by the ship's gear and removed when the cargo has been unloaded.

The cargo handler is hydraulically actuated by a power pack consisting

(Continued on page 34)



IN-HOLD CARGO HANDLING DEVICE

R&D Advances Serving Military Supply Distribution

(Continued from page 33)

of a 3,000-psi pump driven by an electric motor which uses ship's power.

It has a reach of 25 feet, a maximum lift of 93 inches, a capacity of 10,500 pounds fully extended, and can be readily positioned in the ship's hold. With these dimensions, the wings of the ship can be worked by the handler with a minimum of effort.

Cargo consolidation is accomplished by three lifting tools so designed that, with one cycle of the ship's hook, a lighterage load can be assembled, thereby increasing efficiency. The CONEX Container Sling is designed for rapid coupling and uncoupling to the lifting points on a CONEX II. Since a minimum of effort is required for disconnect, the lighterage crew's duties are performed with less danger of accident.

The multipallet sling is a "strong back" tool so constructed that four 40 x 48-inch pallets, loaded to 2,500 pounds each, can be lifted at one time.

The third tool is the multidrum hoist device, consisting of a rack and frame. Twelve 55-gallon drums can be loaded, hoisted and positioned on the lighterage deck, and rapidly released from the rack by control levers.

The Lighterage Stabilization Device is a portable lifting machine to provide stabilization of small amphibious lighters during ship's discharge operations, consisting of two hoisting booms, winching gear and associated controls. In operation the lighter, a LARC V, moves between and is attached to two hoisting booms, and then is hoisted clear of the water using the winching system. Lifting the lighter off the water negates the influence of wave action on the relative movement between the two vessels and allows for rapid loading using the ship's gear. When loaded, the lighter is lowered into the water, is disconnected from the booms and is free to move ashore.

RAILWAY EQUIPMENT. The equipment required for military railway operation is the responsibility of the U.S. Army Mobility Equipment Research and Development Center. Foreign service equipment is unique in that it must be adaptable for operation on any railway in the world, and in trains containing indigenous equipment. Dimensions and weights of the equipment are limited by physical clearances and permissible loadings.

The U.S. Army equipment has built-in compatibility with the multiplicity of gauges, couplers, buffers, draft gears and braking systems existing throughout the world. The 30-ton narrow gauge and the 40-ton broad gauge freight car fleets have been upgraded to 40 and 50 tons.

The new U.S. Army railroad cars are of all-steel construction, including nailable steel flooring. Other improvements are the use of roller bearings, geared hand-brakes, ABD air brake valves and wrought- or cast-steel wheels.

Specifications for locomotives, wrecking cranes and maintenance equipment have likewise been upgraded, with a drastic reduction in the number of sizes and types.

THE FUTURE. At this point, it is pertinent to try to answer the question: But what of the future of the Army's supply distribution effort? Integration throughout the system and intermodality are the key words of the future. Development of an Integrated Supply Distribution and Materials Handling System is progressing at the U.S. Army Mobility Equipment Research and Development Center.

This systems approach to cargo movement requires that packaging, transportation and materials handling will be considered not as single entities; rather, they are investigated with respect to their effects upon the efficiency and effectiveness of the total system. An operation less than optimum for one mode in the system might better provide for total system effectiveness—in moving material from manufacturer to the user in the field with minimal delay and by methods that result in minimum cargo rehandling.

Impact upon the total system must be analyzed to see if the addition of a new element adversely affects operations. We can no longer afford to make arbitrary decisions to add a new unitization concept, transportation item or piece of handling equipment to optimize one mode without first analyzing the impact upon the total system and insuring that we have not just moved the bottleneck to a different location.

The future military supply distribution system must be formulated from a sound analytical framework, based on good practical judgment to insure that the supplies to the man in the field are delivered in a timely and efficient manner.

Strategic operations and the technology of military materiel have progressed phenomenally in the past quarter of this century. Still the proved formula for combat success depends upon the historical basic of logistics—delivering critical materiel when and where it is needed.

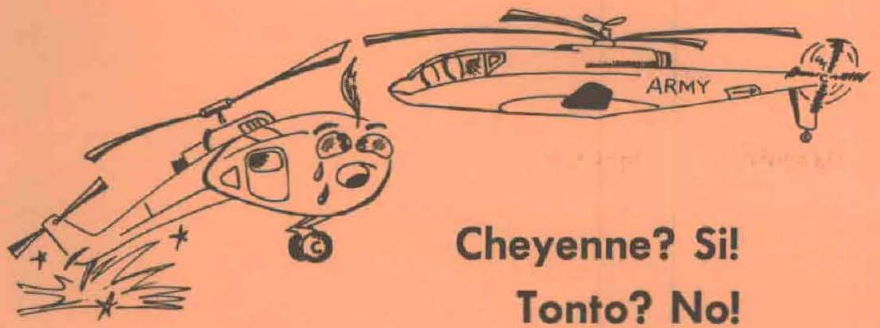
TECOM Conducting Tests of Grenade Launcher Sight

Prototypes of a new sight for the XM203 40mm grenade launcher developed at the U.S. Army Human Engineering Laboratories (HEL) are being field tested by the Army Test and Evaluation Command's Infantry Board, Fort Benning, Ga.

Designed by HEL scientist Paul H. Ellis, the sight is mounted on the left side of the M16A1 rifle grenade launcher. An adjustable range slide and elevation and azimuth wheels provide for zeroing in the weapon.

The SM203 launcher, which can be attached to the M16A1 rifle or the XM177E2 submachinegun variation of the M16, is undergoing advanced production engineering tests at Aberdeen Proving Ground, Md. If results prove satisfactory, the XM203 may replace the M79 grenade launcher.

RANKIN CYCLE ENGINE unispray burner boiler module is put through its paces by John C. Orth, chief, Advanced Power Sources Branch, U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va., for Maj Gen Robert E. Coffin, Deputy Chief of the R&D, HQ DA, and Col Edwin T. O'Donnell, Center CO.



Cheyenne? Si! Tonto? No!

Cheyenne! Cobra! Lance! Each merits an exclamation point as an action-loaded name that identifies items of military hardware in the production stage after extended research and development to prove merit.

How does the U.S. Army R&D organization arrive at a name with sure-fire popular appeal to introduce new items of combat materiel—a name that conjures up a meaningful association for the men whose lives may depend on it?

Proud parents of their first newborn progeny, no matter how extended and troubled may have been the process of deciding upon its name, seldom go through the mental travail that frequently may be associated with selecting the name bearing the desired connotation for new weapons.

Assignment of popular names to major items of military equipment, although not mandatory, is encouraged by the Department of the Army. In this context, a popular name is one that denotes the action, that is appropriately descriptive, and effectively serves publicity and ready reference needs.

Leaders of the Army's developing agencies, that is, the commanding general of the U.S. Army Materiel Command, Chief of Engineers, The Surgeon General and commanding general of the U.S. Army Security Agency, determine if new equipment is a major item warranting a popular name.

To preclude retraction, popular names normally are assigned shortly after Department of the Army approval of the project for initiation of engineering or operational systems development. An exception to this is in the case of Army aircraft. Popular names will be assigned to aircraft only at the time the aircraft enters the production stage or has immediate prospects of going into production. The names selected are imaginative and dignified; they suggest an aggressive spirit and confidence in the item's capabilities.

The recommended popular name for a major piece of equipment normally originates within the developing agency, which is responsible for coordinating the proposal with other interested major commands, each of which "massages" it thoroughly for publicity impact—good or otherwise!

Finally, the recommended name is transmitted to the Chief of Research and Development for approval, requiring thorough review to ensure that legal or other objections will not later be raised.

The agency that proposed the name is then notified of the final approval and the popular name is then transmitted to the Patents Division, Office of the Judge Advocate General. Approved names are processed through appropriate information channels to obtain adequate news media coverage.

The selective process used by the U.S. Army to choose popular names has so far avoided any unpleasant repercussions. However, the perils of the process were illustrated recently when the name TONTO was proposed for an Army aircraft. During staffing, it was found that in the Spanish language this name could be interpreted as meaning "foolish."

Although this meaning obviously would have had no effect on the tactical capability of the aircraft, use of this name could have proved embarrassing to the Army at some future date. TONTO was dropped from consideration.

OTSG Reports on Helicopter Evacuation Statistics

Medical evacuation statistics for U.S. Army patients in Vietnam during the first 10 months of 1968 reflect almost a doubling of the workload of helicopter and medical crews, compared to 1967 statistics.

The Office of The Surgeon General, Washington, D.C., reported that Army Medical Department helicopters transported more than 170,000 patients in 1968, as compared to 94,000 during the same period in 1967.

Each movement of a patient, from combat to an emergency field treatment facility, to a hospital in Vietnam, or to a U.S. medical installation, is counted as an evacuation. The total of patients evacuated by medical helicopters since the Vietnam conflict started exceeds 350,000, including Vietnamese and Allied personnel as well as American soldiers.

More than 47,000 hours of flying time were logged by U.S. Army pilots in 1968 air evacuation operations of 120 helicopters stationed across Vietnam. Often referred to as "Mercy Airlines," these aircraft place every American soldier within about 35 minutes or less of a medical facility equipped to provide life-saving treatment.

UD–1D/H "Huey" helicopters carry six litter or nine ambulatory patients and a crew of four at a normal operational speed of about 120 miles an hour. Use of a special rescue hoist, called a "forest penetrator," increases the versatility of the aircraft in rescue missions. The patient is hoisted from deep forest or thick jungle undergrowth by a 3-seat hoist lowered from the hovering aircraft.

Used by the U.S. Army Medical Department since 1951, helicopters have proved particularly valuable in saving lives during the difficult rescue conditions common in Vietnam. The mortality rate among patients reaching a medical treatment facility, due to the speed of the evacuation, is averaging about 2.4 percent.

'Cold-Soaked' Lance Missile Flight Tested at White Sands

A Lance missile, "cold soaked" to 40 degrees below zero, was recently flight tested successfully at White Sands (N. Mex.) Missile Range.

The firing was the first low-temperature flight test on an improved tactical propulsion feed system. The highly mobile missile and its warhead met all test objectives. The warhead development effort is being conducted at Picatinny Arsenal, Dover, N.J., in conjunction with HQ Army Missile Command, Redstone (Ala.) Arsenal.

To reach sub-zero temperatures, far lower than those normally expected in combat, the 20-foot-long, 3,300-pound missile was cooled for hours in a mobile refrigeration shelter removed just before launch. The flight test verified propulsion system effectiveness previously demonstrated in low-temperature environment ground tests.

Col A. F. Pottle Jr. is Lance project manager, directing the program from the Missile Command.

* * *

"Progress, man's distinctive mark alone, not God's and not the beasts': God is, they are; man partly is, and wholly hopes to be."

Robert Browning

USAEPG Tests KA-60 Aerial Camera

The wide angle panoramic view above shows a large portion of the Fort Huachuca, Ariz., housing area in the foreground rising toward the Huachuca Mountains framed against the desert sky. The photo was taken with a KA–60 forward-looking aerial camera with a 180° field of view.

The camera will be part of the new OV-1D Mohawk aircraft's surveillance system that will receive its engineering test by the Army Electronic Proving Ground in June.

One of the KA-60's advantages, which the photo illustrates, is the furnishing of a preliminary side view of a target area which will facilitate a detailed analysis when used with a vertical camera.

A tactical surveillance feasibility study of the camera was conducted last fall by USAEPG's Image Interpretation Branch in conjunction with the U.S. Army Combat Surveillance School (white buildings in the lower right belong to the school).

Test procedure was to fly local training missions using the camera as a supplement to vertical photo coverage. Taken by Maj C. A. Weaver of the school's Airborne Sensors Department, this photo was one of many test shots.

WSMR Adopts Triggering System for High-Speed Cameras

Remote electronic control triggering of as many as 28 high-speed cameras is possible with a mobile system accepted recently by the Pictorial and Processing Division, White Sands (N. Mex.) Missile Range (WSMR), for use in its missile testing program.

Representing several years of WSMR research and development work, the system replaces a radio system used since 1955. In some cases, it also will eliminate laying wire from camera stations to remote control facilities.

Mounted on a 2½-ton truck, the equipment employs a transistorized transmitter-programer and seven lightweight receivers to handle the "on" and "off" functions of the cameras. Each receiver has four plug-in stations for still or motion picture cameras.

The transmitter or programer uses a digital coding system (transmitted at a frequency of 139.44 mh) to direct the operation of 28 separate cameras in any predetermined sequence within a time span of X minus 31 seconds to X plus 31 seconds with reference to time zero. All steps in sequencing are at integer-second intervals or multiples thereof.

The system was designed to provide a 20-mile line-of-sight operation for WSMR cameramen who must place their equipment at points within blast or danger zones of missile launch sites. The 30-watt transmitter has proved successful up to 56 miles.

Completely self-contained, the system includes a generator mounted behind the cab of the truck. Storage space for cameras and related equipment is provided in the air-conditioned van. Two persons can set up operations in less time than four to six men formerly required for the wire-laying system.

ALMC to Publish Army Logistician

Publication of the *Army Logistician* as a bimonthly magazine issued by the U.S. Army Logistics Management Center at Fort Lee, Va., will begin with a May-June edition.

Feature articles and news stories will provide timely and authoritative information on U.S. Army logistics concepts, plans, policies, procedures, operations and developments, the center has announced. The magazine is designed to serve military and civilian personnel in logistics.

Material may be submitted to Thomas A. Johnson, editor, *Army Logistician* Magazine, Army Logistics Management Center, Fort Lee, Va.

USAEPG Tests Mobile Aircraft Control Central

Environmental tests on the Army's mobile Aircraft Control Central, AN/TSQ–70A have started at the U.S. Army Electronic Proving Ground (USAEPG), Fort Huachuca, Ariz. Engineering tests were completed last spring.

Though small in size, the truck-mounted tower is designed to play a large role in air traffic control for Army airfields. It provides for visual sighting and communication with aircraft in-flight, enabling on-the-ground assistance and control, and may be operated from inside controls or through two remote consoles up to 100 feet away.

The cluster of antennas serves ultra-high frequency (UHF), very high frequency (VHF), and frequency-modulated (FM) channels of radio communication. Wind direction and speed are also furnished to the operator who sits in the tower behind green tinted windows providing a 360-degree field of vision.

USAEPG's Avionics, Meterology and Electronic Test Division is performing the environmental testing at White Sands (N. Mex.) Missile Range, under the direction of project officer John D. Mulhorn. Upon completion of this phase, the tower will go to Aberdeen (Md.) Proving Ground for transportability tests.

The Landing Control Central, AN/TSQ–72, a similar though larger item of equipment mounted in a 2-1/2-ton truck, received its engineering tests at USAEPG last spring. It also possesses a radar capability.

Aircraft Control Central AN/TSQ–70A