ARMY RESEARCH AND DEVELOPMENT

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Army Science Conference Keyed To Modern Soldier, Environment

ASC BANQUET SPEAKER Dr. Ralph G. H. Siu is shown with wife Irene as Lt Gen H. A. Miley, Army Materiel Command Deputy Commanding General, presents a rare second Decoration for Exceptional Civilian Service. (See article, page 5.)

U.S. Army Science Conference invited-participants, expected to gather nearly 500 strong June 16–19 at the United States Military Academy, will hear a keynote address on "The Modern Soldier in His Current and Future Environment." A panel discussion such as contributed outstandingly to success of the 1966 and 1968 ASCs is focused on "How Do You Meet Your Research and Development Needs?"

Keynote speaker will be Lt Gen George I. Forsythe, Commanding General of the U.S. Army Combat Developments Command, whose long and distinguished career as a leader of combat troops—including command of the 1st Cavalry Division (Airmobile), U.S. Army Vietnam (1968–69)—particularly qualifies him to discuss the ASC theme.

Dr. Ralph G. H. Siu, toastmaster of every ASC since 1957 except in 1966 when Chief of R&D Lt Gen Austin W. Betts was called upon to pinch-hit for him because of the urgency of a project on which he was working, will be the banquet speaker. Lt Gen Betts will take over in the toastmaster role.

Assistant Secretary of the Army (R&D) Robert Louis Johnson will make his first ASC appearance and is programed to present the awards for the award-winning technical papers at the closing session. Listed on the program are 100 technical presenta-

(*Continued on page 4*)

Conference Keynoter

Lt Gen George I. Forsythe
CG, Combat Developments Command

Featured in This Issue . . .

$71.8 Billion Budget Hits DoD Low Percent of Total Federal Level Since 1950

National security threats posed by a multiplicity of serious problems linked to rapid technological gains by the Soviet Union and Communist China were detailed by Secretary of Defense Melvin R. Laird in a Mar. 2 statement to the House Armed Services Committee.

In proposing a Department of Defense FY 1971 budget of $71.8 billion for outlays, Secretary Laird said it was the lowest since 1950 in percentage (34.6) of the total federal budget of $200.8 billion. The DoD budget represents the lowest percentage of the Gross National Product since 1951 (7 percent as compared to 8.7 in FY 1969 and 9.5 in FY 1968).

In what has been labeled the annual "posture statement" of the Defense Department, this year a 167-page document, Secretary Laird stressed strongly the requirement for greatly improved military procurement procedures. He spoke at length

(*Continued on page 3*)

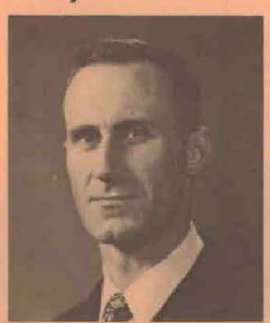
HumRRO Develops SFTS To Reduce Training Time

Envisioned as the possible answer to all U.S. Army synthetic flight training requirements in the future is a $3.5 million initial engineering development model computer-based 4-cockpit helicopter instrument system scheduled for operation in October.

Based on a concept developed with the assistance of the Human Resources Research Organization (HumRRO), and considered to have

(*Continued on page 6*)

Army Scientists Win Princeton University Study Awards



Dr. Valentine E. Zadnik

Selection of two U.S. Army mid-career scientists as the first Army representatives chosen in three years to study in the prestigious Woodrow Wilson School of Public and International Affairs at Princeton University was announced in April.

Edward F. Kovanic was chosen for an academic year of study under the

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Edward F. Kovanic

Army R&D Newsmagazine

Vol. 11 No. 3 • March-April 1970

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

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

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Forrestal Award Winner Discusses R&D Funding

Director of Defense Research and Engineering Dr. John S. Foster Jr. was honored as the recipient of the 16th annual James Forrestal Award at a Mar. 12 dinner sponsored by the National Security Industrial Association at the Washington Hilton Hotel. Before a highly prestigious assembly of many of the nation's top leaders, he used the occasion to paint a somber picture of his views regarding the threat to U.S. security and continued economic well-being posed by reduced R&D funding in recent years in comparison to rapidly expanding efforts of the Soviet Union to achieve technological superiority. His address follows:

* * *

I accept the award on behalf of the tens of thousands of men and women in the Defense research and development community. These are people with varied skills and varied views, but they share a single dedication to national security through technological leadership.

Tonight I will describe an issue which is central to Defense technology but which extends well beyond the domain of defense. It is an issue which has not been fully debated nor widely understood. The issue is complicated, fundamental to our security —and serious. My subject is the sweeping challenge from abroad to America's technological leadership.

Here, in brief, is the problem.

For at least a generation, the United States has been the major world power in both military and economic terms. Since World War II, our strength has been built upon the bedrock of advanced technology.

As a nation, we started our industrial growth as the bold and versatile engineer of technological applications—in shipping, agriculture, and then in the chemical and electrical industries.

In the early days, we were an importer of science. Later, we began to forge ahead in the basic sciences, often thanks to the immigration of superb scientists who sought refuge and freedom here.

Recently, we have achieved most of the world's "firsts," not only in engineering but also in science. *But today, global patterns are changing. Our position of leadership is fading.*

For many years now, the Soviet Union, clearly recognizing a prime source of national strength in the modern world, has emphasized research and development. Soviet expenditures for defense, space, and atomic energy technology have grown until they now exceed ours. Soviet efforts continue to expand rapidly. Our effort has leveled off and begun to decline.

In civilian technology—particularly in the manufacture of technologically intensive products—Japan, West Germany and others have achieved and sustained a growth rate several times ours for more than a decade. In selected areas we no longer lead. We follow. No reversal of this trend is in sight.

For some years, we Americans, as a people, have tended to consume more and invest less. If these trends continue, the United States will lose its over-all world technological and economic leadership. The impacts of such a decline on our national institutions—our national strengths—would be profound.

Our consumers would pay more for less.

Our industrial base would lose vitality.

Our exports would decline.

Our universities would stagnate.

Most significant for all our national institutions is the fact that our ability to deter war and to defend ourselves would be weakened. Other adventuresome countries would be tempted to take advantage of a new situation.

I fully realize that these are serious statements. But they cannot be dismissed or shrugged off as burdens to be shouldered only by the President, the Cabinet and the Congress. The problems must be faced by all responsible Americans.

Let me outline the problem, as I see it, in terms of four questions: What is happening? Why is this happening? What will be the consequences? What is to be done?

We should start with a few basic facts. Some of the data are not precise, but they are adequate, and the trends have been crosschecked from several points of view.

One indicator is a comparison of

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$71.8 Billion Budget Hits Low Percent of Total Level Since 1950

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on the need for new standards of excellence in management of shrinking research, development, test and evaluation funds.

Administration officials term the $71.8 billion DoD budget a "fiscally constrained budget," as opposed to previous "requirements-based budgets." It proposes outlays $6.9 billion lower than the FY 1969 budget. In real terms, that is, in respect to reduced procurement power of the dollar, FY 1971 proposals are down $12.8 billion.

Secretary Laird stated that $7,346,000,000 proposed for Defense research, development, test and evaluation is $23 million less than actually appropriated for FY 1970. Considering inflation, this represents about a five percent reduction in effort between FY 1970 and FY 1971, with attendant reductions in research contracts and RDT&E personnel.

The Safeguard ABM System, in which the Army has a major developmental role as well as in construction of facilities, is proposed for a substantial increase in funding. Continued deployment of Safeguard carries an FY 1971 cost of $1,490 million (NOA) as compared to $892 million in FY 1970.

Secretary Laird explained the Safeguard increase by saying: "Our decision to proceed with further deployment . . . gives us another year in which to pursue SALT (Strategic Arms Limitation Talks) without ourselves exacerbating the arms control environment through action on offensive systems. We can do this while still providing a hedge against moderate threats and an option to meet, if necessary, a heavier threat.

"Also, the production of Soviet nuclear-powered ballistic missile submarines is continuing at two shipyards. By the mid-1970s the Soviets will probably have a submarine force capable of destroying most of our alert bomber and tanker force before it can fly to safety.

"We need the Safeguard area defense to blunt the first few minutes of such an attack so that our bombers can escape and our command system can execute its prime function. Otherwise, we must turn to expensive alternatives such as rebasing our continuous airborne alert. . . ."

In view of the possibility of SALT leading to "many possible agreements with the Soviet Union . . . which would be consistent with our national security objectives and the legitimate security interests of the Soviet Union," Laird explained, "the decision to begin a modified Phase 2 deployment (of Safeguard) does not preclude an agreement on low ABM levels."

Another factor influencing the Safeguard additional deployment decision, he said, is "that the Soviets have no control over the Communist Chinese, whose threat we must therefore cope with regardless of SALT.

"As President Nixon recently stated: 'Ten years from now, the Communist Chinese, among others, may have a significant nuclear capability . . . then it will be very important for the United States to have some kind of defense so that nuclear blackmail could not be used.' "

Relative to results of detonations of 10 nuclear devices between Oct. 16, 1964, and September 1969, Secretary Laird commented: "Thus with only a relatively few shots, the Chinese have made more rapid progress than any other nation.

"The intelligence community does not believe that they have achieved a probable objective of a nuclear warhead in the weight ranges required for medium range ballistic missile use, but that they will continue development with this objective in mind. . . ."

The DoD has made "no irrevocable decisions with regard to new strategic force programs," he said, in planning FY 1971 as a "transition budget. It is designed to preserve the basic capabilities we currently have while retaining key options until a clearer

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Army Scientists Win Princeton Study Awards

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Career Educational Awards Program of the National Institute of Public Affairs, providing that 5 to 10 fellowships annually may be awarded. Full tuition and other fees are paid.

Dr. Valentine E. Zadnik was selected under a provision of the program that enables "a few additional students" who meet the rigorous requirements to attend the Woodrow Wilson School when a federal agency pays costs. He will attend as a visiting student.

Kovanic, 40, is a GS–15 electrical engineer currently studying for a PhD degree at Polytechnic Institute of Brooklyn, where he also has served as a member of the teaching staff.

After serving as a member of the technical staff of Bell Telephone Laboratories, Murray Hill, N.J., from October 1956 to April 1964, he was promoted to project engineer.

In August 1967, he became an Army employe with the Mallard Project, a 10-year multimillion-dollar 4-nation (United Kingdom, United States, Canada and Australia) research and development effort to develop a tactical satellite communications system.

Kovanic was promoted to GS–15 in February 1969 and assigned as chief, Mission and Logistics Support Division, U.S. Project Office, Mallard Project.

In June he became chief, System Support Division, Joint Engineering Agency, Mallard Project, his present job.

Graduated with a BS degree in electrical engineering from the University of Pennsylvania in 1952, he earned his master's degree in the same field from New York University in 1959.

DR. ZADNIK, 35, joined the professional staff of the U.S. Army Research Office, Office of the Chief of Research and Development, HQ DA, in 1966 as a geologist in the Environmental Sciences Division.

Graduated magna cum laude from Case-Western Reserve University in 1957 with a BA degree as a geologist, Dr. Zadnik started his U.S. Civil Service with the Geological Survey. In 1960 he transferred to the U.S. Air Force and after three years became a research engineer/geologist with ESSO Research and Engineering Co., Florham Park, N.J.

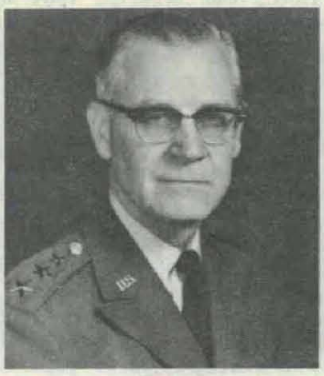
A year later he accepted a similar position with Jersey Production Research Co. in Tulsa, Okla., followed in 1965 by a job as senior research geologist, ESSO Production Research Co., Houston, Tex., until he accepted his present position with the Army.

Dr. Zadnik received an MS degree from the University of Illinois in 1958 and remained there to earn his doctorate in geology and civil engineering in 1960. He is a member of Phi Beta Kappa, Sigma Xi and Phi Kappa Phi honorary societies.

In nominating him for a fellowship in the Woodrow Wilson School, his supervisor, Dr. Leonard S. Wilson, chief of the Environmental Sciences Division, acclaimed him as "an unusually competent individual who had a brilliant record of scholastic achievement, now complemented by an outstanding record of on-the-job performance."

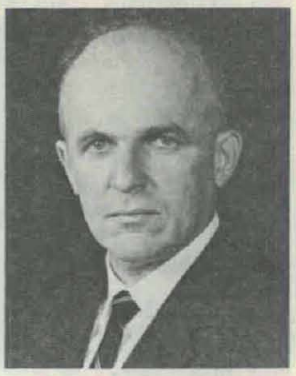
Army Science Conference Keyed to Modern Soldier, Environment

Robert L. Johnson



Lt Gen A. W. Betts

Dr. Robert B. Dillaway



Dr. Marvin E. Lasser

(*Continued from page 1*)

tions. Usually about 10 to 15 individual researchers or teams share $3,500 to $4,000 in awards through the Army Incentive Awards Program.

Certificates of Achievement signed by Mr. Johnson and General Betts also will be presented to authors of meritorious papers. One of the closely guarded secrets is a special award that will be presented for the first time, to honor and perpetuate the name of a great Army scientist.

Dr. Robert B. Dillaway, U.S. Army Materiel Command (AMC) Director of Laboratories, has accepted an invitation to moderate the panel discussion. Appointment of members to complete the panel had not been completed at press time, but they will be distinguished leaders in their fields of specialty.

Deputy and Scientific Director of Army Research Dr. Richard A. Weiss will be among the conference dignitaries in the same role he has filled continuously since 1957—that of general chairman of arrangements. He will call the conference to order and introduce Director of Army Research Brig Gen George M. Snead Jr. for general remarks.

Following an introduction as the Superintendent of the U.S. Military Academy, Maj Gen William A. Knowlton will join with Lt Gen Betts in welcoming conferees. General Betts also will give an address on the Army R&D program in which he will discuss progress, problems and goals.

Brig Gen George M. Snead Jr.

Dr. Richard A. Weiss

Dr. John C. Hayes

Dr. Marvin E. Lasser, Army Chief Scientist, will be present in a familiar role as presiding chairman and is on the agenda for brief remarks. Dr. John C. Hayes, chief of the Technical Information Branch, Information Systems Office, is the project officer for the conference, a role he also served in 1966 and 1968.

Award-winning papers among the 100 listed for presentation during five concurrent sessions will be judged prior to the conference by a select panel of top Army scientists representative of the major disciplines. Twenty-one additional (supplemental) papers have been selected, from which alternative presentations may be chosen if necessary.

Technical presentations are limited to reports on research conducted by Army in-house laboratory personnel. The purpose is to provide them with an opportunity to be appraised on their work by an assembly of the Army's top scientists and distinguished leaders of other government agencies.

In line with the Quadripartite Agreement on weapons standardization for mutual defense, United Kingdom, Canadian and Australian R&D

Col Helmuth Sprinz

Dr. J. V. R. Kaufman

Dr. Gilford G. Quarles

Dr. Craig M. Crenshaw

Dr. Robert Watson

leaders are invited.

Dr. Craig M. Crenshaw, AMC chief scientist, is chairman of Session A. Other chairmen are Dr. Gilford G. Quarles, Office, Chief of Engineers Chief Scientific Adviser; Dr. J. V. R. Kaufman, deputy director, Plans, Research, Development and Engineering Directorate, AMC; Col Helmuth Sprinz, director, Division of Experimental Pathology, Walter Reed Army Institute of Research; and Dr. Robert B. Watson, chief, Physics, Electronics and Mechanics Branch, Physical and Engineering Sciences Division, Army Research Office, Office of the Chief of R&D (OCRD), HQ DA.

Each of the five concurrent sessions is organized into five subsessions. The subsession chairmen are:

Subsession A—Dr. Robert S. Wiseman, Electronics Command Deputy for Laboratories; Dr. R. L. Haley, scientific adviser, Missiles and Space Division, OCRD, HQ DA; Dr. Henry P. Kalmus, chief scientist, Harry Diamond Laboratories; Dr. J. P. Hallowes Jr., chief scientist, Missile Command; and Dr. R. J. Eichelberger, technical director, Ballistic Research Laboratories, Aberdeen (Md.) Proving Ground.

Subsession B—Dr. Leonard S. Wilson, chief, Environmental Sciences Division, OCRD; Frederick R. Brown, technical director, Waterways Experiment Station (WES); G. L. Arbuthnot Jr., chief, Nuclear Weapons Effects Division, WES; Dr. Sidney Ross, technical director, Frankford Arsenal; William B. Taylor, technical director, Mobility Equipment R&D Center.

Subsession C—Lt Col R. C. Chabot, commanding officer and director, Atmospheric Sciences Laboratory, White Sands (N. Mex.) Missile Range; Dr. J. W. Dawson, chief scientist, U.S. Army Research Office-Durham, N.C.; Lt Col John D. Daight, Department of Mechanics, U.S. Military Academy; H. W. Painter, technical director, Picatinny Arsenal; and Dr. A. E. Gorum, director, Army Materials and Mechanics Research Center.

Subsession D—Col I. C. Plough, commander, U.S. Army Medical R&D Command; Col D. L. Howie, chief, Life Sciences Division, Army Research Office, OCRD; Col W. H. Meroney, director and commandant, Walter Reed Army Institute of Research; Dr. H. M. El-Bisi, chief, Research Division, RD&E Directorate, HQ AMC; Dr. Dan Crozier, commander, U.S. Army Medical Research Institute of Infectious Diseases, Office of the Surgeon General, HQ DA.

Subsession E—Dr. R. B. Watson, chief, PE&M Branch, Army Research Office, OCRD; W. H. Brabson Jr., director, Research and Development, U.S. Army Aviation Systems Command; Dr. Russell D. Shelton, technical director, U.S. Army Land Warfare Laboratory; Dr. C. M. Hudson, chief scientist, U.S. Army Weapons Command; and Dr. E. N. Petrick, chief scientist, U.S. Army Tank-Automotive Command.

ASC Banquet Speaker Gains Rare Distinction

Repeat performances in winning the highest distinction the Secretary of the Army can bestow upon a nonmilitary employe, the Decoration for Exceptional Civilian Service, are extremely rare—but not as rare as a man of Dr. Ralph G. H. Siu's talents accounting for that recent honor.

Historians of notable achievements in Army science may be hard put in future years in deciding Dr. Siu's greatest claim to enduring fame—as a researcher of top stature, as a scientific administrator, as a planner and innovator, or as a humorous sage who has delighted many thousands.

When Lt Gen H. A. Miley, Army Materiel Command Deputy CG, presented the second Exceptional Civilian Service Award to Dr. Siu in recent ceremonies at AMC Headquarters, however, the honor definitely was for remarkable achievements as a scientific administrator and program planner. The citation states, in part:

"Through his dynamic leadership, professional competence, and eminent executive ability, he made an *immeasurable contribution* to the mission of conceiving, developing and fielding the vast materiel needed by the modern Army. . . ."

Until he resigned in October 1968 to accept a Presidential appointment as associate administrator of Law Enforcement Assistance and director of the National Institute of Law Enforcement and Criminal Justice, Department of Justice, Dr. Siu was deputy director for Plans, Army Materiel Command Research, Development and Engineering Directorate.

In March 1969, he retired from U.S. Government employment after more than 25 years service. Since then he has been exercising his exceptional secondary talents as a man who believes that humor in an uptight situation is an unfailing source of strength, and one of God's greatest gifts, to be bestowed lavishly in easing tensions—by lecturing at universities throughout the nation and by working on books and articles for professional publications.

To long-time readers of the *Army Research and Development Newsmagazine*, dating back to the 1961–65 period, Dr. Siu will be remembered as the author of "T-Thoughts," a column in which he used quotations and anecdotes from the wisdom of the ages to apply to Army R&D situations. When he ceased that effort, our readers lost a source of unfailing humor.

Scientific achievements of Dr. Siu are too numerous to cite in detail again, as was done in this publication in May 1966 when he was an Army nominee for the Rockefeller Public Service Award. His accomplishments also were recognized in March 1961 when he was honored by the National Civil Service League as one of the nation's top 10 U.S. Government career employes.

Dr. Siu started his government career as a research scientist with the Department of Agriculture. His association with the Army began in 1945 with the Quartermaster Corps and continued with the QMC until the Army-wide reorganization in 1962 transferred him to the U.S. Army Materiel Command.

During that 17-year span his notable research included highly significant work on the microbiological causes of deterioration of Army materiel in World War II. He also gained international renown as the founder of the U.S. Army's Irradiated Food Program. Results have since had a profound worldwide impact, through efforts of the United Nations to solve the food problem in underdeveloped countries.

In all sectors of the Army R&D community, Dr. Siu has made himself almost legendary—not the least notably by his finesse and scientific acumen as the first chairman of The Army Research Council (TARC), which was concerned with developing long-range plans for in-house laboratories.

From the viewpoint of a select group of about 500 Army key scientists and R&D representatives of other U.S. Government agencies, as well as of the Quadripartitie Agreement nations united in effort for common defense, Dr. Siu is perhaps best known as the "perennial toastmaster" for the biennial Army Science Conference at the United States Military Academy, West Point.

This year he will attend that June 16–19 meeting in a new role—as guest speaker at the conference banquet. Chief of R&D Lt Gen Austin W. Betts will take over as toastmaster.

HumRRO Develops SFTS to Reduce Helicopter Pilot Training Time

(Continued from page 1)

tremendous potential for civilian flight training as well as for military requirements, the simulator is being installed at the U.S. Army Aviation School, Fort Rucker, Ala.

Designed in accordance with HumRRO training specifications developed after extensive studies, the Synthetic Flight Training System (SFTS) was described to the U.S. Congress last year as having the capability of substantially reducing helicopter pilot training time and costs.

Congress was advised that feasibility studies indicate the SFTS will reduce training time in operational aircraft from 50 to 40 hours. Translated into U.S. Army requirements, involving the training of some 6,700 helicopter pilots annually, that means a yearly saving of $1.7 million; also, release of 47 helicopters, valued at $10 million for other uses.

The initial model at Fort Rucker will simulate the flight characteristics of the Army's "workhorse," the UH–1H (Huey) helicopter.

The SFTS will feature the latest state-of-the-art advances in hardware and incorporate the most modern training techniques, such as *adaptive training*, as part of its design concept.

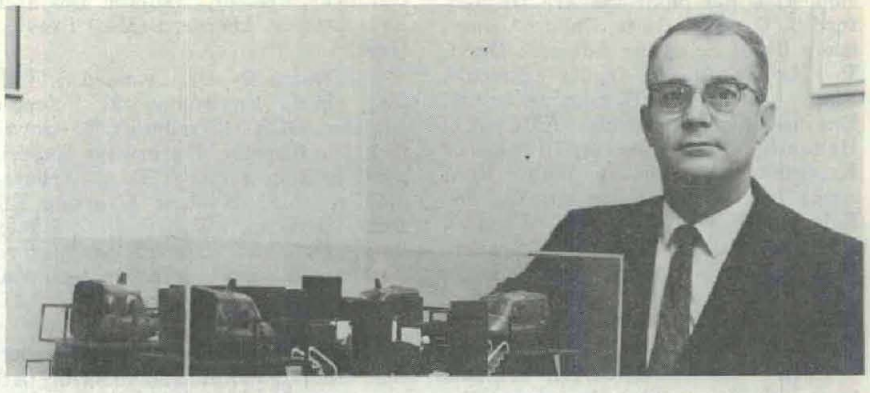
In adaptive training, the problems presented to a student vary as a function, usually, of his immediate past performance. While this is reasonably easy for a skillful teacher to accomplish, in a tutorial situation (one instructor to one student), it becomes much more difficult as the student-to-teacher ratio increases.

Automatic training devices have typically been even less adaptive (and therefore less efficient) because the sequence of problems is usually preprogramed and proceeds without regard to student performance.

In earlier generations of flight training simulators, the instructor has manipulated training problems while the student practiced flight skills much as if he were in an actual aircraft.

The SFTS will provide the same high-fidelity simulation but will automate most of the traditional instructor functions—determining what the trainee is to do, briefing him on the flight maneuvers to be performed, demonstrating the desired performance, scoring the trainee, modifying his behavior as required, and providing him feedback concerning his performance.

In the SFTS, these functions will be controlled by a large-capacity, general-purpose digital computer. In making the computer control adaptive, HumRRO scientists at Division No. 6 (Aviation), headed by Dr. Paul W. Caro Jr., had first to develop a means for measuring training performance. Then they identified adjustable features of flight problems which change their difficulty (the adaptive variables). Finally, they developed the logic that enables the computer to change automatically the adaptive variables as a function of trainee performance.



HumRRO Division No. 6 (Aviation) senior scientist Dr. Paul W. Caro Jr. poses with model of Synthetic Flight Training System (SFTS), which is being installed at the United States Army Aviation School, Fort Rucker, Ala.

The Simulator's major components will include four trainee stations (cockpits), an instructor station, and a digital computer. A broad range of software programs will be available for the computer in addition to the adaptive training feature, such as:

- Scoring programs will contain the criteria for evaluating all aspects of trainee performance.
- A sophisticated aircraft simulation program will provide high-fidelity realism.
- Flight demonstration program will "fly" the simulator realistically to show the trainee the desired performance.

The SFTS will evolve eventually into a massive helicopter instrument training complex to facilitate simultaneous instruction of more pilots at a minimum cost, while maintaining the present high standard of aviator proficiency.

The system will have the capability of simulating aircraft other than the UH–1H helicopter, and can be used to give periodic checkrides for qualified pilots. Because its computer can provide instant readouts of every phase of the pilot's control of his "aircraft," a more thorough and objective evaluation of pilot performance is possible than could be made by even the most experienced instructor pilot, HumRRO reports.

The Army may set up additional SFTS modules at sites other than Fort Rucker as the need arises.

Link Division of The Singer Co., experienced in producing flight simulators for both civilian and military use, is developing the SFTS under contract to the Naval Training Device Center. Representatives of the other military services, as well as civilian airlines, have expressed considerable interest in the SFTS, and are following its development at Fort Rucker.

Army Awards $137.8 Million For Safeguard Launch Site

Award of a $137,858,850 Safeguard Ballistic Missile Defense System contract for construction of a launch site in the Grand Forks, N.D., area was announced this month by the Department of the Army.

Morrison-Knudsen Co. of Boise, Idaho, headed a joint venture in submitting the successful bid in competition with two other firms—the only contenders among 23 construction companies invited to file bids.

Other firms in the joint venture are Peter Kiewit Sons, Inc., Omaha, Neb.; Fischbach and Moore, Inc., Denver, Colo., and C. H. Leavell and Co., El Paso, Tex. A separate $3,845,000 contract was awarded to Zurn Engineers, Upland, Calif., for construction of the water supply system.

Included in the construction project will be a Perimeter Acquisition Radar (PAR) building and associated power plant, Missile Site Radar building with associated power plant, and launching facilities for Sprint and Spartan missiles.

DoD Requests $2.069 Billion for FY 1971 Construction

Construction projects proposed in FY 1971 at U.S. Army installations are listed in a proposal submitted by the Department of Defense to the Congress, requesting $2,069,094,000 new authorization in support of the Armed Forces, DoD agencies and the Reserve Components.

Construction is proposed to "strengthen and improve the combat readiness and capabilities of military land, sea and air forces wherever they may be stationed, and to provide the modern facilities required to support the advanced weapons and defense systems with which they are equipped."

The proposed program includes projects at 260 military installations in the United States and at overseas bases in the Caribbean, Europe, Pacific Islands, Japan and Korea. Included in $809,038,000 for military family housing is $196,507,000 for 8,000 units in the U.S. and overseas.

Army projects as proposed are: Alabama Army Ammunition Plant, $117,000; Anniston (Ala.) Army Depot, $915,000; Fort Rucker, Ala., $1,435,000; Fort Wainwright, Alaska, $2,430,000; Fort Huachuca, Ariz., $2,383,000; Yuma (Ariz.) Proving Ground, $1,798,000; Fort Ord, Calif., $3,497,000; Hunter-Liggett Military Reservation near Fort Ord, $3,659,000;

Oakland (Calif.) Army Base, $1,458,000; Presidio of Monterey, Calif., $2,635,000; Presidio of San Francisco, Calif., $7,004,000; Sierra (Calif.) Army Depot, $369,000; Fort Carson, Colo., $846,000; Walter Reed Army Medical Center, Washington, D.C. $10,216,000; Atlanta (Ga.) Army Depot, $117,000; Fort Benning, Ga., $55,000; Fort Gordon, Ga., $31,447,000; Fort Stewart, Ga., $1,534,000; Schofield Barracks (Hawaii), $2,955,000; and

Fort Sheridan, Ill., $2,488,000; Rock Island Arsenal, Ill., $2,750,000; Tooele (Utah) Army Depot, $249,000; Fort Belvoir, Va., $4,959,000; Fort Eustis, Va., $260,000; Fort Lee, Va., $98,000; Fort Myer, Va., $525,000; Radford (Va.) Arsenal, $2,333,000; Vint Hill Farms, Va., $475,000; Fort Benjamin Harrison, Ind., $523,000; Iowa Ammunition Plant, $300,000; Fort Leavenworth, Kans., $3,617,000; Fort Riley, Kans., $7,881,000; Fort Campbell, Ky., $497,000; Fort Knox, Ky., $8,249,000; and

Fort Leonard Wood, Mo., $1,946,000; Topographic Command, Mo., $558,000; Cornhusker Army Ammunition Plant, Neb., $650,000; Burlington (N.J.) Army Ammunition Plant, $384,000; Military Ocean Terminal, Bayonne, N.J., $3,440,000; Fort Dix, N.J., $11,671,000; Fort Monmouth, N.J., $3,274,000; Picatinny Arsenal, N.J., $752,000; and

White Sands (N. Mex.) Missile Range, $2,261,000; Fort Hamilton, N.Y., $575,000; U.S. Military Academy, N.Y., $8,519,000; Watervliet (N.Y.) Arsenal, $1,362,000; Fort Sill, Okla., $581,000; Carlisle Barracks, Pa., $503,000; and

Letterkenny Army Depot, Pa., $410,000; New Cumberland (Pa.) Army Depot, $99,000; Tobyhanna Army Depot, Pa., $115,000; Fort Jackson, S.C., $506,000; Charleston (S.C.) Army Depot, $67,000; Fort Lewis, Wash., $1,567,000; Badger Ammunition Plant, Wis., $1,604,000; and

Burtonwood Army Depot (England), $1,191,000; Vietnam, $40,000,000; various locations overseas, $52,535,000; Army Reserve Components (various), $9,078,000.

New housing proposals call for 200 units at Redstone (Ala.) Arsenal, 100 at Fort Huachuca, Ariz., 220 at Fort Carson, Colo., 40 at Rock Island (Ill.) Arsenal, 150 at Fort Leavenworth, Kans., 28 at Natick (Mass.) Laboratories, 200 at Malmstrom (Mont.) ABM site; 200 at Grand Forks (N.D.) ABM site, 20 at New Cumberland (Pa.) Army Depot, and 240 at Fort Jackson, S.C.

CE Realigns Field Elements to Absorb Cutbacks

Reorganization of U.S. Army Corps of Engineers military construction field elements resulting in reduction of 900 manpower spaces and annual savings of $10.8 million in operational costs was announced Mar. 6.

Involved in the realignment is a transfer of responsibility for military construction from seven district and three division offices to other field organizations. None of the division or district offices will be closed and they will continue civil works construction functions.

Transfers will be made from the Army Engineer Office at Waltham, Mass., to the New York District; from Norfolk, Va., and Louisville, Ky., Districts (except Indiana) to Baltimore, Md.; from Chicago, Kansas City and Louisville (Indiana) Districts to the Omaha (Neb.) District; from Seattle, Wash., to Sacramento (Calif.) District; from Jacksonville, Fla., to Mobile (Ala.) District; and from Albuquerque (N. Mex.) to Fort Worth (Tex.) District.

Military construction responsibility will be continued in Engineer Districts at Los Angeles, Calif.; Savannah, Ga.; Anchorage, Alaska, and Honolulu, Hawaii (Pacific Ocean Division). The staff of the Honolulu District will be merged with the Pacific Ocean Division.

Other adjustments in the Army Corps of Engineers field organization are the centralization in Chicago of civil works project design for the Buffalo, Detroit, and Chicago Districts; the provision of administrative support to Buffalo District by the Detroit District; centralization in the Sacramento District of military design for Los Angeles and Sacramento Districts; and personnel reductions in the Lake Survey District, Detroit, Mich.; Little Rock District, Ark.; Canaveral District, Fla.; Alaska District, Anchorage, Alaska, and the Waterways Experiment Station, Miss.

In an effort to keep layoffs at a minimum, personnel reductions will be by normal attrition wherever possible. Affected employes will be entitled to benefits under the Department of Defense Stability of Employment Program for career employes, including priority rights to vacancies in other Department of Defense activities and priority reemployment. The Corps presently has a 36,200 employe construction force.

MICOM Engineers Seek New Missile Target System

Army Missile Command engineers at Redstone Arsenal, Ala., recently conducted research tests that involved BATS, two railroad cars, and a collision—to help the Army select a missile target from two competing contractors.

BATS denotes Ballistic Aerial Target System and the Army will use the targets as training devices for soldiers equipped with air-defense weapons. Intended to replace more sophisticated targets for a significant portion of the training program, BATS will be comparable to a clay pigeon, a one-shot device.

To determine suitability for packaging and transportation, Redstone engineers recently loaded two railroad cars with these targets. As part of the test, one car was rammed into the other at speeds varying from four to eight miles an hour.

Additional tests, including actual firings, are to be staged at Fort Bliss, Tex. After evaluating all test data, the Army will make a production decision on BATS, which is intended as a target for such Army weapons as the Vulcan, Chaparral and Redeye missiles.

Lt Col R. P. Loshbough is chief of the Air Defense Control and Targets Project Office managing the BATS program.

Army Materiel Command Expands Training Effort for PROMAP-70 Personnel

Upgrading of management capabilities of personnel assigned to the U.S. Army Materiel Command Program for Refinement of the Materiel Acquisition Process (PROMAP–70) is the objective of an expanding training effort.

In line with goals set by Deputy Secretary of Defense David Packard and Secretary of the Army Stanley R. Resor, PROMAP–70 is designed to streamline the development, procurement and production of major weapon systems and materiel items.

AMC responsibilities in this area are broad, involving expenditures of $14 to $15 billion annually—about half the Army's total budget.

PROMAP–70 activities, directed by Maj Gen Paul A. Feyereisen, extend through all AMC HQ directorates, staff elements, and major commands. Implementation is assigned to selected personnel as well as to program/project managers for 48 elements.

Relative to the recent announcement of the expanded training for PROMAP–70 personnel at all levels is a statement by J. Ronald Fox, Assistant Secretary of the Army (Installations and Logistics), as follows:

"If there is one thing which we have learned from our past efforts to make improvements in the management systems area, it is that regulations, instructions, and guides, by themselves, are insufficient to bring about improvements. They must be accompanied by practical, problem-oriented training programs. . . . If we do not provide this training for our key personnel, our new management systems are likely to amount to little more than facades."

In responding to the broad range of the PROMAP–70 training requirements, the AMC has concentrated on developing a totally integrated systematic approach which complements the entire acquisition process, from concept formulation through the production phase.

AMC has identified requirements for new courses in 15 specific subject areas needed to achieve the proper educational level of personnel responsible for improving the weapon system acquisition process. These areas encompass acquisition management, concept formulation, contract definition, engineering research and development, test and evaluation, and production.

Within these areas, the envisioned PROMAP–70 training plan includes new courses that involve an estimated annual input of 3,900 students, an increased input to existing AMC and other DoD courses, and an extensive in-house orientation program to be conducted by AMC functional managers and major subordinate commands.

Some of the courses in the planning and development stage are Cost Analysis; Configuration Management; Technical Risk Analysis; Systems Engineering Techniques; Integrated Logistics Support; and Preparation of Industrial Plant Equipment for Storage or Shipment (Mobilization Production Package Program.)

Two additional new courses in an advanced stage of development are Cost Estimating Techniques for Systems Acquisition, and Managing with Contractor Performance Measurement Data.

AMC's Army Logistics Management Center at Fort Lee, Va., has added a 5–week Cost Estimating Techniques for Systems Acquisition course to its on-campus curriculum. It will be given Mar. 16 through Apr. 17 and May 18 through June 19, and is scheduled for seven sessions during Fiscal Year 1971.

Each class will have an enrollment of approximately 30 students consisting of project engineers and personnel in procurement and production involved in cost estimating at HQ AMC and its commodity commands.

Among the subjects to be covered are mathematics, statistics, confidence limits and tests of hypotheses, economics, accounting, learning curve, cost analysis, life cycle and data collection.

As progress is made toward full implementation of the DoD cost/schedule control systems criteria, full benefits will not be derived unless project managers, contracting officers and other key personnel associated with project planning and execution are adequately trained in analysis and use of these data.

To accomplish this training, AMC's Army Management Engineering Training Agency at Rock Island, Ill., has been tasked to develop and present a 2–week course, six times yearly, on "Managing With Contractor Performance Measurement Data."

The course will rely heavily on the use of case studies designed to illustrate the review and analysis of data rather than on calculations. It is designed for project managers, contracting officers and other key personnel associated with projects required to implement the cost/schedule control systems criteria.

Approximately 15 case studies are under development, and it is anticipated that the Training Agency will present the first class early in the first quarter of FY 1971.

Maj Gen deSaussure to Succeed Davisson as WSMR CG

Command of White Sands (N. Mex.) Missile Range will pass to Maj Gen Edward H. deSaussure Jr., following retirement of Maj Gen H. G. Davisson on Mar. 31. General Davisson has commanded WSMR since October 1966.

General deSaussure served until he assumed his new duties as commander of Joint Task Force 8 and the Test Command, Defense Atomic Support Agency, Sandia Base, N. Mex. In this capacity, he also was assigned responsibility for removing radiological hazards from Bikini Atoll as part of a joint government agency project to prepare the atoll for resettlement.

During 1967–68 he was deputy chairman and then chairman of the Joint Chiefs of Staff (JCS) Special Studies Group in Washington, D.C. In Vietnam he served in various capacities, including assistant commander, 1st Cavalry Division (Airmobile), following a 1964–65 assignment as the Army member of the Chairman's Staff Group, JCS.

While at Fort Sill, Okla. (1961–63), he was director of the Guided Missile Department at the Artillery School and CO of the 9th Field Artillery Missile Group. During this time, he also participated in training Sergeant and Pershing missile battalions for deployment to Europe and the Pacific.

General deSaussure graduated from the U.S. Military Academy in 1941 and earned an MS degree in electrical engineering from Johns Hopkins University in 1949. He served in the Pacific Theater of Operations during World War II and in 1946 was aide-de-camp to General Jacob L. Devers, when he commanded U.S. Army ground forces.

Maj Gen Edward H. deSaussure Jr.

GATE Providing for Field Testing of Army Equipment

High-precision capabilities of a new computer-controlled system termed GATE (General-Purpose Automatic Test Equipment) promises to minimize the need for return of many items of Army field equipment to laboratories for testing—especially electrical and electronic gear.

Reported as a development of the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., in conjunction with Hewlett-Packard Co., GATE is expected to yield important savings in time and money. It permits testing in the field or at the nearest depot.

Termed ideally suited for testing where high reliability and little maintenance are required, the GATE system uses standard programable instruments, with a minimum of custom-designed interface units to provide output stimuli, response measurement, and processing and recording of test data.

In software programing, the system uses a simple computer language which enables the operator or programer to use English-like statements. By using an interpretive compiler, resident in the system's computer memory at all times, a soldier without special training may become a "programer"—since a program can be written by typing instructions directly into the computer on the teleprinter.

After a test program is written, it is checked immediately for inaccuracies. Corrections can be made without time-consuming delays associated with off-line compiling.

The GATE system uses the HP 2116B computer and other standard programable instruments, each interfaced with one or more input/output logic cards.

A card accepts instruction in computer language and converts the information to a form which controls the instrument. By using input/output cards to interface instruments, the computer can be adapted to control an extensive combination of instruments.

System control is either through manual keyboard entry on the teleprinter or by prepared programs via the punched tape reader. The system weighs approximately 1,950 pounds and will be housed in an airconditioned field depot.

The Mobility Equipment R&D Center conducted an operator's training course for a number of Department of Defense personnel in October, and a training class for technicians on how to maintain the equipment was conducted in December 1969.

A $1,057,748 contract has been awarded to Hewlett-Packard for six of the GATE systems for the Department of Defense.

Explorer I Satellite Burns Up After 12-Year Journey in Space

Explorer I, launched by the Army as this nation's first satellite at 10:56 p.m. (EST), Jan. 31, 1958, plunged into the earth's atmosphere over the South Pacific and burned up at 5:57 a.m. (EST), Mar. 31, 1970.

The 30.8-pound, 80-inch stovepipe-shaped satellite died several hours ahead of schedule after circling the earth every 101 minutes for more than 12 years.

The space defense center at North American Air Defense Command headquarters said the erratic orbit of the satellite made final calculations difficult. Instead of burning up over Burma, as first predicted, the Explorer entered the atmosphere between 500 and 1,000 miles southwest of Easter Island—halfway between New Zealand and South America.

(For feature story on ceremonies commemorating Explorer I's decade in orbit, see January 1968 issue of the Newsmagazine, p. 1.)

Picatinny Simulates Electromagnetic Field Hazards

Susceptibility of munitions to unplanned detonation from effects of high-powered electromagnetic fields can be tested with improved accuracy in one of the newest research facilities at Picatinny Arsenal.

The electromagnetic hazard simulation chamber is believed unique in its capability of creating concentrated power (radiation up to 10,000 watts) and dissipating it at the chamber's center for test purposes.

Through electronic measurement of the power in the test environment, the chamber provides a means of estimating the amount of current that flows to the precise spot in a munitions item where a detonator would be placed.

Test results enable the munitions engineer to determine how susceptible a propellant may be to the hazard from sources of electromagnetic fields. Included among such sources are nuclear bursts, lightning, a static charge, or communications and radar systems.

Researchers say the chamber is four orders of magnitude more efficient than an antenna for establishing high-quality electromagnetic fields for testing the radio frequency (RF) susceptibility of munitions to undesirable detonation.

Field intensities of 100 V/m can be established that are uniform over a 20-foot diameter and can have a field impedance of 377 ohms or greater than 4,000 ohms; also, 266 ma/meter with impedance less than 40 ohms. The system now operates over the frequency range from 300 kHz to 3 MHz and will soon perform down to 50 Hz.

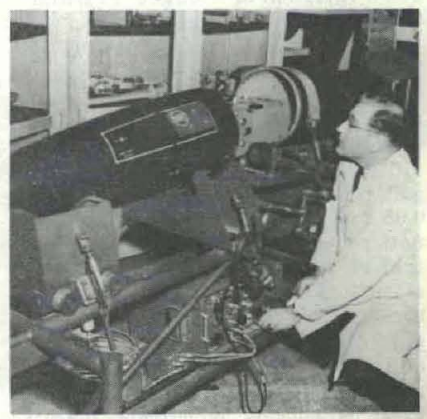
Abraham Grinoch, chief of the Evaluation Branch, Technical Services Directorate, suggested the chamber as a means of extending the low-frequency range of the test fields into the VLF range to meet requirements.

Simulating electromagnetic radiation was his solution when he felt that conventional antennas, in addition to their undesirable size, lacked the wide frequency coverage desired. He reasoned that if the impedance of the fields could be controlled, this would allow accurate determination of shielding effectiveness under realistic conditions.

Envisioned also was more accurate determination of the effect of pulse fields on munitions, at field intensities where linearity holds, provided it is possible to relate CW measurements to pulse measurements.

Electromagnetic fields established in the chamber are essentially TEM waves, guided between parallel planes as described by John D. Ryder in a technical publication, *Networks Line and Fields* (pp 378–381).

Completed in mid–1969, the chamber is 70 feet long, 30 high and 30 wide. Plans call for construction of another chamber to increase the operating frequency range to 50 MHz.



Abraham Grinoch, chief of the Evaluation Branch, Technical Services Directorate, prepares a nuclear missile warhead section for testing in the radio-frequency hazard simulation chamber, new Picatinny Arsenal facility.

Yuma PG Establishes Pyrotechnical Evaluation Range

Checkout of a Pyrotechnical Evaluation Range (PER), a new test and evaluation facility at Yuma (Ariz.) Proving Ground that permits a more comprehensive determination of effective light supplied by a flare system under deployment conditions, was recently completed.

Yuma PG is a general-purpose testing facility of the U.S. Army Test and Evaluation Command. Flare testing, prior to completion of the dynamic test range, had been restricted to static conditions for measuring light intensity, and dynamic testing for length of burn. Design and deployment were based on individual values.

Planning for the new facility began early in 1966 and in mid-1967 the Test and Evaluation Command authorized extension into a prototype range. Pyrotechnic Laboratory experts at Picatinny Arsenal were called upon to assist in completing the range layout and electrical harness design.

Construction was started late in 1968 and more than 400 miles of cable were installed within the 8,100-square foot sensor field. Development of a suitable sensor proved more of a problem than anticipated. Sensors available were quite unstable in a field environment; also, their spectral response did not closely match that of the human eye.

Picatinny Arsenal specialists, working with the Corning Glass Co., succeeded in developing the sensors now in service. Their spectral response matches that of the human eye very closely; they can withstand a temperature variation of about 40°F. without significant drift.

Working together, Yuma PG and Picatinny Arsenal personnel installed the sensors and other electrical equipment. The first flare rounds were fired over the new range Oct. 8, 1969.

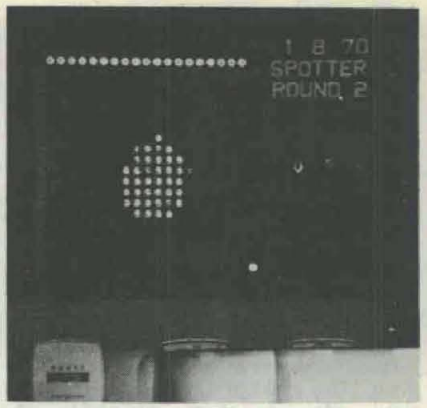
The sensors are of the "go"—"no-go" type and are set to respond to 0.05 foot-candles of light. This illumination roughly corresponds to twice that of bright moonlight during a full moon. The figure is generally accepted as the amount of light required by the soldier to be able to see and recognize a ground target at about 300 meters. With less light, figures cannot be effectively detected and held in the sights of a rifle.

During this first stage of development, Yuma PG can determine whether a flare does or does not illuminate the ground at 0.05 foot-candles, the pattern of the light on the ground, its continual change as the flare descends, and the time the flare illuminates the ground at over 0.05 foot-candles.

The illumination pattern (at right) was recorded during a test on a 4.2-inch mortar pyrotechnic round, M335A1, approximately 30 seconds after burst. (The ground area illuminated at +0.05 foot-candles is approximately 1,000,000 square meters.)

The choice of Yuma PG for the PER site was based on the excellent terrain, airspace and weather at this desert test center. PER is located on flat ground, cleared of all vegetation, and is quite remote from any habitation. Testing, which is done at night, is not affected by artificial light in the surrounding area. The range is covered by restricted airspace with an unlimited ceiling which permits air-delivered flares to be tested.

Future plans for the range include a Phase II in which actual illumination received by each sensor will be measured. In Phase III, flares will be automatically tracked and space/position recorded by a light-sensing spotter instrument.



SENSORS record illumination pattern of 4.2-inch mortar pyrotechnic round during tests at Pyrotechnic Evaluation Range, Yuma Proving Ground, Ariz.

PER is believed unique in the Free World. It offers pyrotechnic designers, testers, and users an entirely new facility for the test and evaluation of their military hardware and utilization techniques.

MRC Plans Seminar on Nonlinear Functional Analysis

An Advanced Seminar on Nonlinear Functional Analysis and Applications, sponsored by the Mathematics Research Center, is scheduled Oct. 12–14 on the Madison campus of the University of Wisconsin.

Dr. L. B. Rall, chairman of arrangements, states that experts in various aspects of the subject will provide expository lectures on recent progress. A distinguished panel of speakers from universities in the United States, Germany and Great Britain will participate.

U.S. Army personnel interested in attending should write to: Secretary, Advanced Seminar, Mathematics Research Center, University of Wisconsin, Madison, Wis. 53706.

Development of functional analysis as a mathematical discipline began approximately 50 years ago, when it was noticed that various mathematical problems under study had features in common which could be abstracted to provide a unified theory. Impetus came from the calculus of variations and the then emerging theory of integral equations.

The functional analysis ideas obtained were quickly applied also to ordinary and partial differential equations, and infinite and finite systems of algebraic equations. Much of the progress in theoretical physics before World War II, particularly in quantum mechanics, was due to the use of these mathematical tools.

Although some basic principles of nonlinear functional analysis were developed in the United States around 1930, emphasis until quite recently was on linear problems.

Along with the development of electronic digital computers came the realization that the theorems of functional analysis also have direct application to the numerical solution of many types of analytical problems.

Interest in the numerical aspects of functional analysis has been accompanied by an increase in attention to nonlinear problems which are of present importance in applications, not only in classical applied mathematics, but also in more recently developed areas such as control theory.

Textbooks and college courses on functional analysis which are available at the present time tend to emphasize the linear aspect of the subject, which is the most highly developed. The Advanced Seminar will provide an introduction to the principles and techniques of nonlinear functional analysis, including some significant applications.

The seminar will be presented on a level which does not require the participant to have had a previous course in functional analysis; however, mathematical maturity is essential, and some previous orientation in the subject is desirable so that maximum benefit may be obtained from lectures.

Interservice Meet Deals With Gun Tube Erosion, Metal Fatigue

Gun tube erosion and control methods to reduce damage estimated at millions of dollars annually were considered recently at an interservice meeting termed the most comprehensive of its kind in 17 years.

Watervliet (N.Y.) Arsenal was host to the gathering of some 80 experts, including 64 from Army, Navy and Air Force agencies, as well as representatives of industry, the United Kingdom and Canada.

Col William Mulheron Jr., arsenal commander, gave the address of welcome and introduced Dr. R. E. Weigle, arsenal chief scientist and general chairman for the meeting. Dr. Craig M. Crenshaw, U.S. Army Materiel Command chief scientist, was the banquet speaker. In discussing "Military Scientists of Yore," he reviewed many of their outstanding contributions to world progress for many centuries.

Erosion and metal fatigue are the most important factors contributing to early condemnation of gun tubes. Causes and possible preventive measures have been studied about 75 years. The most intensive effort was during World War II under sponsorship of the National Defense Research Committee in Washington, D.C.

Interest in coordinated effort to improve understanding of the causes of erosion lagged following the last major symposium on the subject in 1952 under sponsorship of the Office of the Chief of Ordnance. Various U.S. Government agencies and private industry, however, continued small-scale investigations.

The Watervliet symposium thus provided an opportunity to review progress of research intensified in recent years as a result of the conflict in Southeast Asia. Foreign speakers included S. W. Hollingum and Mrs. Doris J. Taylor of the Royal Armament R&D Establishment, England, and Dr. A. K. Roberts and J. T. Bedard from the Canadian Defence Research Establishment.

Dr. Iqbal Ahmad, chief of the Physical Chemistry Laboratory at Watervliet Arsenal, presented a technical paper reporting on recent results. In 1966, he said, the 175mm M113 gun tube had average fatigue life of 400 EFC (effective full-charge) rounds. This was increased to 2,350 rounds by the autofrettage process developed by Watervliet researchers.

Erosion problems of gun tubes, Dr. Ahmad said, go hand-in-hand with those of fatigue and are linked to the continuous demand for higher muzzle velocities and higher rates of fire. He stressed the need for a well-coordinated research and development effort, using a systems approach, in the Department of Defense to improve erosion and fatigue control.

Dr. Peter R. Kosting, a consultant to the U.S. Army Materiel Command who has been active in weapons research since World War II, discussed the history of research on erosion. He cited the significant work done by Col H. H. Zornig of Watertown (Mass.) Arsenal in introducing the systems approach to erosion studies in World War II.

N. T. Ebihara, U.S. Army Weapons Command, reported on the erosion characteristics in a 7.62mm gun tube at various stages of firing up to 3,000 rounds. Herman Gay, chief engineer, U.S. Army Ballistic Research Laboratories, described results of BRL erosion studies.

G. L. Warlick, manager of the Propulsion Laboratory, U.S. Naval Ordnance Station, Indian Head, Md., was chairman of a session devoted to the introduction of wear-reducing additives such as TiO_2-wax, termed one of the most important advances in erosion control in two decades.

Warlick said the Naval Ordnance Station (NOS) has experimented with NACO (Navy Coolant), essentially an improved Canadian polyurethane coolant. Proven ground life of most gun tubes was extended by a 4 to 1 ratio in many cases, he said, with some improvement much higher. D. E. Ayer, also with the NOS, described the successful use of an erosion deterrent coating (Methyl Centralite) on a propellant in 20mm gun tubes.

Harry Hassman of Picatinny Arsenal, Dover, N.J., reviewed advances in wear-reducing additives and evaluation data on gun systems ranging from the 90mm tank gun through the 175mm self-propelled howitzer. Russell L. Trask of Picatinny Arsenal also reported on an additive he believes is superior to TiO_2-wax.

Dr. James F. Kowalick of Frankford Arsenal explained an improved fabrication process—the explosive-charge lining of gun barrels.

Small arms barrel erosion related to thermochemical properties of the propellant and additives was discussed by Marvin F. Levey of Frankford Arsenal, Philadelphia, Pa. Dale Davis, technical director, Guns and Rockets Branch, Eglin Air Force Base, Fla., presided at a session on materials aspects of erosion control.

Other technical papers reported results of research on erosion-resistant coatings, additives, fabrication of bimetal barrels, swaging and shrink fitting techniques, super alloys for high temperatures in gun tubes, and improved tube design.

Presentations were made by Frederick R. Gruner, Army Small Arms Systems Agency, Aberdeen (Md.) Proving Ground; Robert Thierry, Watervliet Arsenal; W. R. Brown, Cornell Aeronautical Laboratory; Dr. W. Beeuwkes and G. G. Wakefield, Texas Instrument Co.; and Paul K. Rummel, chief, Development Engineering Laboratory, Watervliet Arsenal, who also presided as chairman of a concluding general discussion.

Problem areas warranting intensive effort, it was indicated, are: elucidation of the mechanisms of the wear-reducing action of additives; improvement of design and materials of rotating bands in gun tubes; development of coatings better than chrome; and

Determination of physio-mechanical properties of refractory metal and alloys under dynamic conditions at elevated temperatures; new or improved techniques of applying coatings; liner and tube fabrications from suitable erosion-resistant super alloys; and formulation of high-energy propellants with low flame temperatures.

Each conferee received an up-to-date bibliography on the subject of gun tube erosion and control. After further modification, the bibliography will be included in the symposium proceedings to be issued as a Watervliet Arsenal technical publication.

'Call Me Hussein', King Says To ECOM Ham Radio Operator

Ham radio operator George Diak, a technician with the Army Electronics Command Institute for Exploratory Research, recently called CQ DX and very surprisingly got HM—that is, His Majesty King Hussein of Jordan.

Diak, whose call letters are W2FWE, went on the air, 20-meter, single-sideband, looking for someone to talk to, preferably at a distance—DX—and picked up an operator at JY1APG, in Jordan. Queried as to his identity, the Jordanian operator replied that he was "Hussein."

Somewhat flustered when he suspected he was talking to royalty Diak referred to his caller as "Your Excellency," instead of "Your Majesty." In the democratic language of hams, the king said, "Call me Hussein."

His Majesty's QSL card acknowledging the conversation recently was received by Diak at his home in Middletown, N.J.

AMC Initiates Procurement Cost Analysis Review

In-depth procurement cost analysis review of related factors in operations of a major firm which holds production contracts for more than $100 million was initiated recently by the U.S. Army Materiel Command.

AMC's objective is to develop a capability for coordinated in-depth procurement cost analysis review to appraise the reasonableness of direct and indirect costs in contractor proposals. Involved is a determination of what a major weapon acquisition *should* cost under noncompetitive conditions rather than what it *will* cost, if special provisions are not made.

This "should-cost" estimate is a coordinated analysis of a contractor's business management, cost estimating, and production engineering procedures.

AMC's approach assumes that the inefficiencies associated with noncompetitive procurement may be identified through the coordinated effort of a government evaluation team, and that the cost impact of these inefficiencies may be eliminated during contract negotiations.

Analytical review of a defense contractor is one of 48 different tasks which AMC has undertaken in an effort to field better weapon systems and equipment more economically. Army plans for development of should-cost analysis capability is an important goal in the command's Program for Refinement of the Materiel Acquisition Process for the 1970s (PROMAP–70).

In its first in-depth study of a major weapons contractor, the PROMAP–70 should-cost task force team is currently performing an on-site review. The team is composed of 28 AMC specialists including cost analysis, contract audit, industrial engineering and procurement management personnel.

Basically an AMC Missile Command team, it is supplemented by specialists from HQ AMC, other major subordinate commands, and Defense Contract Audit Agency and Defense Contract Administrative Services.

Results of this first study will determine the extent to which AMC expands this effort. AMC expects to apply should-cost concepts to a wide range of major weapon system acquisitions. The team's final report is intended to serve as a practical tool to provide contracting officers with back-up information in negotiations to cut costs at the plant.

A procedures guide is being developed concurrently with the performance of the on-site analysis at the defense contractor's plant.

CDCEC Realigns to Offset Cut in Military Strength

Budgetary reductions that cut the military strength by 1,051 personnel necessitated a recent reorganization at the U.S. Army Combat Developments Command's Experimentation Command at Ford Ord, Calif.

Commanding Officer Col Thomas W. Brown said the reduction of military jobs will be completed by June 30, involving realignment of some units, elimination of others, and an over-all tightening of the budget.

HQ CDCEC is being functionally realigned to carry on the command mission efficiently despite the economies, including retention of hardcore experimentation capabilities. Additional troops or units will be called in when an experiment requires more manpower.

Col Brown said the capacity to analyze, research, plan, control, instrument and report on experimentation has been preserved, as well as the ability to conduct experiments in the areas of mounted combat, dismounted combat, combat support and aviation.

Ceremonies Mar. 18 marked the inactivation of the Experimentation Battalion (Armor), the change of command for the Experimentation Battalion (Infantry), and activation of the new Experimentation Brigade (Provisional).

In other changes, Troop E, 9th Cavalry, previously assigned to the Experimentation Battalion (Armor), was relocated from Camp Roberts when it closed and returned to the CDCEC; HQ Company of the EDA, Battery E of the 78th Artillery, and Company D of 73d Armor, all at Camp Roberts, were eliminated.

The new Experimentation Brigade will exercise command and control of all subordinate support and player units. Upon completion of the reorganization, the CDCEC will consist of two battalion-size units and two company-size units.

The Field Support Company and one Transportation Company will be located at the Hunter Liggett Military Reservation, 88 miles south of HQ CDCEC, in support of the CDCEC Field Laboratory on Liggett.

Equipment has been reduced and by June 30 will include 67 combat vehicles.

The CDCEC is the only experimentation organization of its kind in the U.S. Army, with the mission of improving Today's Army while designing the Army of Tomorrow.

STRATCOM Establishes ATSO at Fort Huachuca

An Advanced Telecommunications Sciences Office (ATSO) was established by the U.S. Army Strategic Communications Command (STRATCOM), Fort Huachuca, Ariz.

ATSO's function is to provide guidance in the development and operation of future telecommunications systems designed for use by the Department of Defense and Department of the Army.

STRATCOM Commander Maj Gen William B. Latta announced the creation of ATSO in mid-March and named Peter B. Pichetto acting director. Formerly STRATCOM's chief engineer, Pichetto is also ATSO's associate director for Advanced Engineering.

Others given key posts in ATSO are William T. Craven, acting associate director for Advanced Concepts, and Eric R. Osborne, acting associate director for Advanced Requirements and Technology.

As an integral part of its mission, ATSO will formulate, develop and investigate hypotheses which may lead to advanced telecommunications conceptual solutions, systems planning and developments in support of defense requirements. The office also will develop and engineer telecommunications systems which are the responsibility of STRATCOM.

ASTA Tests to Standardize Hovering Performance Data

In an effort to develop a procedure for correcting hovering-performance data obtained in winds, which frequently are beyond the desirable level for testing at Edwards Air Force Base, Calif., the U.S. Army Aviation Systems Test Activity is conducting a study.

Cooperating with ASTA personnel in the study are researchers from Serendipity Associates. A preliminary method has been developed by which hovering data may be obtained in a disturbed atmosphere and then corrected to zero wind conditions.

Actual field testing of the procedure will determine its feasibility for obtaining reliable test data. If proved acceptable, the procedure is envisioned as being of major importance to all military services engaged in testing helicopters.

Examination of test programs at the Aviation Systems Test Activity has revealed that considerable time and money are spent in obtaining required hovering performance data of aircraft for inclusion in reports. High sensitivity of helicopter rotors to winds can cause large performance variations from relatively small amounts of wind in-flow.

RDT&E, Procurement Contracts Sink to $151 Million

Continuing reductions in Department of Defense spending are reflected in a 10-year low total (for a corresponding period) of $151,611,736 for Army research, development, test, evaluation and materiel or services procurement contracts from Feb. 11 to Mar. 14. Only $1 million or more contracts are listed in this compilation.

The largest award of $14,202,533 was to Day & Zimmerman, Inc., for loading, assembling and packing ammunition and related components, followed by $13 million to Philco Ford Corp. for electronics equipment.

Olin Corp. received three contracts totaling $11,398,513 for .45-caliber ball cartridges and for operating facilities at Army ammunition plants. Raytheon Co. will be paid $10,993,000 (two contracts) for repair and modification of radars to function as doppler velocimeters, and for advanced development of the SAM–D missile system.

Contracts under $10 million. Sperry Rand Corp., $9,438,972 for production, loading, assembling and packing of projectiles; Remington Arms Co., Inc., $8,268,212 for operation of ammunition facilities; AVCO Corp., $6,695,000 for rotor modification kits for turbine engines; and

Honeywell, Inc., $6,603,319 (three contracts) for grenade fuzes; National Gypsum Co., $5,410,548 and Uniroyal, Inc., $5,188,636 for operation of ammunition facilities; Gulf and Western Industries, Inc., $4,261,711 (two contracts) for 40mm cartridge cases and assemblies; and

Chamberlain Manufacturing Co., $4,218,250 for 81mm projectiles; Norris Industries, Inc., $4,136,000 for 81mm projectiles; Whittaker Power System Corp., $3,578,949 for generator sets; General Motors Corp., $3,237,319 for vehicle installation units, spares and transfer assemblies;

Lasko Metal Products, Inc., $2,934,484 for bomb dispensers; Raytheon Co., $2,734,740 for fuze units; Brunswick Corp., $2,536,485 (two contracts) for 2.75-inch rocket launchers and ground illuminating parachute signals; and

General Instrument Corp., $2,500,000 for electronic equipment; Barrett Intercommunication Products Corp., Brooklyn, N.Y., $2,448,997 for telephone sets; Martin Marietta Corp., $2,139,967 for Pershing missile system; International Harvestor Co., $2,071,000 for turbo-alternators; and Goodyear Tire and Rubber Co., $2,047,539 for track shoe assemblies for combat tanks.

Contracts under $2 million. Hercules, Inc., $1,987,481 for operation of ammunition facilities; Union Carbinde Corp., $1,817,000 for reserve energizers for fuzes; ITT Gilfillan, Inc., $1,801,000 for radio modification kits and components of the AN/FPN–40; and

J. I. Case Co., $1,642,360 for full-tracked tractors; Wilkinson Manufacturing Co., Fort Calhoun, Neb., $1,605,000 for 81mm projectile fuzes; Global Associates, $1,528,125 for logistics support of the Kwajalein Missile Range; Scovill Manufacturing Co., $1,437,930 for grenade fuzes; and

Penguin Industries, Inc., $1,392,202 for hand grenade fuzes; REDM Corp., $1,353,000 for fuzes; Fairchild Camera and Instrument Corp., $1,350,000 for fuze units; Stewart Warner Corp., $1,278,000 for parts for 60mm projectiles; and

Harvey Aluminum, Inc., $1,172,500 for 40mm cartridge cases; Southwest Truck Body Co., $1,106,484 for shop equipment; Action Manufacturing Co., $1,056,515 for bomb tail fuze parts; and Magnavox Co., $1,039,965 for direction and memory units for M18 computers for howitzers.

NOMTF Aerobee 350 Launch Scores Another WSMR First

Another first in rocketry at White Sands (N. Mex.) Missile Range occurred Mar. 24 when the U.S. Naval Ordnance Missile Test Facility (NOMTF) launched an Aerobee 350, the newest member of the Aerobee rocket family.

To date only three other Aerobee 350s have been flown, all successfully, from Wallops Island, Va., a test station of the National Aeronautics and Space Administration. This first launch from WSMR carried the heaviest NASA sounding rocket payload ever flown, 720 pounds, to a peak altitude of about 175 statute miles.

Objectives of the flight were to demonstrate the suitability of the complete Aerobee 350 sounding rocket system for scientific research to investigate solar and stellar X-ray phenomenon.

The Aerobee 350 system was developed by the NASA Goddard Space Flight Center (GSFC) to provide the scientific community with a versatile sounding rocket capable of sophisticated space research missions in the heavy-payload to moderate-altitude performance region. Aerobees 150, 150-A and 170 do not provide the capability.

Launching weight of the rocket, powered by a Nike M5E1 solid-propellant booster and a 4-engine sustainer, is about 7,400 pounds. The vehicle is 57 feet long (with payload) and has a maximum body diameter of 22 inches. A 160-foot high tower is used to launch the rocket.

After achieving full operational status, the Aerobee 350 system will be used for conducting a wide variety of important scientific missions, including stellar and solar physics investigations.

The NOMTF is responsible for all Aerobee sounding rocket firings at White Sands Missile Range, and maintains the launching facilities located near the *USS Desert Ship.*

Watervliet Research Chemist Assigned to ACTIV Team

Watervliet (N.Y.) Arsenal research chemist, Dr. Robert S. Montgomery, begins a 3-month assignment Apr. 1 in Southeast Asia as research and development specialist with the Army Concept Team in Vietnam (ACTIV).

The assignment is in support of the Vietnam Laboratory Assistance Program, Army (VLAPA), which is designed to provide U.S. combat forces with technical assistance in solving urgent materiel requirements. The U.S. Army Materiel Command has allocated VLAPA funds for these short-term, fast-response projects.

Dr. Robert S. Montgomery

Dr. Montgomery's job will be to identify priority problem areas, to transmit information to the specially qualified laboratory groups, and to provide liaison between U.S. Army Weapons Command laboratories and the field forces.

Dr. Montgomery joined the staff of the Advanced Research Laboratory of the arsenal's Maggs Research Center in July 1969. He came to Watervliet from Ingersoll-Rand Research Center, Princeton, N.J., and had previously been employed as an associate scientist at Dow Chemical Co., Midland, Mich.

A graduate of Northwestern University, he has master's degrees from Columbia University and Princeton University and a doctorate from Princeton, all in organic chemistry. He is the author of 28 articles and holds 25 U.S. patents.

Natick PRL Publishes CY 1969 Report on Research

Technical abstracts of 104 basic and applied research tasks performed during Calendar Year 1969 at the Pioneering Research Laboratory (PRL), U.S. Army Natick (Mass.) Laboratories (NLABS), are presented in a 116-page annual report.

One of six laboratories comprising NLABS, PRL is responsible for providing background research in physical, life and behavioral sciences relevant to mission areas of NLABS' assigned programs.

Stated briefly, these missions are to provide the research and development required to supply the soldier with optimum food, clothing, protective devices and individual equipment necessary for his maximum effectiveness under a wide variety of environmental conditions.

Development of these items is assigned to the NLABS' product laboratories—Food, General Equipment and Packaging, Clothing and Personal Life Support Equipment, and Airdrop Engineering.

Compiled by Frederic Penniman, the report for CY 1969 lists principal investigators for the research tasks, seminars, visiting scientists, publications, organizational structure and staff members of PRL.

The report summarizes 74 basic research investigations in biology, chemistry, physics, and psychology. Accomplishments are listed in areas such as mycology, spores, microbial enzymes and products, proteins, theoretical biology, entomology, organic photochemistry, pulse radiolysis, and flash photolysis; also, gas chromatography/mass spectrometry, food-related chemistry, organic chemistry, organic synthesis, energy transfer, radiation physics, stress, acoustics, taste, regulatory psychophysiology.

"Mycological Survey of Thailand and Indonesia," by Dr. Emory G. Simmons and Bonnie J. Wiley, is listed as one of the significant efforts. Dr. Simmons, the senior investigator, was supported in the study by a Secretary of the Army Study Fellowship.

Approximately 1,000 Thai strains of microfungi were accessioned during the year as an addition to some 600 strains received previously. A substantial portion of identified Thai and Indonesian survey material is accessioned permanently in the NLABS Culture Collection and will be made available to other groups for research purposes.

Studies on the prevention of microbiological degradation of food and other material were reported by Dr. Hillel S. Levinson, Mildred T. Hyatt, Dr. Neil J. McCormick, Dr. Gabriel R. Mandels, and Anne H. Maguire.

Applied research was performed on 30 tasks in microbiology, entomology and psychology. Studies were made of bacterial culture collections; susceptibility and protection of materials; analytical methods for determining biocides or susceptibility of materials; military disinfectants; insect and rodent control; analysis of factors in food acceptance and appetite; and military performance in relation to parameters of clothing, personal equipment and material.

Diversity of materials research capabilities of PRL is exemplified by investigations carried out by the Applied Microbiology Branch, headed by Dr. Arthur M. Kaplan who is listed as an investigator on 13 of the reports.

Research subjects include: Culture Collection of Fungi and National Index of Fungus Cultures; Sand Bag Materials; Polyurethanes: Structure vs. Susceptibility; Reticulated Polyester Foam; Parachute Nylon; Gelled Fuels; Polyvinylchloride Films; and Machine Working Fluids.

The over-all program of NLABS was expanded recently by a directive giving them further responsibility in the 5-year "Department of Defense Food Research, Development, Testing and Engineering Program." (See February issue of this Newsmagazine, p. 1, for further details.)

The introduction to the 1969 PRL report states: "Events at the national level require a closer scrutiny of the relevance of the research reported here to the military system which supports it. We are, therefore, carefully evaluating these studies to assess the need for changes in order that new advances in science may be considered with the limited personnel and funds available to us."

NSF Funds Provide for CAI Research Project

Research on computer-administered instruction (CAI) funded by the U.S. Army in Project IMPACT recently received support from the National Science Foundation in a grant of $303,900 to the Human Resources Research Organization (HumRRO), Alexandria, Va.

The NSF funding provides for a 2-year research project on instructional decision models in CAI, a phase included in the original concept of Project IMPACT when it was launched as an Army program in 1967. Supplementing the NSF grant is a $16,100 grant from the James McKeen Cattell Fund, as announced earlier this year.

The grants permit an expansion and elaboration of the HumRRO research effort on CAI as it has been conducted under sponsorship of the Office of the Chief of Research and Development. Project IMPACT was programed to develop specifications for an effective, efficient, economical CAI system.

An instructional decision model, as ordered under the NSF grant, is a set of rules enabling the CAI computer to "personalize" instruction—to interact with the student and then to select subject matter and sequence its presentation on the basis of the student's individual characteristics, including his responses to earlier instructional materials.

Project IMPACT is being conducted in special CAI facilities at HumRRO Division No. 1 (System Operations), Alexandria, Va., with Dr. Robert J. Seidel as project leader and principal investigator.

Army R&D Program Offers 765 MOBDES Assignments

Reserve officers desiring a career in Army research and development may apply under the provisions of a new career program for about 765 Mobilization Designee (MOBDES) assignments currently available.

The program offers career management assistance established at the Reserve Components Personnel Center to insure that the careers of participants are managed to offer maximum opportunities for rewarding assignments and progress.

Specially desired are young officers with research and development experience or education that qualifies them for the challenge of R&D MOBDES assignments. Officers wishing to remain active in the Reserve Components upon completion of active duty are encouraged to check out the opportunities in MOBDES careers.

Additional information may be obtained by writing to the Office of the Chief of Research and Development, ATTN: Office, Assistant Executive for Administration, Washington, D.C. 20310.

Applications for MOBDES R&D assignments should be submitted to the CO, U.S. Army Administration Center (USAAC), ATTN: AGUZ-RA-SM, 9700 Page Boulevard, St. Louis, Mo. 63132, on DA Form 2976, Applications for MOBDES Assignment. These forms may be obtained from Army Headquarters, Army Reserve Centers or USAAC.

WSMR Awards $8.1 Million for Missile-Tracking Radar

Production of a new generation missile-tracking radar is ordered in an $8.1 million contract announced by White Sands (N. Mex.) Missile Range.

The RCA Missile and Surface Radar Division will build five AN/MPS–36 transportable radars. Three of the instruments will be deployed at WSMR, one at Kwajalein Missile Range in the Pacific Ocean and one at the Tonopah Test Range in Nevada.

WSMR is acting as procurement agent for Kwajalein and Tonopah, and has conducted acceptance tests before turning over the radars to those locations. Kwajalein Missile Range is operated by the Safeguard System Command and supports Army, Navy and Air Force strategic systems tests.

Tonopah Test Range is operated by the Atomic Energy Commission for test and research purposes.

The development model of the AN/MPS–36 was accepted in January. In reporting on the acceptance tests, WSMR officials said the radar met all specifications and exceeded its requirements for precision and range.

Nearly 2,000 rockets and missiles are fired annually at WSMR and the new radars will be employed to pinpoint the position and velocity of targets flown over the range. The AN/MPS–36 is the first instrumentation radar to have the capability for direct measurement of a target's radial velocity as an inherent part of the system design.

With its 12-foot diameter antenna mounted on a 36-foot trailer and its electronics contained in a 40-foot van, the radar can be transported by truck, or air when desirable, to a tracking site anywhere on or off the 4,000 square-mile range. It can be in operation within eight hours after arrival.

The AN/MPS–36 is designed (maximum capability) to track targets traveling up to 40,000 miles an hour at a range of 32,000 nautical miles, and can measure range to within nine feet at that distance, or determine velocity to within one foot-per-second.

The instrument capitalizes on application of the doppler principle—the shortening and lengthening of radio signals reflected from a target as it travels toward or away from the radar—for precise velocity measurement.

Extensive use of integrated circuits has reduced size and improved reliability. The entire system is designed to be hauled at speeds up to 60 mph over a highway, or over more rugged terrain at slower speeds.

The AN/MPS–36 is the latest in high performance instrumentation radar utilized at WSMR. Officials said its versatility will introduce an important new dimension to range tracking capability.

AVSCOM Personnel Train For ALPHA Implementation

Project ALPHA (Army Logistics Program Hard-Core Automated), scheduled for implementation July 1 in the U.S. Army Aviation Systems Command, will be preceded by AVSCOM's most ambitious training effort.

Starting Apr. 15, approximately 2,100 personnel will receive training in six functional areas of Project ALPHA: procurement and production; cataloging; provisioning; financial management; stock control; and supply management. Training varies from 56 to 88 hours.

In preparation for the training program, 36 AVSCOM employes were selected to attend a 3-week course at the Army Logistics Management Center, Fort Lee, Va., beginning in mid-March. However, their role will be mainly that of answering questions.

About 15 percent of the courses will be video tape lectures, 60 percent programed instruction in which students work with textual materials, and 15 percent computer-assisted simulation. Ten percent of the time is scheduled for tests.

Paul Hendrickson is AVSCOM control officer for the ALPHA conversion. Harold Ruschmeyer is his deputy for training. Joseph Strinni is alternate DCO.

Since last fall, 274 AVSCOM personnel have attended training courses of various lengths and subject areas in preparation for Project ALPHA, including a 40-hour course for colonels and civilians (GS–15 and above).

Participants in the executive course included Col J. Elmore Swenson, AVSCOM deputy commander for administration and resources management support, and Wayne Smith, director of technical data, cataloging and standardization.

WSMR Sensor Complex Control Transferred to RM Laboratory

Control of a White Sands (N. Mex.) Missile Range sensor complex, consisting of the Target Tracking Radar (TTR–3) and Discrimination Radar (DR–1) in Launch Complex 38, will be transferred to the U.S. Air Force Range Measurements Laboratory (RML) about July 1.

The TTR/DR complex was inactivated last September when its Rondo support function was transferred to the Advanced Research Projects Agency Measurements Radar facility in another area of WSMR. It had been used to illuminate missile targets and to track missiles and satellites.

Built originally in stages between 1957 and 1962 for use in the Nike Zeus missile development program, the sophisticated complex was modified in 1964–65 for use in the Rondo and HAPDAR (Hardpoint Demonstration Array Radar) projects. It was operated under an Army contract by Western Electric Co. and Bell Telephone Laboratories.

The RML, an element of Patrick Air Force Base, Fla., plans to update and modify the complex to advanced sensor status and operate it for microwave and optics technology R&D. Design work for the modification is under way.

Picatinny Arsenal Receives Defense Conservation Award

Support of the Defense Department's Natural Resources Conservation Program recently earned Picatinny Arsenal a Meritorious Achievement Award signed by Defense Secretary Melvin R. Laird.

The Defense Secretary annually presents awards to Army, Navy and Air Force installations for outstanding achievements in conservation of natural resources.

Lt Gen Henry A. Miley Jr., deputy CG of the Army Materiel Command, notified Col W. A. Walker, arsenal commander, and said that General F. J. Chesarek, CG of the AMC "has noted with pleasure the award presented to Picatinny . . . and has asked me to express his appreciation for the outstanding program in conservation of natural resources which led to this award."

Department of Army installations supporting the program take in nearly 10 million acres. The Army is responsible for conserving and keeping free from waste the land, water, trees and wildlife on these installations.

Picatinny covers 6,491 acres, including 3,793 acres of woodland, 1,462 acres of improved grounds and 308 acres of lakes and ponds.

Typical projects undertaken at Picatinny included raising of 400 pheasant chicks by the Arsenal Rod and Gun Club (300 were supplied by the New Jersey Division of Fish and Game, the rest hatched in incubators on post); stocking 2,200 brook, brown and rainbow trout; planting 1,000 tree seedlings, 1,000 multiflora rose plants, and four wildlife food patch areas to improve wildlife habitat.

Army Medical Research Unit in Panama Studies Tropical Diseases

Challenges of the mission assigned to the United States Army Medical Research Unit (USAMRU) in Panama are those presented by tropical diseases inimical to health and well-being of military and civilian communities throughout Latin America.

Environmental conditions and human activities in tropical areas may expose man and his animals to infectious organisms that impede ability to cope with tasks related to military operations and objectives. Involved also is the development and economic growth potential of the area.

USAMRU, Panama is a separate activity under direct control of HQ U.S. Army Medical Research and Development Command, Washington, D.C., and is attached to the U.S. Army Southern Command for logistical and administrative support.

Operationally, USAMRU is also the Army component of a dual-agency laboratory and is located within the Middle America Research Unit (MARU).

MARU is staffed and supported primarily by the National Institute of Allergy and Infectious Diseases, National Institute of Health, U.S. Public Health Service, Department of Health, Education and Welfare.

The four U.S. Army group professional and six technical staff members are participating in research studies on selected communicable diseases involving the scientific disciplines of parasitology, entomology and veterinary pathology.

Along with others interested in the health problems of the area, USAMRU researchers have cooperated in acquiring information concerning the extent, prevalence and distribution of various diseases in Latin America.

With specialized equipment, reagents and techniques, the laboratory furnishes diagnostic support to military and civilian health facilities of the Canal Zone, Republic of Panama and, when requested, to other Central and South American medical agencies.

Current investigative efforts are directed toward parasitic diseases that are endemic in the region and are health hazards to the Army. One of these is leishmaniasis, an infection caused by protozoan organisms transmitted by the bites of various species of *Phlebotomus* sandflies.

In Latin America, leishmaniasis occurs primarily as an infection of small jungle mammals. Man becomes involved when his work or recreational activities place him in the forest environment.

USAMRU Commander Lt Col James Burke and Capt William Collins, parasitologist, examine sloths in search of the reservoir hosts of leishmaniasis.

A leishmaniasis infection is suspected clinically with the appearance and development of an individual papule followed by ulcerations at the sites of the insect bites and enlargement of the regional lymph glands.

In human cases, the original lesion heals but, in the meantime, the organisms have metastasized to the facial region and may cause extensive necrosis in the nasal and oral regions. Destructive facial lesions may occur months or years following the infecting bite.

Active research projects are in progress to determine wild animals that serve as infected reservoir hosts; also, how leishmaniasis is perpetuated within these animals.

Organisms isolated from insect vectors and from human and animal hosts are being cultured and compared by immunological techniques and laboratory animal studies. These studies allow a comparison to be made concerning the growth potential, antigenic composition and virulence of the organisms isolated from various hosts.

Diagnosis of leishmaniasis is not always feasible by standard methods of culture or histopathological preparations. USAMRU and MARU have adapted the indirect fluorescent antibody test as a reliable procedure for detecting serum antibody levels. With this technique, the diagnostic ability of the laboratory is enhanced and the effect of treatment on the organisms and patient can be more thoroughly evaluated.

The primary research effort of the Entomology Section of USAMRU is focused on Panamanian phlebotomine sandflies (*Lutziomyia spp.*) and their role in the transmission of cutaneous leishmaniasis. The epidemiological significance of adult sandflies is related directly to their population dynamics. A detailed study of vectors is under way in the Canal Zone forest to determine behavior in their natural environment.

The study includes daily and seasonal activity, host preferences for blood meals, vertical and horizontal stratification of habitat, and disease vector potential. A detailed taxonomic study reference collection of the major Panamanian sandflies has been completed.

Establishment of a field jungle study site in the Canal Zone has made these investigations possible. The collection sites are located in moist, semievergreen forests having distinct biotropes of primary and secondary forest with a large animal population.

Observations and collecting of specimens have been conducted in this area for more than a year. Valuable information on sandfly behavior and requirements for survival and successful generation are being obtained. Collecting is done with attracting light traps, placed from ground to canopy levels. Specimens are obtained while they feed on humans or while they are resting.

During the past year, 45 species of three genera have been collected. More than 50,000 sandflies have been examined and identified. In parallel with the insect collections, the physical and climatic daily variables of the area are recorded so that conditions can be assessed as to their value to the insect vector.

In the laboratory, colonization of the phlebotomine vectors is under way in controlled environments. Wild-caught sandflies are dissected and examined for the presence of leptomonad forms of leishmania. Organ-

FIELD COLLECTOR aspirates resting *Phlebotomus* sandflies from base of tree at a Panama jungle field station.

isms recovered are cultured for identification and transmission studies.

Scientific literature contains little information on ecological requirements of phlebotomine sandflies of this area. Consequently, the information being obtained from this study should be of great value in determining the epidemiology of cutaneous leishmaniasis in Central America.

The disciplines of pathology and parasitology are being employed in the study of toxoplasmosis, a protozoan disease with a cosmopolitan distribution causing infections in many species of animals, including man.

Investigators in the Panama laboratory recently had a unique opportunity to participate with the Instituto de Nutricion de Centro America y Panama (INCAP) in a survey in six countries of Central America. Serum specimens received were examined serologically by the indirect fluorescent antibody test for toxoplasmosis.

Participation in the study made it possible to form a basic assessment of area prevalence and distribution of antibodies to *Toxoplasma gondii* antigen; also, recognize a public health problem and a potential disease of military importance.

Although the prevalence rate varied among the communities surveyed, the over-all average was just under 50 percent, indicating that toxoplasmosis is of special importance in Latin America.

Information collected during the survey, combined with the fact that the transmission of *Toxoplasma* infection to man or animals in nature is unknown, stimulated current projects concerning transmission and diagnosis of this disease.

Pathological studies are directed toward characterizing the distribution and nature of lesions produced by the organisms, and applying techniques to recognize with certainty these organisms in tissues. Various rodents and primates are utilized in controlled studies. Correlation of their serum reactions with presence or absence of organisms in tissues is in progress.

Natural transmission of the organisms or *Toxoplasma gondii* is not known, although experimentally it is possible to infect susceptible laboratory animals by various routes of body entry. Excreta from selected domesticated animals infected in the laboratory is being tested to determine if a form is present in fecal debris, and whether it is capable of infecting mice when fed orally to them. The animals' serum and tissues are examined for antibody change and tissue reponse.

The objectives of these transmission studies are to supply information that could be utilized in formulization of a preventive medical program that would be applicable in Latin America and in other parts of the world.

A constant surveillance is made on the numerous wild and domesticated mammals and birds submitted to this laboratory for examination. This examination leads to the discovery and documentation of naturally occurring zoonotic diseases which may pose a public health problem.

The USAMRU, Panama veterinary pathologist has cooperated with the U.S. Public Health Service personnel in characterizing lesions related to the immune systems of *Calomys callosus*, definitive reservoir host rodents of Machupo virus disease.

Recognized as the cause of Bolivian Hemorrhagic Fever in man in the early 1960s, the virus has been under constant study by MARU scientists from the important aspects of diagnosis, characterization of virus activity, host reservoir status and epidemiology.

USAMRU Panama personnel are using to good advantage the unique geographical and climatic conditions of the area to investigate and record naturally occurring diseases and their vectors. Results are contributing to scientific understanding of factors important in transmission diagnosis and pathogenesis of American leishmaniasis and toxoplasmosis. A more thorough evaluation then can be made on how communicable diseases can affect the health of soldiers operating under field conditions in the tropics.

Chief of Engineers Sets Up Environmental Advisory Board

Establishment of an Environmental Advisory Board was announced recently by U.S. Army Chief of Engineers Lt Gen F. J. Clarke, who said it makes available to him "a group of experts representing a broad range of environmental knowledge and experience."

Members are Dr. Lyton K. Caldwell, professor of political science at Indiana University and author of books and papers on the political and institutional aspects of environmental problems; Roland Clement, ecologist and vice president of the National Audubon Society, New York City; and

Dr. Charles H. W. Foster, executive director, New England Natural Resources Center, Boston; former Commissioner of Natural Resources for Massachusetts; former president, The Nature Conservancy; former research associate, Conservation Foundation; member of President Nixon's post-election Environmental Task Force; and

Harold Gilliam, author, environmental reporter for the San Francisco *Chronicle*, consultant to a number of U.S. Government agencies; contributor to and author of a number of books and reports; Richard H. Pough, engineer, conservationist, chairman of the board, Open Space Action Institute, and America the Beautiful Fund, New York; author of several books and numerous articles; and

Charles H. Stoddard, environmental consultant and former director, Bureau of Land Management, Department of the Interior; former executive director, Citizens Committee on Outdoor Recreation and Natural Beauty; staff member, Resources for the Future, Inc.; consultant to a number of governmental and private organizations; author of a number of books and articles on conservation and resource management.

Dr. Lehn Appointed to AMC Numerical Control Group

Appointment of Dr. Lloyd L. Lehn as chairman of the U.S. Army Materiel Command Numerical Control Working Group was recently announced.

Since he was released from three years active duty with the Army in 1969, Dr. Lehn has been employed as a mechanical engineer at the U.S. Army Production Equipment Agency, Rock Island, Ill.

While serving as a captain at Rock Island Arsenal, he was in charge of numerical control manufacturing and computer aided manufacturing. He also was a special assistant in development of a worldwide project for using computers to provide fast response to machine spare parts requirements.

Dr. Lehn is a native of Princeton, Ill., and has BS, MS and PhD degrees in mechanical engineering from the University of Illinois.

Dr. Lloyd L. Lehn

Janis Klebers

Kenneth J. Oscar

Maryland D. Kemp

Dr. Hermann J. Spitzer

Mobility Equipment R&D Center Selects 20 Employes For Commanding Officer's Special Achievement Awards

Twenty nominees for the 13th annual Commanding Officer's Awards for leadership, technological and scientific achievement at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., were announced in mid-March.

Winners from the record list of candidates will be honored at an outdoor public ceremony May 22. Two of the top leaders in the Army R&D community will be invited to present the awards.

Nine Leadership Award candidates are Nicholas A. Caspero, Mechanical Technology Laboratory; F. Lee Davis, Office of Comptroler/Director of Programs; Albert L. Gaudreault, Technical and Research Support Office; David L. Gee, Military Technology Laboratory; Stuart A. Kilpatrick, Intrusion Detection and Sensor Laboratory (IDSL); Harold E. Ream, Engineering Laboratory; Ben L. St. Jermaine, Facilities and Services Office; James E. Montgomery, Electrotechnology Laboratory; and John F. Sweton, Electromagnetic Effects Laboratory (EEL).

Technical Achievement Award nominees are Harry J. Barker, Electrotechnology Laboratory; Allen Ford, MTL; Taylor H. Jefferson, Mechanical Technology Laboratory; George Gornack, EEL; Dr. T. G. Horwath, ASCL; Bernard J. Bretz, Engineering Laboratory; and Guy F. Origlio, IDS.

Scientific Achievement Award nominees are Maryland D. Kemp, IDSL; Janis Klebers, EEL; Kenneth J. Oscar, MTL; and Dr. Hermann J. Spitzer, Electrotechnology Laboratory.

Caspero was nominated for "superior leadership" during an extensive development program on military fuel handling systems and systems components. Graduated from the University of Pittsburgh with a BS degree in petroleum engineering, he has been with the MERDC since 1953.

Davis was cited for "decisive leadership, sound judgment and highly technical knowledge" in understanding and analyzing the complex requirements of the MERDC and its tenant organizations. He has been a civilian employe of the MERDC and predecessor organizations since 1954.

Gaudreault's nomination was for "outstanding leadership" as chief of the Photographic Methods and Analysis Branch in performance of "complex and unprecedented technical photographic and visual aids support. . . ." Employed at the center since 1946, he is a graduate of the Aero Technical Institute and the AF Photography School.

Gee's selection as a candidate for the leadership award is based on his work as a research physicist in the Countersurveillance Branch when he was called upon to serve as acting chief. Employed at the center since 1951, he was graduated in 1950 with a BS degree in industrial physics from Virginia Polytechnic Institute.

Kilpatrick has served at the center since 1956 in both military and civilian capacities while coordinating test and evaluation activities with various Army and Department of Defense agencies. He has distinguished himself as chief of the Test and Evaluation Branch, and has been with the center since he received a BS degree in mechanical engineering from the University of Colorado in 1956.

Montgomery was nominated for outstanding leadership in supervising the Turbo-Alternator Group in developing a new family of turbo-alternators for the Department of Defense. He also provided support to the Project Mallard, Main Battle Tank 70s, and R&D on turbine engine generator sets. Graduated in 1942 from Louisiana

David L. Gee

Ben L. St. Jermaine

F. Lee Davis

Harold E. Ream

Taylor H. Jefferson

Bernard J. Bretz

Harry J. Barker

Allen Ford

Polytechnic Institute with a BS degree in mechanical engineering, he has been employed at the center 25 years.

Ream's nomination credits him with superior leadership in the topographic field, including a modernization program on critical equipment which anticipated and avoided many procurement and field problems. He is an Iowa State University graduate and has been with the MERDC since 1961.

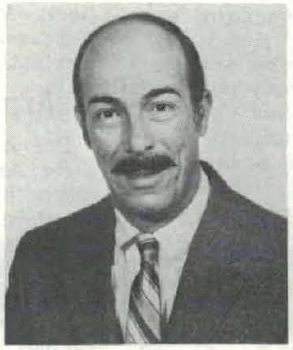
St. Jermaine was nominated for the second consecutive year for his leadership as chief of the Equipment Modification and Repair Division, including R&D tests and demonstrations. He is a graduate from Haskell Institute and has been with the center 20 years.

Sweton was field coordinator for the Pershing Special Test Program, involving 60 technical personnel representatives of four U.S. Government installations and seven industrial companies. His leadership included a complex electromagnetic pulse experimental program. He was graduated in 1962 from Washington and Jefferson College with a BS degree in physics.

Technological Achievement. Barker's nomination credits him with engineering investigation, design and development of the "Barkerized System," as applied to a military standard ignition engine generator set.

Nominated also in 1968, Barker is credited with achieving better performance, reduced oil consumption, moderate noise reduction, and capability to operate in a confined space or tight revetment. Graduated in 1958 from the University of Houston with a BS degree in industrial engineering, he has been employed at the center since 1968.

Dr. T. G. Horwath



Guy F. Origlio

George Gornak

Bretz was nominated for his outstanding performance as a supervisory industrial engineer, notably for design and acquisition of machine components, fabrication, and assembly in 60 days "at a cost of only $10,000" in repairing $2.5 million of bridging equipment. He is a graduate from Ecole Nationale Professionelle, Paris, France, and has been with the center since 1962.

Ford's candidacy for the Technological Achievement Award is based on research that has contributed significantly to selection of the reverse osmosis system for purification of all types of water that might be encountered in military field operations. He has a BS degree in chemistry from Arkansas Agriculture, Mechanical and Normal College (1966), and has pursued advanced studies at Kansas State and at Dartmouth University.

Gornak earned nomination for technological achievements in directing government and contractor personnel in "effective vulnerability evaluation" and hardening of a major "critical Army weapon system to the Nuclear Electromagnetic Pulse (EMP)." He has a BS degree from Geneva College.

Dr. Horwath's nomination for a second consecutive year gave recognition to his contributions to acoustic sensing, signal processing, guidance

(*Continued on page 20*)

Stuart A. Kilpatrick

John F. Sweton

Albert L. Gaudreault

James E. Montgomery

Nicholas A. Caspero

MERDC Selects 20 Employes for Achievement Awards

(*Continued from page 19*)

and control, simulation, field tests and data processing. Employed at the center since 1966, he has MS and PhD degrees from the University of Graz in Austria.

Jefferson's candidacy for technological achievement honors stems from his "breakthrough in the fuels decontamination art through utilization of previously untried electrohydrodynamic principles." His concept has "enabled solution of the problems existing in use of current equipment." He is a University of Virginia graduate (BA degree in geology, 1951) and has been an MERDC employee since 1956.

Origlio was cited for his work as a research physicist—"contributions to the rapid development and implementation of a new electromagnetic detection" technique useful against concealed targets such as personnel, munitions, booby-traps and contraband cargo. He has a 1953 BS degree in physics from the University of Pennsylvania and has been with the center since 1962.

Scientific Achievement. The nomination of *Maryland Kemp* for this award acclaims him for "significant contributions to the knowledge and understanding of the detection of explosives by trace gas methods . . . critical to development of detection devices of major military importance." A 1961 recipient of a Secretary of the Army Research and Study (SARS) Fellowship, he has a BS degree in chemistry from J. C. Smith University, and master's degree from Howard University.

Janis Klebers was nominated in recognition of outstanding results in extending present theory for calculating the electromagnetic pulse environment in the presence of a finitely conducting earth resulting from an incident plane wave electromagnetic pulse. He earned a BS degree in physics from Kalamazoo (Mich.) College in 1963, BS degree in electrical engineering from the University in 1966, and is doing graduate work at George Washington University.

Kenneth Oscar's research won him nomination for achieving new knowledge of complex phenomena associated with the application of infrasonic sound as a barrier mechanism in controllable barrier systems. He is credited with significantly advancing the state-of-the-art. Graduated from Clarkson College of Technology with a BS degree in physics in 1968, he is a graduate student at American University.

Dr. Spitzer is a solid-state research physicist and his nomination hails him for "outstanding contributions to the science of thin-film superconductors. . . . He has produced the highest quality superconducting films available in the United States today, which will ultimately greatly improve the density of power generation equipment." He was graduated from the University of Munich in 1964.

4 Army Employes to Attend Stanford Under EPSA

One Army Materiel Command and three Army Corps of Engineer employes have been selected to attend Stanford University for a year of graduate work under the 1970–71 Educational Program in Systems Analysis (EPSA).

Authorized under the Government Employes Training Act of 1958, the program is designed to identify and develop persons who can be expected to make a major contribution to systematic program analysis—"through intensive work in a variety of subjects with application to emerging issues of public policy and management."

EPSA is conducted annually at five universities: California at Irvine, Harvard, Maryland, Massachusetts Institute of Technology and Stanford. The program is managed by the Civil Service Commission in consultation with the Bureau of the Budget.

Army participants who will begin their studies during the fall semester are Roger C. Hollenbaugh, Letterkenny Army Depot, Chambersburg, Pa.; Richard E. Brown, Sacramento (Calif.) Engineer District; Arthur J. Klingerman, Rock Island (Ill.) Engineer District; Charles E. Workman, St. Paul (Minn.) Engineer District.

The Civil Service Commission has announced the names of 28 federal employes from 15 agencies who will participate in the 1970–71 EPSA program.

Candidates are nominated by their agencies and screened by a panel of representatives from the Civil Service Commission and the Bureau of the Budget. Eligible candidates must have bachelor's degrees and records of superior academic achievement.

While exceptions may be made under circumstances of special agency needs, most of those nominated are career officials between the ages of 25 and 30 with at least 3 years of federal civilian service in a grade level range of GS–9 to 13 or the equivalent.

Dr. McDaniel Heads Missile Command R&E Directorate

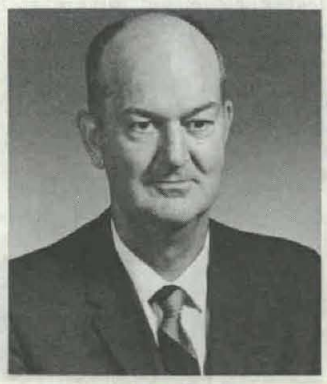
Occupying No. 2 spot behind Dr. Wernher von Braun—though separated by a 10-year interval in line of progression—is the distinction held by Dr. John L. McDaniel, new head of the U.S. Army Missile Command Research and Engineering Directorate.

Until he transferred in 1960 to the Marshall Space Flight Center at nearby Huntsville, Ala., Dr. von Braun was the first civilian head of Army rocket and missile research and development at Redstone (Ala.) Arsenal.

Dr. McDaniel recently was elevated to the position of director after acting in that capacity since last September. Except for two years of service with the U.S. Navy during World War II, he has been employed continuously since 1942 at Redstone. In 1962 he was appointed technical director of R&D, and held this assignment until his recent promotion.

Among Dr. McDaniel's numerous honors for outstanding performance of duties with the Army Missile Command are the Army R&D Achievement Award in 1961, the Army Meritorious Civilian Service Award in 1963, Department of Defense Distinguished Civilian Service Award, and the Decoration for Exceptional Civilian Service.

Dr. McDaniel has been deeply involved in development of many of the Army's current missile and rocket systems. In his new position he will direct a staff of highly skilled scientists and engineers in investigating feasibility of future systems.



Dr. John L. McDaniel

Army to Undertake Training Of Air Force 'Copter Pilots

The Army will begin initial training of all Air Force helicopter pilots in October at Fort Wolters, Tex., and Fort Rucker, Ala., the two major Army helicopter training centers. After graduating from the course with about 190 flight hours, the pilots will undergo transition into the Air Force helicopters at a centralized Combat Crew Training School.

Picatinny Assigns Foreign Munitions Expert to FRL

Picatinny Arsenal's new foreign intelligence officer, William F. Calvert, can discuss in some detail the explosives and munitions of practically every nation that makes any.

Until he recently joined the staff of Picatinny's Feltman Research Laboratories, he was with the Foreign Science and Technology Center in Washington, D.C., an organization which specializes in intelligence on foreign weapon systems.

Part of his job at Picatinny Arsenal is to sift reports about foreign army type items acquired by the United States. Hundreds of these reports are received every month, channelled through the Army Materiel Command's Foreign Science and Technology Center (FSTC).

The arsenal is one of the Army in-house installations the FSTC uses to insure wide distribution of the intelligence it gets about foreign ammunition and weapons.

Calvert's principal duties connect directly with engineers and technicians doing R&D work. They might consult him, for example, about the design—has some other country built anything like it and was it successful? If not, did the country make some modification; if so, what was the modification and how did it work?

Occasionally his own knowledge and experience will provide an answer. Often it will be a mix: his special know-how plus what he can dig out of the Foreign Intelligence Office's data bank at Picatinny, plus find out by phoning the FSTC in Washington. For seven years he was chief of the FSTC Ammunition Branch.

This center, formed out of a number of technical intelligence agencies, such as Chemical Ordnance, Signal Intelligence, and the like, gives support both at the top level and to R&D people at various arsenals. Its experts evaluate incoming intelligence from all parts of the world.

The FSTC carries the responsibility of establishing the foreign army threat to the U.S. Army, and by extension to our entire nation.

Calvert also served seven years with the Ordnance Intelligence Agency, and worked for around seven years at Aberdeen Proving Ground doing R&D on weapons and ammunition for the Development and Proof Services.

Many branches of the U.S. Government depend on him for specialized intelligence about the explosives and munitions of foreign powers. He briefed a subcommittee of the House of Representatives on Chinese-Communist weapons. He gave a briefing to the Secretary of the Army on Soviet armor-defeating ammunition, and was called upon to repeat it on five separate occasions—for the Assistant Secretary of Defense; HQ Army Materiel Command; HQ Marine Development Command; HQ DA Office of the Chief of Research and Development; and the American Ordnance Association.

Calvert has briefed the Joint Technological Intelligence Conference in London on battlefield illumination; on Soviet armor-defeating ammunition; and on Soviet rockets and launchers. He also has written numerous studies about foreign munitions.

Educated in engineering and technical writing at Maryland, Delaware, and Louisville Universities, he has completed the advanced Atomic Weapons Course at Sandia Base, N. Mex., the weapons course at Dugway Proving Ground, Utah, and several courses on ammunition and ballistics.

William F. Calvert

OCRD Announces 4 Officer Assignments

Four staff officer assignments to the Office of the Chief of Research and Development (OCRD) were announced in March.

LT COL ALVIN L. MEREDITH is with the Human Factors Branch, Behavioral Sciences Division, U.S. Army Research Office (ARO), following a tour of duty as commanding officer, 3d Battalion (Target Acquisition), 25th Artillery, Fort Sill, Ola.

He earned an MS degree in psychology from the University of Miami in 1967, then was assigned as senior adviser to the Republic of Vietnam (RVN) Polwar College, Military Assistance Command, Vietnam (MACV).

Lt Col Meredith graduated from the Command and General Staff College (C&GSC) in 1965, subsequent to an assignment as S–3, 3d Battalion, 79th Artillery, U.S. Army Europe. He holds the Silver Star (SS), Legion of Merit (LM) and the Air Medal (AM).

LT COL EUGENE J. VITETTA is a staff officer with the Foreign Developments Team, International Office, OCRD. Recently he completed a tour of duty in Vietnam, initially as CO, 86th Signal Battalion and then as assistant signal officer, HQ II Field Force Vietnam.

From 1966 to 1968 he was deputy director, Army Armaments Division, U.S. Mission, NATO (Paris and Brussels).

He has a BS degree in electrical engineering from Norwich University (1952), and has graduated from the C&GSC (1964) and the British Staff College (1965).

Among his citations and decorations are the LM, Bronze Star Medal (BSM) with two Oak Leaf Clusters (OLC), AM, Joint Service Commendation Medal (JSCM) with OLC, Army Commendation Medal (ARCOM) with OLC, Vietnam Honor Medal (VHM), and the Vietnamese Signal Corps Honor Badge.

LT COL GEORGE LOFFERT JR. was assigned to the Combat Support Aircraft Branch, Air Mobility Division, OCRD, after serving with the 9th Infantry Division in Vietnam as deputy G2 and as executive officer, 2d Battalion, 47th Infantry.

A 1956 graduate of the U.S. Military Academy (USMA), Col Loffert earned an MS degree in aerospace engineering from the University of Arizona (1964) and completed the regular course at the C&GSC in 1968. He served as an assistant professor with the Department of Mechanics, USMA, from 1964 to 1967.

His decorations include the SS, Distinguished Flying Cross (DFC), BSM with "V" and two OLC's, ARCOM, Combat Infantryman Badge (CIB), and the Purple Heart.

LT COL GEORGE E. WIEN served with the Force Accounting Division, Office of the Assistant Chief of Staff for Force Development, prior to assignment with the Communications Branch, Communications-Electronics and Space Division, OCRD.

Graduated from the USMA (1956), he earned a 1964 MS degree in electrical engineering from the Massachusetts Institute of Techology and completed the C&GSC in 1969.

He was assigned as chief of the Army Communications Operations Center, 1st Signal Brigade, RVN, subsequent to service as an assistant professor, Department of Physics, USMA (1964–67). His decorations include the BSM and the ARCOM.

Armed Forces Propose Greenland Research Projects

Scientific projects planned by the U.S. Armed Forces in the continuing research in Greenland in 1970 were explained Mar. 16–17 in a presentation to the Danish Commission for the Scientific Exploration of Greenland.

The U.S. Army proposed environmental performance surveys of the DEW Line radar warning stations on the Greenland Icecap, and of facilities established at Camp Tuto, by the Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H.

Annual performance surveys of the DEW Line stations, elevated about 20 feet above the snow surface and each mounted on eight extensible columns, have been conducted since their construction in 1959. Knowledge gained has contributed to effective operation of the stations and provided design criteria for future use.

Information to determine the optimum level to keep such structures above the snow surface to prevent snow drifting and accumulation is being sought in the 1970 program.

The second Army project proposed for 1970 is a performance survey of facilities at Camp Tuto, about 12 miles from Thule Air Base, to update and determine the environmental effect on the abandoned facilities.

Visual inspections are planned of the permafrost and ice tunnels near Camp Tuto, and of the structures and utilities of the 50-man Winter Camp. Durability information will be collected on the prefabricated, semipermanent construction, which is similar to that used at other places in the Arctic.

The U.S. Air Force program for 1970 calls for continuation of rocket soundings of the atmosphere and upper atmospheric geophysical research at the Geopole Observatory at Thule Air Base.

The U.S. Navy program provides for sea ice reconnaissance and oceanic research in Greenland waters, and ionospheric research from Thule AB.

Thirty-two members of the Danish Commission for the Scientific Exploration of Greenland were present for the briefing given by representatives of the U.S. Armed Forces.

Dignitaries included Dr. Jorgan Taaghold, scientific liaison officer for Greenland, and representative of the Danish Government; and Eske Brun, chairman of the Commission and former permanent under secretary, Ministry for Greenland.

Dr. Leo Alpert, Environmental Sciences Division, Army Research Office, Office of the Chief of Research and Development, presented the proposed Army program.

The U.S. delegation included Col R. D. Kemp, U.S. Air Attache, and B. Barr, U.S. Embassy, Copenhagen, Denmark; Dr. Max Britton, director, Arctic Programs, Office of Naval Research, Washington, D.C.; Dr. Samuel M. Silverman, director, Air Force Cambridge Research Laboratory Geopole Observatory, Bedford, Mass.; and Col Arnold Hull, commanding officer, Air Force 6th Weather Wing, Andrews Air Force Base, Md.

Army ISR Burn Experts to Present 14 Papers

U.S. Army Institute of Surgical Research importance as a world-renowned center of research and advanced technology in treating severe burn cases is attested by 14 papers staff members will present at the second annual meeting of the American Burn Association, Apr. 10–11, Boston, Mass.

The *Army Research and Development Newsmagazine* reported at length on the highly specialized capabilities of ISR personnel in a feature article in the February 1970 edition to mark the ISR's 25th year.

ISR commander and director, Lt Col Basil A. Pruitt, will lecture on "Hemodynamic Changes." Dr. Robert B. Lindberg, supervisory microbiologist, is programed for "Changing Patterns in the Role of Enteric Bacteria." Lt Col Andrew M. Munster, chief, Trauma Branch, will talk on "The Effect of Thermal Injury on Cellular Immunity." Research surgeon Maj Morris J. Asch will discuss "Acid-Base Physiology and Carbonic Anhydrase Inhibiting Effects of Sulfamylon."

Maj William Curreri, chief, Clinical Division, will present a "Study of Coagulation Factors," Maj Harold M. Bruck, chief, Burn Study Branch, will speak on "Invasive Phycomycostic," and Capt Jon M. Reckler, Burn Study Branch, is listed for "A Critical Evaluation of Fluid Resuscitation."

Col Munster also will speak on "Cardiac Infection in Burns," Dr. F. D. Foley on "Herpesvirus Hominis Infection," and Dr. Bruce E. Zawacki on "The Causes of Hypermetabolism."

Maj Joseph Moylan Jr., Burn Study Branch physician, is programed for "Ocular Complication of Thermal Injury," and Dr. Douglas W. Wilmore, now with the University of Pennsylvania, who did residency work at the ISR, will speak on "Supranormal Dietary intake in the Hypermetabolic."

Lt Col Katherine Galloway, chief nurse of the ISR, will speak on "Orientation and Education of Nursing Personnel," Lt Col Lois A. Johns will report research on "Nursing Procedures for Urinary Catheter Care," and occupational therapist Maj Kilulu Von Prince will lecture on "The Use of Special Devices in Wound Care."

If Program Needs Slogan

Future Lieutenant Has Super Salesman Attributes

"Keep Kissable" as a possible slogan for the Military Community Oral Health Manager Program, originated as a partial solution to U.S. Army dental hygiene problems, might be advocated exemplarily by the first applicant accepted for this new field of effort.

Miss Judith M. Schuster probably could "sell" the slogan without any extra effort on her part. She became the first enrollee in the program early in April, but will not be commissioned as a first lieutenant in the Medical Service Corps until July.

Currently engaged in graduate work in dental hygiene at San Diego State College, she has a bachelor's degree from the University of Southern California and is working as a hygienist.

Miss Schuster is interested in dental hygiene from a public health angle rather than individual care. This makes her a "natural" for the Army's newest commissioned officer program. It involves teaching preventive dentistry to groups, overseeing dental hygiene training programs, conducting oral health lectures, and compiling dental reports.

The objective of the program is to fill public health type teaching positions with qualified dental hygienists, thereby relieving dental officers to enable them to concentrate on clinical preventive dentistry.

Judith M. Schuster

Col Ohl Takes Command USAMCFO of Sandia Base

When Col William C. Ohl, Ordnance Corps, enrolled in the U.S. Army Atomic Energy Officer Program in 1957, he was a young officer who decided that it presented excellent possibilities for career advancement and a progression of challenging assignments.

That conviction has been sustained during the past 13 years in the "proof of the pudding," so to speak, in that his expectations have been fully justified—capped by his current assignment as commander of the U.S. Army Materiel Command Field Office (USAMCFO), Sandia Base, Albuquerque, N. Mex. His signature block has read "Commanding" in varied assignments, including special weapons battalions.

Designated as a "key position" within the Atomic Energy Officer Program, his present job is another step up the ladder of progression to responsibilities requiring highly specialized skills in atomic energy operations at the policy-making level.

USAMCFO is a Class II activity under the CG of the Materiel Command, General F. J. Chesarek. Col Ohl represents the Army in the Albuquerque, Los Alamos and San Francisco areas on all matters pertained to desired nuclear weapons characteristics, requirements, doctrine, policy, development and logistics.

Col Ohl started his military career in the Coast Artillery Corps in 1939 and transferred to the Ordnance Corps the following year. In World War II he served with the Army Air Force in the China-Burma-India theater, and later became ordnance and armament adviser to the U.S. Military Air Mission in Lima, Peru.

His career has included assignments as executive officer at Redstone (Ala.) Arsenal, now HQ U.S. Army Missile Command; R&D duty with the Office of the Chief of Ordnance; chief Office for Nuclear Munitions Operations, U.S. Army Munitions Command; chief, Plans and Operations Division, G4 Section, HQ Eighth U.S. Army; and commander, Fort Wingate Army Depot.

Graduated from the University of Pittsburgh in 1939, he completed graduate studies in metallurgy at Rensselaer Polytechnic Institute, has taken numerous special weapons courses, and is a graduate from the U.S. Army Command and General Staff College.

Col William C. Ohl

Atomic Museum Attracts Sandia Base Visitors

One of the popular new military attractions open to the public is proving to be the Atomic Museum at Sandia Base, Albuquerque, N. Mex., which traces the history and development of nuclear weapon systems.

Opened Oct. 6, 1969 by the Defense Atomic Support Agency (DASA), the museum is attracting visitors at a rate supporting the estimate that more than 50,000 persons will view exhibits during the first year of operation. Within the fist four months visitors came from 49 states and 31 foreign countries.

More than 50 exhibits of unclassified nuclear weapons and related activities, collected over a 5-year period with the help of the U.S. Army Materiel Command Field Office (AMCFO) at Sandia, are on display. Only unclassified weapons are exhibited.

One of the attractions is a replica of "Little Boy," the atomic bomb dropped on Hiroshima and "Fat Man" dropped on Nagasaki, Japan, during World War II; the MK 101, an atomic depth charge developed for the Navy; the Honest John missile that was fired from a mobile, self-propelled launcher; models of Nike Ajax surface-air missiles, other guided missiles, weapons and special displays.

The largest exhibit is a 280-millimeter cannon over 45 feet long, 12 feet high without its carriers, and weighing more than 50 tons. The weapon was capable of firing both nuclear and conventional projectiles over 20 miles.

Sandia Base is the home of Field Command of the Defense Atomic Support Agency, several other military organizations, a large private corporation doing government research, and other U.S. Government agencies.

SANDIA BASE Field Office Commander Col William C. Ohl views 280mm atomic cannon, the largest exhibit at the new Atomic Museum.

MICOM Commander Revises Civilian Personnel Cutback

Army Missile Command personnel have been informed that less than 900 full-time civilians must be separated to meet a new manpower ceiling the command has been directed to reach by June 28.

Original estimates were that more than 1,100 personnel at Redstone Arsenal, Ala., would have to be discharged to meet the reduced manning level announced Mar. 6 in connection with Defense Department budgetary reductions.

Maj Gen Edwin I. Donley, CG of the Missile Command, in a letter to all command personnel said: "As of today, it appears certain that the number of full-time permanent civilian personnel who must be separated to reach the new ceiling has dropped below 900 and continues to decline."

General Donley explained the significant drop was attributable to a net loss through attrition during the past five weeks that has averaged about seven persons a week and a plan to use temporary part-time manpower spaces to place 180 full-time civilians who would otherwise have to be separated. Individuals placed in this manner will continue in their current tenure status.

Missile Command specific manning levels are established in several categories, among them full-time permanent civilian employes and temporary part-time employes. In March, the command was directed to cut its full-time staff to 7,888 by June 29.

General Donley added that he believed there will be a further reduction in the number of full-time permanent personnel who must be separated by June 29—through transfers to other installations where vacancies exist, the various special retirement programs being offered, and normal resignations and retirements.

Kudos

DISTINGUISHED SERVICE. General F. J. Chesarek, AMC commander, recently presented to *Maj Gen William B. Latta*, CG of the U.S. Army Strategic Communications Command (STRATCOM), the Distinguished Service Medal (DSM). He was honored for "eminently meritorious service" as CG, U.S. Army Electronics Command and Fort Monmouth, N.J., from October 1965 to August 1969.

The citation acclaims him for "exceptional managerial ability, broad technical and logistics knowledge, and ability to resolve complex problems which made possible an eminently successful, rapidly expanded communications-electronics program, despite limited manpower resources. He led his command at an unprecedented pace and furnished the equipment and support for a worldwide communications system which is second to none."

DCS Medal. Under Secretary of the Army Thaddeus R. Beal recently presented the Distinguished Civilian Service Medal, the Army's highest civilian honor for nonemployes, to *General Thomas T. Handy* (USA, Ret.).

General Handy was cited for operations research and interpreting military problems to the civilian scientific community while serving as a senior staff member of the Research Analysis Corp.

He was lauded especially for his ability in educating young scientists in operations research and in influencing them to pursue research analysis careers for the Army. General Handy retired from active Army service in 1954 after a 37-year Army career.

Dr. M. G. Bekker, former chief of land locomotion research at the U.S. Army Tank-Automotive Command at Warren, Mich., was more than mildly surprised when Lt Gen Jean E. Engler (USA, Ret.) presented him with a scroll on behalf of the American Ordnance Association (AOA) during an AOA dinner, Mar. 17, at Fort McNair, Washington, D.C. At left is Lt Gen Lewis W. Walt, Deputy Commander of the U.S. Marine Corps. Known to his associates as "the father of our off-road and articulated vehicle concepts for travel on rough terrain of the earth and moon," Dr. Bekker was honored for pioneering efforts in off-road locomotion problems and authorship of two books, *Introduction to Terrain-Vehicle Systems.*

MERITORIOUS SERVICE. *Lt Col Iladene H. Filer* was presented the Meritorious Service Medal for her accomplishments during a 2-year period when she was chief of Nursing Service at Womack Army Hospital, Fort Bragg, N.C. Lt Col Filer is now assigned to the Directorate of Personnel and Training, Office of The Surgeon General, U.S. Army.

SPECIAL ACT AWARD. For saving the U.S. Government about $86,000, *Alvin D. Bedrosian*, chief, Army Scientific Liaison Office, Greater Boston Area, received a Special Act certificate and $750 during recent ceremonies at HQ U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J.

Dr. Hans K. Ziegler, ECOM chief scientist and deputy for science, presented the award. Bedrosian's suggestion regarding contract auditing review procedures made the savings possible.

The U.S. Army Scientific Liaison Office, Greater Boston Area was formerly under ECOM cognizance and is now under cognizance of the U.S. Army Research Office, Office of the Chief of Research and Development.

Jack T. Stevenson of the U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va., earned a Special Act or Service Award of $450 and a silver lapel pin for participating in hazardous military operations in Vietnam from May to November 1969.

Under the Vietnam Laboratory Assistance Program-Army (VLAPA), and also as a representative of the project manager, Mobile Electric Power, he participated in more than 100 hazardous field operations in connection with countermine warfare and land clearing, and helped to solve on-site, mobile electric power supply and maintenance problems.

COMMENDATION CERTIFICATE. *Robert A. Bergseth*, chief of the Product Improvement Branch, Engineering Division, HQ U.S. Army Materiel Command (AMC), recently received a Certificate of Commendation from Brig Gen Mahlon E. Gates, deputy director of Research, Development and Engineering, AMC.

ARMY MATERIEL COMMAND Chief of Staff Maj Gen L. B. Jones presents Legion of Merit to Lt Col Peter E. Hexner for "outstanding and exemplary service as commanding officer of the Harry Diamond Laboratories (HDL), November 1968 to March 1970." He retired with 21 years Army service.

Bergseth was cited when he recently retired from government service for his management of complex programs in development and engineering areas which "contributed significantly" to the performance of AMC's mission from 1962 to 1970.

CDC Undertakes Production Of 'Instant Field Manuals'

Production of "instant field manuals" to accompany developmental items of STANO (Surveillance, Target Acquisition and Night Observation) equipment deployed to Vietnam for evaluation is a priority task of the Army Combat Developments Command (CDC).

STANO equipment ranging from new radars and sensors to night observation devices are undergoing accelerated development and testing prior to deployment. The CDC is producing handbooks for each item to enable the combat soldier to employ property and maintain the experimental materiel.

Headquartered at Fort Belvoir, Va., the CDC has produced the first two user guidance handbooks, one for the Hand-held Thermal Viewer and one for the PPS-9 Ground Surveillance Radar.

Reduced in size to fit in a fatique uniform pocket, and printed on waterproof paper for use of frontline troops, the manuals contain a description of the items, nomenclature, capabilities, limitations, training requirements, concepts of employment, techniques to gain maximum advantage from the equipment, and maintenance instructions.

Chief of Staff Westmoreland Lauds USACSC on First Anniversary

U.S. Army Chief of Staff General William C. Westmoreland noted the U.S. Army Computer Systems Command's first anniversary Mar. 31 by addressing a congratulatory message to Brig Gen Wilson R. Reed, CG of the USACSC, that stated in part:

". . . The skill displayed by the personnel of your command, coupled with their dedication to duty, has been in the highest tradition of the United States Army. . . . The members of the Army join me in saluting your first year of operation and in expressing confidence that you will continue to carry out your mission as successfully in the future. . . ."

The USACSC was organized from the nucleus of the former Automatic Data Field Systems Command (ADFSC), also commanded by General Reed, who now functions additionally as Army Materiel Command Project Manager for Automated Data Systems within the Army in the Field (ADSAF).

USACSC's scope of interest ranges from worldwide administrative systems to worldwide combat service support systems. The mission embraces hardware, software and systems support, and represents a broader latitude of automatic data processing (ADP) systems responsibility than has ever been brought together in a single Army agency.

The USACSC plans, directs and controls all aspects of multicommand data systems development, testing and installation, and provides technical support to commands using the developed systems.

Among the major systems included within the USACSC scope of responsibilities are the Tactical Fire Direction System (TACFIRE); the Tactical Operations System (TOS); the Combat Service Support System (CS3); the Direct and General Support Unit Computer System (DSU/GSU); Division Logistics System (DLOGS); Continental Army Command Class One Automated System (COCOAS); Centralization of Supply Management Operations (COSMOS); U.S. Army, Pacific, Standard Supply System (3S); Personnel Management and Accounting Card Processor System (PERMACAPS); and the Continental Army and Major Overseas Command System (CARMOCS) (A).

Additionally, on Apr. 1, the Computer Systems Command will assume responsibility for the Theater Army Support Command (TASCOM) supply system, U. S. Army Europe. TASCOM will provide centralized theater control of supply management, stock control, field depot maintenance, and supporting finance and transportation functions.

Approved command planning provides for additional growth through the 1970–74 time frame as ADP systems projects now in the conceptual stage are defined and assigned to the USACSC.

HQ USACSC occupies some 13 buildings at Fort Belvoir, Va. Subordinate field groups and agencies are located at Fort Lee and Fort Eustis, Va.; Fort Monmouth, N.J.; Fort Hood, Tex.; Wright-Patterson Air Force Base, Ohio; the Presidio, San Francisco. Calif.; Van Nuys, Calif.; Fort Shafter and Schofield Barracks, Hawaii; Okinawa, Korea and Vietnam; and Karlsruhe, Heidelberg and Zweibrucken, Germany.

General Reed explains that the Computer Systems Command "provides the Army an immediate source of highly qualified ADP specialists who can be made available in solving ADP problems of any nature wherever they may develop . . . . The service is available not only to Headquarters, Department of the Army elements, but to commanders throughout the world. Furthermore, the service is available not only for multicommand systems, but also for any command-unique system, if desired."

Picatinny Group Grows Crystal for Research Effort

More than 20 universities and laboratories will participate in a worldwide research effort involving measurement of characteristics of specimens from one of the largest sodium bromate crystals over grown in a laboratory.

The crystal is being grown by Picatinny (Dover, N.J.) Arsenal scientists and technicians to satisfy a request from participants in a recent radiation chemistry meeting at Cambridge (England) University.

The Picatinny group consists of Dr. Peter Kemmey, Dr. Pat Herley and Albert Pinelli, all permanently stationed at the Brookhaven National Laboratory, Upton, Long Island, as part of a group that first produced large crystals in 1962.

In a letter to Dr. P. W. Levy, a Brookhaven staff member who directs the Picatinny group, Prof. A. G. Maddock of the Cambridge chemistry department stated that many scientific puzzles could be attributed to differences in crystals grown at different laboratories.

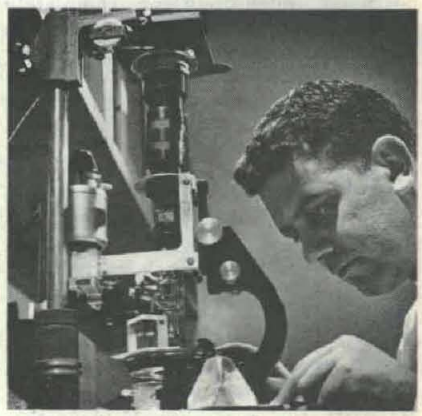
To test this hypothesis, each of the participating universities and laboratories will make measurements on samples cut from the Brookhaven-grown crystal, expected to measure more than three inches on a side and weigh several pounds.

Each group will conduct a number of different types of measurements, including ionic conductivity, photo conductivity, diffusion and thermoluminescence. The Picatinny group will make electron spin-resonance, color-center, and optical and electron microscope measurements. Two or three different laboratories will make similar measurements to confirm each others results.

Army research interest in crystals lies in the fact that their explosive decomposition mechanisms are similar in many ways to those of true explosives; because of their metastable composition, crystals do not detonate easily. Researchers are investigating interactions involved in irradiating metastable substances of crystals.

Picatinny scientists recently succeeded in growing crystals of ammonium perchlorate an inch on a side, and somewhat smaller crystals of ammonium nitrate and sodium nitrate.

One of the most unpredictable of all materials, crystals grow in sizes down to 1/1,000th of an inch. When Picatinny researchers say they have succeeded in growing a crystal, they mean a seed crystal saturated in a solution that enlarges it in size to a crystal free of bubbles and other inclusions, and as transparent as water.



PICATINNY ARSENAL scientist Dr. Pat Herley examines a large crystal grown at Brookhaven National Laboratory, Upton, Long Island. Dr. Herley is one of a group of scientists and technicians who recently were asked to supply a special crystal for measurement of characteristics in a worldwide research effort conducted by more than 20 universities and laboratories.

MERDC Modifies Management Methods in Response to R&D Resources Rollback

By William B. Taylor
Technical Director, MERDC

The mission of the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va., is to enhance the mobility of our troops in the field, and to impede the mobility of the enemy.

Accomplishment of this mission involves the MERDC in research and development in 15 widely diversified fields of endeavor. Areas of interest include electric power generation, industrial engines and turbines, detectors and sensors, barriers and counterbarriers, fuels handling, construction equipment, materials and cargo handling, environmental control, fortifications and obstacles, marine craft, bridges and structures, counter-surveillance and deception, sanitary engineering, materials research and nuclear weapons effects.

Within these fields, the center currently has assigned projects comprising more than 100 separate tasks. The wide and diverse variety of end items for which the center is responsible presents a challenge when management is faced with the need to absorb major research and development rollbacks in resource allocations.

In this situation management might be tempted to cut uniformly across the board, thereby keeping each group of specialists in business, but at a reduced rate. This could well be sinking the ship on an even keel.

The preferable alternative is to postpone indefinitely or completely eliminate low-priority tasks. This is always difficult to implement, not only at the local level, but also at higher headquarters because of varied interests existing at every echelon of management.

As part of its effort to "do more with less," the MERDC is concentrating on three areas of hardware R&D management to improve performance and shorten the development lead time for major items.

Requiring cooperative efforts of other elements of the Army Materiel Command (AMC), Combat Developments Command (CDC) and the MERDC, the areas are 1) definition and refinement of realistic qualitative materiel requirements; 2) employment of improved contracting techniques; 3) definition and implementation of improved test plans and procedures.

Effort toward more realistic requirements must be made in two phases. Initially, assurance is necessary that the users' requirements are technically attainable and operationally essential in terms of field needs.

During the process of development, the requirements must be subjected to critical reviews by management in AMC and CDC, as well as by the responsible project engineers. Civilian engineers must assess the technical and cost achievability of the performance goals.

Experienced military officers must assess the essentiality of the qualitative and quantitative requirements in the light of actual field operation experience.

Sound management requires at least two critical reviews—the first preceding the formal approval of the requirement; the second after engineering prototypes have been tested, but before subsequent models are procured for engineer/service test. This prototype test review will permit, if necessary, not only modification of the requirement, but also design adjustments to make the engineer/service test prototypes more responsive to the requirement.

In the second area, modified contracting techniques will be geared to motivate industrial partners to retain a sense of responsibility for performance of the equipment throughout its acceptance testing cycle.

The plan is to employ a form of the new Pre-production Evaluation (PPE) contract now in use in first quantity production. It would hold the contractor to producing units which would meet the specified performance requirements. It might be possible to include a warranty under which the contractor agrees to "fix" any item that fails in predetermined tests by the Test and Evaluation Command (TECOM).

The third approach to shortening the journey of R&D items through TECOM tests and into quantity procurement is possibly the most important. Comprehensive and well-defined test plans and procedures for prototype testing by MERDC and the contractor are the key to refining requirements and to maintaining contractor responsibility.

Engineer Design Test (EDT) plans and procedures must be reduced to writing by the project engineer and, following approval, be reviewed periodically by higher management levels. Specific tests must be included to yield quantitative results suitable for determining the compliance of the contract with each essential element of the requirement.

Improvements in the areas of requirements, contracting techniques

FUEL CELLS, which convert chemical energy of fuel directly into electrical power without the wasteful heat cycle common to internal combustion engines, are being developed at MERDC to generate precise power. The 300-watt fuel cell, shown above, can be used as an independent generator or battery charger, or plugged into the electrical system of a vehicle to provide silent power for operations.

FAMILY OF TURBO-ALTERNATORS is being developed at MERDC to cut costs and ease logistical problems involved in generating electric power in the field. The 10-kw unit shown here is one-fifth as big and weighs 725 pounds less than the standard Army 10-kw engine generator it is designed to replace.

and test procedures are expected to hasten the day when an item will pass TECOM's tests on time, the first time, and go into production for use.

The challenge in selecting MERDC equipment to go this route and to get into the hands of troops sooner can be seen from a look at the variety of equipment now under development at the MERDC.

Electric Power. Military electric power consumption has increased 5–fold since World War II because of high power communications and surveillance equipment, complex weapons systems, and changes in military tactics.

A major MERDC effort is devoted to developments to meet growing demands for equipment which will generate electric power with increased reliability and with reduced logistic effort.

Present-day mobile electric power requirements are generally being met with families of gasoline and diesel engine generator sets and turbines. Reliability problems with smaller sets in Southeast Asia have prompted a major "get well" program aimed at doubling the time between overhauls from 1,500 to 3,000 hours.

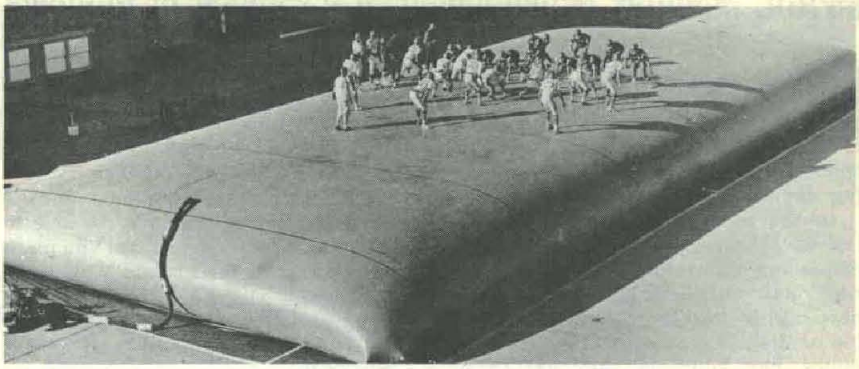
Direct-coupled turbo-alternators producing up to 100 kilowatts of high-quality electric power are being developed to realize potentially lower life cycle costs and—more important to the man in the field—reduce the weight and maintenance effort associated with engine-driven sets.

A 10-kilowatt unit now under test has a design weight of 125 pounds, some 700 pounds less than the standard 10-kw gasoline engine-driven set, and a design life of 25,000 hours, with 6,000 hours between overhauls. As the smallest and first of a family of turbo-alternators, this advanced power source has many potential military applications, and may be attractive for non-military users.

A $4.55 million contract for 22 Engineer Development Test models has been let with Solar Division of International Harvester. It calls for delivery and extensive testing starting in February 1971.

Under consideration as a small silent power source is the closed Rankine-cycle engine. Advanced developmental models of a 1.5-kw unit are under contract with a delivery expected in the fall of 1970. Ultimately, a choice will be made between the closed Rankine-cycle and the fuel cell for silent power requirements.

The fuel cell because of its high efficiency, simplicity, reliability, silence and versatility is a prime candidate for an important role in the Army's future electric power picture.



STORAGE TANK for 27,000 gallons of fuel is displayed in the form of one of the world's most unusual gridirons. Made of nylon coated with polyurethane, it is the largest of a family of self-supporting "pillow" tanks developed to provide mobile combat forces with unit that can be quickly erected and disassembled.

ASSAULT BRIDGE is hydraulically launched in less than two minutes by M113 armored personnel carrier. Constructed of a stress-carrying composite of extruded aluminum, the 33-foot-long, 2,700-pound bridge supports 15 tons.

The major MERDC fuel cell effort currently is an open-cycle, hydrogen-air system deriving hydrogen from the regenerative thermal cracking of logistically available hydrocarbon fuels such as combat gasoline, diesel fuel, and JP–4.

This in-house project is in the feasibility demonstration phase and will enter advanced development within the next year. Advanced studies and component experiments are under way in a long-term program for exploiting scientific and technological advances in solid-state controls, cryogenic superconducting materials and electric-drive systems.

Environmental Control. Another area of vital concern to the modern Army is environmental control: air conditioning and heating. The Army's need is great for equipment to control the temperature and humidity in vans and shelters housing the highly sensitive electrical and electronic equipment essential to communications, missile support and medical operations.

Families of vertical and horizontal units have been developed to meet military requirements for environmental control equipment that must heat, dehumidify and ventilate, as well as produce cold air. Utility packs capable of generating electric power as well are being engineered for operation with the 10-kw turbo-alternator system.

One of several approaches to the goal of reducing the size and increasing the capacity of future utility packs is a silent system using solid-state thermoelectric units instead of a compressor, evaporator and condenser.

Barriers. Detectors and sensors, fortifications and obstacles are all part of barrier research and development at the center. This is an area where we must have broad technological superiority over any potential enemy.

A wide variety of sensors and detectors has been developed to find the hit, run and hide enemy in Vietnam. A multipurpose intrusion detector is but one of many seismic, infrared, magnetic inductor and balanced pressure devices developed by the MERDC for this purpose.

Without alerting the intruder, the multipurpose detector reports to an annunciator by means of a buried wire. Each sensor consists of buried loops of insulated wire connected to a buried pick-up box, six inches high and five inches in diameter.

Sensors also play a key role in the employment of a new type of buried explosive mine. A concept now undergoing feasibility tests envisions

(*Continued on page 28*)

MERDC Modifies Management in Response to Rollback

(*Continued from page 27*)

the launching and acoustic homing of explosive mines from buried emplacements to enemy targets, such as trucks or tanks, which will have been spotted and identified by remote sensing devices.

In the meantime, work is continuing at MERDC on quick methods of emplacing thousands of mines in conventional minefields. Tests show a new highly mobile dispenser is capable of distributing up to 300 antitank mines per hour on the surface or planting 250 per hour to depths of six inches. The mines are supplied in racks carried by the prime mover.

Logistics problems involved in shipment, storage and emplacement of standard antipersonnel obstacles are expected to be alleviated by a barbed-tape device being evaluated in Korea and Vietnam. The steel-barbed tape is wound up in foam containers for shipment and storage, and can be manually erected or dispensed from the back of a moving vehicle.

Solid-state components and printed circuitry have reduced the weight of the nonmetallic mine detector and doubled its effectiveness. The heavy vacuum tube and complicated electronics formerly carried on the soldier's back has been replaced by a module that can be quickly plugged into a small box on the handle.

Research is continuing for the ultimate in mine detectors, effective for any mine, anywhere. Offering some promise at present are several new detection techniques that may be able to discriminate between natural and man-made objects in the ground.

For mine clearance, the MERDC has developed a tank-mounted roller to clear long stretches of road with a low density of mines, or routes expected to contain hastily emplaced mines. Studies are under way jointly with Picatinny Arsenal on a concept which envisions the use of fuel-air explosive charges to activate buried pressure-type fuzes.

Fuels Handling. Fuel is the life blood of the mechanized Army. Consequently, MERDC fuels handling R&D has a high priority, covering many projects geared to keep petroleum products flowing from tankers at sea to the users in the combat zone. These involve a wide range of items, including mooring systems, pumps, pipelines, storage tanks and filters.

In the area of fuel filters, a family in the 15 through 600 gpm size range has been developed to remove dirt and water contaminants. It has been discovered, however, that new fuel additives and surfactants are preventing the coalescence of the water contaminants which is basic to their successful operation. To effect the coalescence and subsequent removal of the water, passage of the fuel through an electrical field is being investigated. Ultrasonics are also under study.

Construction Equipment. Combat construction equipment has always been critical to success in military operations. In today's mobile Army, it is even more so. The Mobility Equipment Command, of which the MERDC is a part, has a lead role in implementing the new Army policy on use of commercial construction equipment for combat service support units, when that option is advantageous. For combat engineer tasks in forward areas, air lift, etc., military design equipment still appears necessary.

To build pioneer roads, assault airstrips, and fortifications extending from underground emplacements to mountain-top firebases under the threat of enemy fire, combat engineers must have equipment which is versatile. Development is complete on a Universal Engineer Tractor (UET). It can provide the divisional combat engineer with an armored, air-deliverable, amphibious multipurpose earthmover that can outperform the dozers, scrapers and haulers currently available.

Development is progressing on FAMECE (Family of Military Engineer Construction Equipment) to provide a complementary capability or serve a wider variety of combat engineer tasks. Scheduled to be ready for the field Army in the late 70s, FAMECE will consist of a common power module and a number of work modules, such as a dozer, scraper, grader, dumper, tanker and compactor.

Another ongoing development, a Repetitive Explosive Device for Soil Displacement, called REDSOD, represents a radical departure from traditional excavation concepts. It may provide the technological breakthrough needed to meet future requirements for combat construction equipment.

REDSOD is basically an internal combustion device that fires repetitively several times per minute. The exploratory development model consists of six combustion chambers mounted on the Universal Engineer Tractor.

Exhaust ports for the gas pressure

FAMECE, denoting Family of Military Engineer Construction Equipment, is being developed by the Mobility Equipment R&D Center to increase mobility of earthmovers and decrease the logistical burden caused by multiplicity of makes and models in the field. FAMECE features a common mobile power module that will accommodate as many as 13 different pieces of construction equipment.

generated by the combustion chambers are located at the foot of the blade. As the blade is pushed into the soil, a mixture of compressed air and gasoline is admitted to the combustion chambers and ignited. The resulting explosions disaggregate the soil and displace it to either side.

REDSOD may eventually be a kit designed for field installation on a standard tractor, or a device requiring the development of a special transporter. Tests indicate that it may be capable of excavating earth more than 19 times faster than conventional equipment.

Materials Handling Equipment. No matter how much effort goes into cutting the logistical tail, handling and transporting supplies is vital to a mobile army. Improved forklift trucks are now under test for use in hauling ammunition and other combat supplies in forward areas.

Procurement in this area is awaiting completion this summer of a Materials Handling Equipment doctrine study. In any event, the equipment must work in and around 8′ x 8′ x 20′ standardized containers now becoming the cornerstone of commercial and military supply handling and shipment.

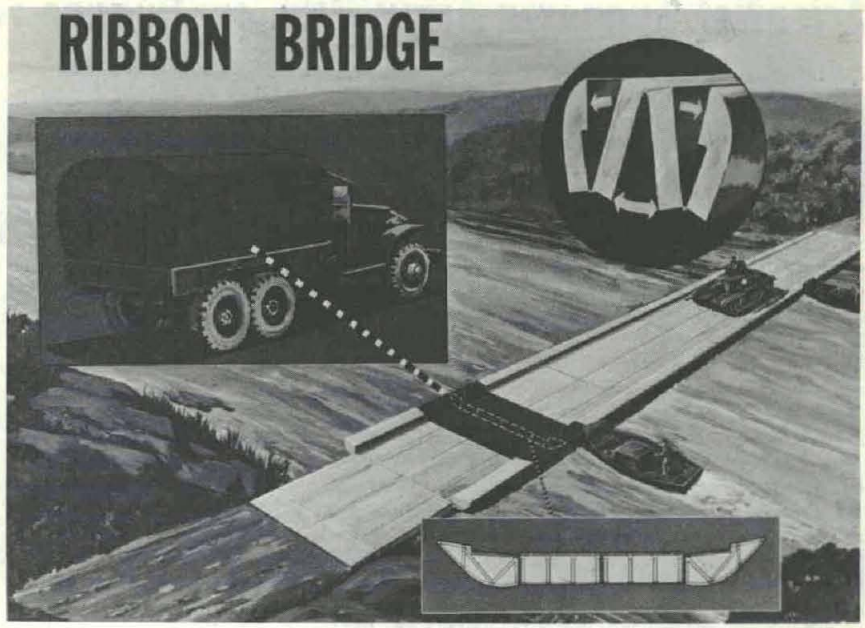
In the long range, emphasis in materials handling equipment may shift to more sophisticated concepts. One which may have application to the Army of the 80s is a vertical takeoff and landing craft employing a vacuum force or magnet to pick up and deliver future containers.

Bridges. While bridges of the future may be drastically different from current approaches, most recent developments are of an expedient nature to meet Southeast Asia demands.

One example is the Marginal Terrain Assault Bridge, M113 Armored Personnel Carrier (MTAB-APC) for quick crossing of the irrigation canals that crisscross the Mekong Delta. Twenty MTAB-APCs used in an evaluation in Vietnam have met with approval on the concept of employment.

The next bridge on our horizon is a continuous cellular aluminum ribbon, supported by the water, as opposed to pontoons, in river crossing. Consisting of 22–foot segments transportable by truck or helicopter, it will be emplaced with the aid of bridge-erection boats and held in place by boats or cables to carry 60–ton loads. Emplacement should be 10 times faster than that of current float bridges and require only one-half the number of personnel. Prototype tests are scheduled to start this summer.

Water Purification. Mobility and versatility are also the order of today and tomorrow in water purification



RIBBON BRIDGE is designed to reduce logistical problems in storing, moving, erecting and retrieving the many components of conventional pontoon bridges. Made of buoyant aluminum segments, each 22 feet long and 26 feet wide, it can be erected rapidly in lengths up to 400 feet and has a load-bearing capacity up to 60 tons.

equipment. A 420–gallon-per-hour unit designed to meet urgent requirements for air mobility in Vietnam can be carried in the cargo compartment of a helicopter. It is the smallest in a family of purifiers that have been effective over the years, not only for the Army but for communities stricken by floods and earthquakes.

In what appears to be a major step toward filling the Army's urgent need for a process that will remove all types of contaminants from all types of water, work is under way in adapting the commercial reverse osmosis process to mobile military equipment.

Experimental configurations are now being used to remove soluble salts and poison from sea and brackish water, radiological substances from fresh water, and detergents, grease and oil from laundry water.

Camouflage. Camouflage and deception programs at MERDC cover development of equipment ranging from concealment sets for missile systems to field-fabricated decoys. Work in this area is dependent to a large degree on our materials research which prescribes the paints, plastics, adhesives, fabrics and chemical compositions needed for modern camouflage devices, as well as the metals and other materials used extensively in mobile military equipment.

Painstaking tests in the Materials Laboratory resulted in the development of plastic sandbags for Vietnam. These last three or four times longer there than the burlap and cotton types, thus saving several million dollars per year.

Nuclear Weapons Effects. As Army lead laboratory facility for nuclear electromagnetic effects, the MERDC conducts extensive tests and analysis of such missile systems as Pershing and Safeguard, along with critical tactical weapons and support systems. The center provides facilities to determine the degree to which electromagnetic pulses released by detonation of nuclear weapons adversely affect electronic equipment spared by the blast, and the means to harden against it.

One facility incorporates five Marx generator modules and a cylindrical coil 60 feet long and 51 feet in diameter to simulate either natural or manmade electromagnetic pulse phenomena. It provides data on the effects on missile-in-flight components, for example, guidance and fuzing systems. The other is a biconic antenna system to simulate reaction pulses would have on ground equipment.

This brief review indicates the wide variety of MERDC fields of endeavor and the essential contributions the center may make to many aspects of Army mobility. While improved requirements, contracting techniques and test plans hopefully will enable the center to do more with less, the challenge is large to effect economies over many diverse areas in a manner best calculated to improve Army mobility now and in the future.

Scientist Suggests Army War on Hunger to Foster World Peace

EDITOR'S NOTE—In this article, an Army scientist expresses views which do not necessarily reflect those of the Department of Defense or any of its agencies. The author advocates a new role for the U.S. Army—the use of its long-established and diversified specialized skills to wage a war against hunger and malnutrition in underdeveloped countries, as a means of alleviating basic causes inimical to world peace.

Published in the Military Review *magazine (January 1970) and reprinted by permission, the article points to the need for an expanded research and development effort to broaden understandng of many complex problems involved in such a role for the Army. It contends that the Army is peculiarly, if not uniquely, qualified to assume a major role in a nationwide effort with other U.S. Government agencies to organize and conduct a war on hunger—as an effective approach toward easing of conditions which are conducive to violence and the spread of Communism.*

Since 1960 the U.S. Army, through the Office of the Chief of Research and Development and under the monitorship of the Natick (Mass.) Laboratories, has sponsored a projected 12-volume series of reports of studies on The Ecology of Malnutrition, *prepared uder contract by Dr. Jacques M. May. Eight volumes have been published (the first under sponsorship of the Office of Naval Research).* When *completed, the series will provide information on major geographical areas of military interest.*

* * *

By Dr. Allan L. Forbes

Civil disorder, insurgency and Communism are spawned by grievances—real or imaginary. At least in the underdeveloped world, grievances are real indeed, and are fanned by the rising expectations created by the technological era in which we live. Hunger, resultant disease and early death most commonly constitute the foundation for these grievances because they so directly threaten man's most basic instinct for survival.

Hunger and its causes prove ultimately to be the most important factors fundamentally responsible for much of existing political and social unrest in the world today. The preponderance of available knowledge indicates that the hunger and malnutrition problems in the underdeveloped two-thirds of the world will become much worse in the foreseeable future of 5 to 20 years.

No one knows precisely how many people die per year of malnutrition. A reasonable approximation is 20 to 30 million. The number maimed for life, both physically and mentally, is much larger. The problem today is of the same magnitude in terms of human destruction as is postulated in the event of thermonuclear war.

Mankind thus faces not one, but two problems which eclipse all others. By expenditures of great resources, we have succeeded in reducing the likelihood of thermonuclear exchange to a creditable level, at least for the present. Worldwide malnutrition and famine constitute threats to human survival of equal magnitude. As the situation stands now, they are far more likely to precipitate dissolution of world peace and security than nuclear holocaust.

Consequently, it seems rational to devote major resources to trying to bring the malnutrition and famine threats under control with the same vigor and dispatch applied to the nuclear threat. Corrective actions will require tremendous efforts, far in excess of those in effect today.

If national resources and capabilities are marshalled to combat the problem realistically, America could be the leader of an era of peace with honor.

If weakened national will and loss of sense of purpose prevail, more Vietnams seem inevitable and our involvement will be less and less decisive. Military missions aimed at preservation of peace and security—at prevention of violence before it occurs—will continue to scratch the surface, not reaching into the heart of the dilemma.

Man is the core. What happens to him is the problem. Malnutrition and starvation lead, on the one hand, to death; on the other, to real grievances and human degradation among the survivors. These in turn lead to violence and dissolution of order and progress.

The causative factors are the population explosion and decreasing food actually consumed by man. Each of these causes is the result of other factors. Unfortunately, the causes are often thought of as being the problem, rather than what happens to man himself. This leads to confusion of thinking and faulty planning.

Man and the environment in which he finds himself—human ecology—is studied to a minimal degree. The precise state of his nutritional health, his nutritional needs and his related disease problems are poorly understood, and infrequently form the basis for existing development programs, although the means to gain the required knowledge are available.

Common Misunderstandings. Several basic factors concerning the world food problem are frequently overlooked. *Malnutrition*, not starvation, is the leading underlying cause of death in the world today. However, individual deaths often are ascribed to a specific terminal infectious disease superimposed on pre-existing malnutrition.

Food deficits, both quantitative and qualitative, lead to many forms of nutritional diseases. Starvation or deficit in total calories is only one of these many forms. Death occurs either directly from deficits of specific nutrients or from common infectious diseases which are not fatal in advanced countries and would not have been fatal elsewhere if pre-existing malnutrition had not been present.

For example, even in a country as advanced as Chile, the fatality rate from ordinary measles exceeds 120 times the rate in the United States.

Economic and social costs of malnutrition are far greater than generally recognized. Malnutrition causes marked impairment of physical growth, development and strength. Of even greater importance is the recent evidence that severe and irreparable retardation of mental growth and development results from protein-calorie malnutrition and probably other forms of malnutrition.

The implications of whole nations where the vast majority of the population is mentally dull are enormous. It is unreasonable to expect nation building to occur with populations whose physical and mental capacity is sapped of strength by malnutrition.

Populations of developing countries are usually larger than vital statistics data indicate. Actual food consumption in developing countries is thus significantly lower than food availability data indicate.

Man does not require *animal protein* for normal health. Conversion of plant protein to animal protein is an uneconomical and often wasteful way to provide man with nutritious food.

Population Growth Factors. Within the short time available, direct approaches to birth control are not

likely to alter greatly the imbalance between food production and population growth in the developing countries. This conclusion appears reasonable because of the unsatisfactory methods currently existing, the general lack of acceptance by the populations most needing them, and the great costs, particularly of professional manpower, to reach effectively the enormous populations involved.

Improving survival of those children who are born alive and healthy, coupled with efforts to meet other fundamental needs concerned directly with human well-being, should be the cornerstone of programs aimed at ultimate population control. When potable water, an adequate diet, and epidemic disease control allow man to see his children grow and mature to provide him with his form of "social security," he and his successors have a major incentive to decrease their family size.

When man ceases to live at a bare subsistence level and graduates to a money economy, he decreases his family size one way or another to safeguard his improving standard of living. When his community has developed a sophisticated medical care capability, he may elect to legalize abortions.

When he can go to elementary school, he may learn how to bring about some of these changes. Until he researches these stages, he is unlikely to control the size of his family, with or without direct birth control programs to induce him or her to do so.

The *science of modern medicine* has been a minor contributor to the population explosion until very recent years. The population explosion in the Western developed world began over two centuries ago without the benefits of modern medicine. The most significant factors reducing our mortality were diversification of the diet and potable water, both resulting from the Industrial Revolution without significant input from the medical profession.

Estimate of the Situation. A reasonably accurate estimate of the situation throughout the word, requires particular consideration of seven factors:

• According to most estimates, the world's population will double by the year 2000 to 6-plus billion, with the greatest increases occurring in the already malnourished underdeveloped world. Only thermonuclear war or starvation of massive proportions can significantly alter these population projections, unless control of malnutrition and impending starvation is given supreme priority and vast resources are devoted to the fundamental factors responsible for high rates of population growth.

• *Current state of health in the developing countries.* Reliable data on nationwide scales are scarce. In general, mortality data are the most valid. By taking the total deaths in a country in a year, and examining these deaths in terms of age by cumulatively adding deaths year by year through old age, a useful estimate can be made of over-all health status, plus a particularly informative single number—the age at which 50 percent die.

One-half of the deaths in the United States occur by the age of 68 years. In sharp contrast, as examples, 50 percent of the mortality in the United Arab Republic occurs by 2 years of age, in Colombia by 4½ years, and in Thailand by 23 years, due to high death rates in infancy and early childhood. The primary underlying cause of the majority of these deaths is malnutrition. In most developing countries, 50 percent of mortality occurs before 5 years of age.

• *Food production.* As of 1967, a 7 percent increase was required even to restore 1964 per capita levels of food production in the developing countries. In 1966, the value of their exports fell 3 percent while food imports rose by 4 percent. In Africa and Latin America, total food production decreased in 1966. In general, these patterns of change have recurred each year during the past decade. Indeed, the cumulative effects have reached critical proportions.

The years 1967 and 1968 did bring some improvement, with increased food production closely paralleling increases in world population. This improvement, however, was due to a large extent to the best crop weather in many years—a situation not likely to recur at a high rate of frequency. At best, 1967–68 provided a short period of uncertain stability.

• *Assistance programs in the areas of agriculture and health, both private and public.* These are financed largely by the developed nations. Among the many existing organizations with such programs are our Agency for International Development (AID), the Rockefeller and Ford Foundations, the French foreign assistance program in West and Equatorial Africa, and a number of international agencies such as the Food and Agricultural Organization of the United Nations (FAO).

FAO has perhaps the clearest mandate to assist in improvement of food production in the developing nations. FAO makes highly creditable contributions in the collection, interpretation and publication of agricultural and food production data, and in the provision of advisory services.

Fiscal limitations, however, place great restrictions on FAO's capability to undertake corrective action programs. Unfortunately, much the same type of fiscal and related limitations apply to the entire scope of existing assistance efforts in health and agriculture.

Much good work is accomplished despite existing handicaps. Periodically, real breakthroughs occur, such as the recent development of high-yield strains of rice at the International Rice Research Institute in the Philippines. The fundamental problem is not program content in the broad sense, but rather is total program magnitude when viewed in terms of the enormity of the needs.

• *Estimates of future food requirements.* In 1967, the President's Science Advisory Committee on the World Food Supply concluded that food requirements of the developing countries will double by 1985.

Surplus food supplies. The United States has played a major role in providing food to developing countries from our stockpiles. However, our supplies of surplus foods have declined sharply since 1961. Wheat and corn surpluses are small fractions of what they were in 1961, as is the surplus of a tremendously important item, nonfat dry milk.

Over the short-term, our presently untapped capabilities to augment domestic food production are considerable, *if we should choose to use them* (italics added). Looking ahead 10 to 20 years, it is highly questionable as to what our domestically produced contributions to the developing nations can be. With them, we will need these resources to feed our own expanding population.

• *Increasing food production.* The massive increases in food production required cannot be achieved by placing primary emphasis on expanding acreage under cultivation. The only major exception may be in the Soviet Union. It is highly unlikly that the many novel concepts and techniques for increased food production, such as synthetic foods, foods from the sea, hydroponics, and desalination of soils and water, can be brought into practical reality in time to avert world famine.

Hopefully, research and development in these fields will continue at an accelerating rate. Still it is well to anticipate that it will take some decades before the application of the results of this research and development will attain sufficient magnitude

(*Continued on page 32*)

Army Scientist Suggests Major War on Hunger

(*Continued from page 31*)

to make great contributions to man's food supplies. *The major practical approach today is growing more and better food on the land already under cultivation* (italics added).

Scope of the Threat. It is reasonable to conclude that, with the present faltering progress in increasing world food supplies, the 70-surplus million people being added each year cannot be fed, even at the malnourished level of today. This is a truly explosive situation. Famine on an unprecedented scale within 5 to 20 years is a logical eventuality.

Precisely when this will occur cannot be predicted. It is consistent with available evidence to conclude that it has a higher likelihood of occuring within 5 to 10 years, could happen more quickly if there are one or two bad crop years, and appears inevitable within 15 to 20 years unless tremendous efforts far in excess of present attempts are commenced to stop it.

Both history and current events demonstrate the threat well. Wars of conquest have often had possession of agriculturally productive land as their goal. Even our own Civil War contained elements of this. The existing and potential productivity of the three great deltas of continental Southeast Asia obviously is a basic factor in the current conflict in the region.

Today, hardly a month goes by without incidents involving armed conflict and army intervention occurring somewhere in the underdeveloped world which have as their basis a collision between population growth, food requirements and lagging agricultural production.

Many of us have an unfortunate tendency to think of these incidents in terms of the event itself, i.e., total casualties, property damage, the politics and personalities of the rival groups and their leaders, without seriously attempting to understand the how and why factors which resulted in dissolution of peace.

Critical Cornerstones. In examining the underdeveloped world generally, it is essential to keep in mind that agriculture and food are the cornerstones for everything that happens. The people at large live in a subsistence economy, usually with 85 percent or more of the populations in rural areas. Their whole lives are devoted to raising enough food to survive.

Tamper with these cornerstones in any number of negative ways, and the result is disturbance of peace and progress. It makes little difference what these negative ways are, be they man-made in the political or economic sense or the results of man's failure to gain control over nature.

Among these ways which directly contribute to food deficits are faulty or inadequate government attention to the agricultural and health sectors, negligible public or private conservation programs, feudalistic land ownership, inadequate transportation facilities, falling exports and inflation, on the one hand; and drought, flood, rising populations, insect devastation of crops, and plant and domestic animal diseases, on the other. Sadly, many of these and related factors often coexist in the underdeveloped world.

No major region of the underdeveloped world has been immune to this type of conflict during the past several years, and the rate at which such incidents occur gives every indication of increasing. Many of these regions have considerable strategic importance to our own national security and to the maintenance of world peace.

Concerning Vietnam, widespread malnutrition and resultant high mortality rates among infants and young children have been, and continue to be, serious problems and real grievances in that country. The situation in Vietnam has deteriorated since studied in detail in 1959 and is compounded by the current refugee problem.

The rapidity with which frank starvation can occur, and reoccur, when civil strife and low-level military conflict are superimposed on a very marginal food supply and poor nutritional status, is vividly represented by recent events in Biafra. The frequency of violence and unrest stemming from collision between population growth and food requirements is escalating rapidly around the world.

In the USSR, by way of contrast, Nikita S. Krushchev's "great gamble" is paying off now in agricultural production. If the USSR continues its heavy expenditures wisely in developing its virgin lands, we must face the Russian potential for supremacy as the world's greatest supplier of food.

The USSR is already a major exporter of agricultural products. We should be aware of the benefits which would accrue if she uses her increasing surpluses directly as basic instruments for Communist dominance in a world rapidly running out of food.

The Role of Military Forces. Is there is a role for U.S. military forces in this war on hunger?

Basic military planning documents clearly identify two fundamental objectives, not one, for our military forces. These are the prevention of conflict, and the waging of conflict. Security operations concerned with prevention of insurgencies have taken a prominent position in Army philosophy and doctrine.

The concept of flexibility of response has become a byword in military planning. If indeed current massive malnutrition and impending starvation are the most fundamental threats to peace and security in the world today, it seems rational that military forces could become committed to assisting in the solution of the food, malnutrition and starvation crises.

"*Why military forces*?" First, there is logic in the philosophical concept that military forces can wage peace, while maintaining combat capacity. Secondly, and more pragmatically, there are many tasks involved for which military forces have outstanding and, in some instances, unique attributes and capabilities. Some of these attributes and capabilities with reference to the U.S. Army, for example, are:

- From the historical point of view, the Army has had wide experience with development projects. These include:

(1) the U.S. Military Academy at West Point was our only source of civil engineers for many years—engineers who devoted much effort to transportation facilities, flood control and improvement of agricultural land;

(2) the opening up by the Army of our West—the world's greatest breadbasket;

(3) the Army's role in initiating the land grant colleges in 1862, from which have come a large proportion of our agriculturalists and many thousands of Army officers over the years;

(4) the massive food and nutrition effort by the Army Medical Department and the Quartermaster Corps in Western Europe after World War II;

(5) the Armed Forces Assistance to Korea program during and after the Korean War, which was aimed at meeting basic needs in agriculture, health, elementary education and transportation; and

(6) the gradual evolution of today's more than $1 billion annual Civil Works Program of the Army Corps of Engineers, which is heavily oriented to the agricultural sector.

- Secondly, the concepts of civic action as they now exist embody many of the required attributes and capabilities. There is a tendency for civic action efforts to be too short-term in nature. The basic concepts,

however, are directly applicable to long-range tasks.

• A third factor is the reality that the ruling authorities of many developing countries are military personages, and that the most efficient bureaucracy in these countries is often the military establishment.

For many projects of significant size, chances of success are dim indeed without following the pattern of management, order and discipline characteristic of military organizations. In some developing countries, there may be no logical alternative to undertaking programs within the framework of the local military establishment, particularly when logistical requirements are high.

Long-Established Skills. Attributes also exist which for practical purposes are unique to military forces and in many areas of the world become of much importance. In brief, these are the provisions of security, the ability to live and function productively under adverse conditions in rural areas for prolonged periods, coupled with the advantages of discipline and clarity of decisions, and the ability to practice reasonable detachment from the local community because of military self-sufficiency.

American military medicine, particularly as represented by the Army Medical Department, is global by definition and practice, unlike any other segment of the American medical community. Hence, clinical acumen and research experience in fields such as tropical medicine, clinical nutrition, climatic medicine, and preventive medicine are outstanding, and at times unique, in the military Medical Services.

A number of Army and Army-related institutions have long histories and current capabilities in the fields of international nutrition and agriculture. The largest nutrition research laboratory in the country, and perhaps in the world, is the U.S. Army Medical Research and Nutrition Laboratory in Denver, Colo. The largest food science and food technology laboratory in the nation is the Food Laboratory of the U.S. Army Natick Laboratories in Massachusetts.

Another scientific group with a strong Army background is an organization formerly known as the Interdepartmental Committee on Nutrition for National Defense, under the chairmanship of the Assistant Secretary of Defense (Health and Medical) from 1955 to 1965. It has now become a part of the Public Health Service, but continues on a reduced scale to undertake nutrition studies and development tasks overseas for the Department of Defense, often in collaboration with the Army and the Navy.

Extremely important groups within the U. S. Army are the Civil Affairs Companies, which have undertaken many food and nutrition tasks in past wars and postwar situations. Today, they are involved in most creditable efforts on a limited scale in Vietnam in the fields of clinical nutrition, provision of food to civilian population groups, and improvement of agricultural productivity.

The Corps of Engineers has few if any peers in the design and construction of dams, irrigation systems, farm-to-market roads, flood-control systems, drainage systems, and potable water supplies, all of which are fundamental to success in waging war on hunger.

In many developing countries, agriculturalists base their programs on maps and associated data on terrain, soils, rainfall, and natural vegetation collected and published by the U.S. Army Corps of Engineers.

In summary, U.S. Army expertise is vast in agricultural engineering, international medicine, food and nutrition, civil affairs, transportation and communications—all being precisely the attributes and capabilities required to augment food production, food distribution, and nutritional status in underdeveloped areas.

Odd though it may seem at first glance, among Federal Government agencies, the U. S. Army has an extremely broad scientific foundation and the operational expertise to make major contributions to building a significant capability to wage war on world hunger.

Conclusion. The world is practicing brinkmanship by underestimating the consequences of present-day and future human hunger. The United States, as the Free World's superpower, is providing insufficient leadership and resources to the war on hunger.

Consideration should be given to assigning responsibilities to the U.S. Army to join with other agencies of the Federal Government to provide national leadership to U. S. participation in the war on hunger in developing countries of strategic importance to the United States, because the Army possesses the necessary attributes and capabilities for many of the tasks required.

The U. S. Army strongly desires to pursue the prevention of conflict. The opinion of some that it is improper for military forces to be committed along with others to nation building is rejected. The proposition is put forward that current efforts to wage war on hunger are weak relative to the magnitude of the problem.

It is not proposed that the Army as now manned and funded embark on the war on hunger. It is proposed that the Army has capabilities which could well make the difference between ultimate success or failure.

The tasks to be done separate themselves into two broad areas: (1) augmenting the quality and quantity of man's food along the entire chain from the planting of the need to consumption in the home, and (2) the prevention of disease and disability due to malnutrition. *These are enormous tasks but they could be successfully undertaken with military assistance if we as a Nation so desired* (italics added).

Dr. Allan L. Forbes is a 1968 graduate of the National War College, and is now chief, Scientific Analysis Branch, Life Sciences Division, Office of the Chief of Research and Development, HQ Department of the Army. He has a BS degree from McGill University in Canada and MS in biochemistry and medical doctor degrees from the Medical College of Virginia. Certified as a specialist in human nutrition by the American Board of Nutrition, Dr. Forbes has directed military and civilian nutrition surveys in Vietnam and Thailand, and has served as a nutrition consultant in many developing countries in Asia and Latin America. As a medical officer and nutrition research investigator for 13 years, he has served with the Veterans Administration, the U.S. Public Health Service, and since 1963 with the Office of the Chief of Research and Development.

AMONG 25 INVENTORS honored for contributing to defense technology are (seated, l. to r.) Andrew J. Grandy, Albert Benditt, Frankford Arsenal CO Col Francis W. Dietsch, who presented awards, Thomas Stevenson; (standing) patents attorney Stanley Dubroff, Manuel Weinstock, Charles J. Litz Jr., Henry S. Lipinski, Sigmund Berk, William E. Perkins, Albert M. Stott, Hugh D. MacDonald Jr., Thomas Q. Cicconi, Joseph Quinlan, James Kowalick.

Frankford Arsenal Honors 25 Employe Inventors

Inventors stepped to the honors platform at Frankford Arsenal, Philadelphia, Pa., when 25 employes with from 5 to 42 patents each recently received gold or silver lapel pins.

Col Eugene C. Barbero, arsenal commander, presented gold pins, signifying 10 or more patentable inventions, to Albert M. Stott, Albert Benditt, Andrew J. Grandy, Joseph B. Quinlan and Thomas Stevenson.

Silver pins (5 to 9 patentable inventions each) were awarded to Sigmund Berk, Thomas Q. Ciccone, Francis W. Dietsch, Cecil C. Fawcett, Henry Gisser, Lloyd W. Insetta, James F. Kowalick, Henry S. Lipinski, Samuel Lipson, Charles J. Litz Jr., Hugh D. MacDonald Jr., William McNeill, Joseph Messina, Fred Pearlstein, William E. Perkins, Frank T. Pisano, Wright H. Scidmore, Martin S. Silverstein, Norma J. Waecker and Manual Weinstock.

Albert Stott is known as the most creative of Frankford's inventors. He has developed 42 patentable inventions, including some of the basic innovations for the Propellant Actuated Devices (PAD) systems, a field in which the arsenal has pioneered and has achieved international renown.

Stott is credited as the primary inventor of the "Electrically Fired Percussion Primer," which permits the design of sequencing systems with and without specific time relays; also, complete coordination of numerous propellant-actuated devices through flexible lines, by-passes and valves.

Devices developed from Stott-initiated concepts also have been used extensively in Air Force aircraft personnel emergency escape systems, and in applications of pyrotechnic devices in spacecraft launched by NASA.

Stott has applied creative ideas to other than the PAD program, and has patented devices for numerous R&D requirements. Examples include the Static and Kinetic Torsional Testing Machines, the recoilless rifle, parachute disconnects and ammunition.

Army Selects 1,242 Students for ROTC Scholarships

Secretary of the Army Stanley R. Resor has announced selection of 1,242 outstanding high school seniors to receive 4-year Reserve Officer Training Corps scholarships—an increase of more than 300 over the 1969 number.

Valid at any of the 281 college and universities participating in the Army ROTC program, the scholarships pay for the student's tuition, textbooks, lab fees and provide $50 per month subsistence allowance. During the 6-week advanced summer camp, the student receives one-half the pay of a second lieutenant, or $193.25 per month.

A scholarship board selected the most outstanding students from 2,352 finalists recommended from more than 4,000 qualified applicants. Nonselected finalists were named as alternates in order of merit.

In addition to the 4-year scholarships, the Army is awarding 400 3-year and 815 2-year scholarships to outstanding college students already enrolled in the ROTC program. Like the 4-year awards, these pay for tuition, textbooks, lab fees and $50 per month subsistence allowance.

The ROTC scholarship program was authorized by Congress in 1964. The first awards, 400 4-year and 600 2-year scholarships, were made in 1965. The number of Army ROTC scholarships in effect for school year 1970–71 will total 5,500. This is the first year that the total number of scholarships authorized by Congress will be in force.

Selection of scholarship recipients is based on academic excellence, extracurricular activities, physical standards, scores received on either the Scholasitc Aptitude Test (SAT) or the American College Testing Program (ACT), and evaluation of motivation and leadership potential.

Upon graduation from college and successful completion of the Army ROTC program, scholarship students are commissioned as second lieutenants in the United States Army and serve on active duty for four years.

The application period for 4-year Army ROTC scholarships for school year 1971–72 begins in September 1970. High school seniors desiring to compete for these awards should write the Army headquarters in their area for information and forms.

Dr. Cogan Named AAAS Fellow

Dr. Eugene A. Cogan, Human Resources Research Organization (HumRRO) director for Research Design and Reporting, has been elected to fellowship by the American Association for the Advancement of Science Board of Directors in recognition of contributions to advancement of science.

Army Studies Free-Wing Concept for Aircraft

Aircraft equipped with wings free to move independently of the fuselage —about a lateral axis—conceivably could reduce substantially the workload on pilots in turbulent atmosphere, results of a study performed under an Army contract indicate.

The Army Aeronautical Research Laboratory at the NASA-Ames Research Center, Moffett Field, Calif., is sponsoring an extensive program of studies of turbulence effects and other operational factors on Army aircraft. Findings of the latest study are reported by Battelle Memorial Institute, Columbus, Ohio.

The aircraft design evaluated would enable the left and right wing panels to rotate freely about a lateral axis through the fuselage. The axis would be far enough forward in the panels to insure a stable lifting surface during forward flight.

Trailing-edge control tabs on the wing would permit change in the wing's planing attitude without rotating the massive fuselage. BMI researchers are of the opinion that the radical design does not present any insurmountable obstacles to manufacturing.

James Loomis, Richard Porter and Joe Brown Jr., the engineers who made the analysis, contend that freeing the wings from the fuselage would offer two principal advantages. First is that the pilot would have rapid response to control inputs—much quicker than the control force produced in conventional aircraft.

The study also indicates that the free-wing concept has natural gust-alleviation characteristics—reducing the heaving, pitching and rolling experienced when the aircraft is in atmospheric turbulence. Insofar as design of the free-wing panels would serve as a shock absorber, many disturbances would be prevented from reaching the fuselage.

BMI researchers considered three hypothetical subsonic aircraft, ranging in gross weight from 3,000 to 50,000 pounds. They compared the turbulence-penetration performance and handling qualities of each free-wing aircraft with that of the equivalent conventional fixed-wing design.

The free-wing approach, they believe, would be most beneficial to the lighter types of aircraft commonly employed for pleasure, business, and air-taxi services. Study results indicate that the concept could reduce buffeting in turbulence normally experienced in light aircraft by as much as 75 percent.

PROMAP-70 Increases Role of Cost Analysis Office

U.S. Army Weapons Command implementation of PROMAP–70 (Program for the Refinement of the Materiel Acquisition Process) is giving its Cost Analysis Office (CAO) an increasingly important role.

Established in 1967, with Fred Chakour as chief, the CAO is increasing its staff to 35 members. Previous experience in developing basic costing techniques and cost data bases as well as conducting a variety of cost studies is proving invaluable.

WECOM has been an Army leader in development of automated models used in the conduct of comprehensive life cycle cost for Army weapons systems. Development started with simple models for small arms weapons and the state-of-the-art has now progressed to comprehensive models for combat vehicles and other weapons systems.

Cost estimating and studies require a variety of computational equipment. Elementary computations are performed on desk calculators and adding machines. The more sophisticated and complex studies are programed on an IBM–360 computer.

WECOM also uses a sophisticated Mathatron calculator/computer and a teletypewriter for both input and output. Mathematical problems can be stored in the memory and processed by punched paper tape.

Instructions can be fed into the machine on one tape and input data and cost factors entered simultaneously on a second tape. The two tapes work in conjunction with the memory bank and a teletypewriter prints the readout.

The Cost Analysis Office is the focal point for the review and evaluation of WECOM estimates from the Cost Estimating Control Center.

Another phase of the PROMAP–70 assigned to the CAO is the WECOM pilot ICE (Improved Cost Estimate), consisting of a series of comprehensive life-cycle studies. Including risk, sensitivity and variance analyses, ICE studies have been conducted on the M60A1E2 tank and Bushmaster weapon systems, and probably will be conducted next on the XM198 towed 155mm howitzer and the M551 Sheridan weapon system.

Dr. Harris Assigned to Pitman-Dunn Research Laboratory

Frankford Arsenal's professional staff capabilities in propellants research was strengthened this month with the addition of Dr. Leonce Harris, who has worked in the theoretical calculation of energy states and the structure of molecules.

Assigned to the Spectroscopy Section of the Pitman-Dunn Research Laboratories, Dr. Harris is a new U.S. Government employe. He was an assistant professor of chemistry at Louisiana State University for 2½ years while doing quantum mechanics research, and also did work on phosphorescence and light emitted from molecules while studying for his PhD degree.

Contacted recently to write a book on the "Extended Huckel Theory," which deals with the semiempirical orbital calculation method for molecules he has had articles published in the U.S. *Journal of Chemical Physics* and in Swiss and Czechoslovakian journals.

Dr. Leonce Harris

President Nixon Nominates 4 As NSF Assistant Directors

Four $36,000-a-year positions as assistant directors of the National Science Foundation, vacant since they were authorized by legislation signed into law July 18, 1968, will be filled if Congress approves President Nixon's recently announced nominees, as follows:

- Edward C. Creutz, 57, to be assistant director for research, now division vice president for research and development, Gulf General Atomic, San Diego, Calif.
- Lloyd E. Humphreys, 57, to be assistant director for education, professor of psychology at the University of Illinois since 1957.
- Lewis Levin, 61, to be assistant director for institutional programs; he has been executive assistant director of the NBS since 1968.
- Rear Adm Thomas B. Owen, 50, chief of naval research since 1967, to be assistant director for national and international programs when he retires in June.

TACOM Upgrading Vehicle Instrumentation

By Joseph W. Steyaert

Joseph W. Steyaert is an electrical engineer in charge of vehicle instruments and vehicular ignition systems at the U.S. Army Tank-Automotive Command's Vehicular Components and Materials Laboratory.

Steyaert holds a BS degree in electrical engineering from the University of Detroit. Registered as a professional engineer in the State of Michigan, he has 11 years of government service.

Shortcomings in the current Military Standard (MS) vehicle instruments and increasingly higher performance of vehicle power plants make necessary a program to upgrade the standards.

MS gauges used on military vehicle instrument panels are modified commercial units, put in waterproof cases, with accuracy and versatility equivalent to those used in automobiles.

The gauges (pressure, temperature, fuel level and voltmeter) are not designed to be mounted with more than a 12-degree inclination from the vertical without seriously shortening life and impairing accuracy.

Recognizing the need for improved design and operational reliability, the U.S. Army Tank-Automotive Commands' Vehicular Components and Materials Laboratory started a program to develop standardized instrument clusters that are durable, dependable, versatile, rugged and able to meet modern human engineering requirements.

The first step was to investigate the MS guage mechanisms and others that could be introduced as replacements. Research results to date indicate that the sliding-coil gauge (SCG) now used may be replaced eventually on all Army vehicles by a simpler and more reliable air-core gauge (ACG).

In its present form, the SCG was designed and put into production prior to World War II. This electromagnetic device is designed for operation through approximately 60° of arc and has a linear resistive transducer as a sensing unit.

Under variation from 24 to 31 volts at 70° ± 5° F. ambient temperature, the accuracy of the SCG is specified as ± 4 angular degrees at all scale deflections. The mechanism has a pair of coils, the extension of whose axis meets at a 90-degree angle. The spindle and armature are mounted at this intersection point.

The coil on the right has a ferrous pole piece to increase its field strength and provide a small degree of temperature compensation. This type of gauge is calibrated by sliding the coils closer to or farther from the armature, to increase or decrease the magnetic field strength.

Current in the SCG flows from the battery through the left into the right coil and then to ground. The sensing unit is connected to an intermediate point between the two coils.

When the sensor indicates the minimum condition (See Figure 1A), the current flows through the left coil to the sensor to the ground. Since the sensor resistance is zero at this point, the right-hand coil is shorted out. Since no current flows through, it produces no flux, causing the armature to line up with the left-hand coil axis and the pointer to indicate zero.

As the sensor resistance increases from zero to 15 ohms (Figure 1B), the current divides after passing through the left coil. One-third of the current passes through the 30-ohm-resistance right coil to ground; and two-thirds passes through the 15-ohm sensor to ground.

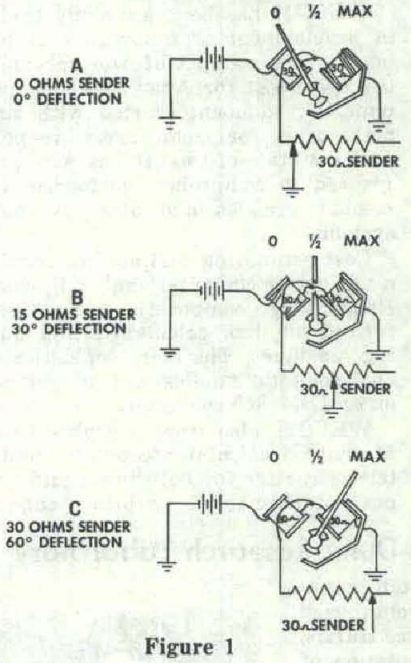


Figure 1

In this manner, the field strength of the right coil is sufficient to deflect the armature and pointer to mid-scale or 30 angular degrees deflection.

When the sensor resistance increases to maximum (30 ohms, Figure 1C), the current passing through the left coil divides equally; half goes through the right coil and the other half through the sensor to ground. The right coil now produces sufficient field strength to rotate the armature and pointer to the maximum position, approximately 60° from zero.

Because the sliding coil gauge is very complex, sensitive to mounting position, and lacks the accuracy required in modern vehicles, other types of instruments were investigated.

The "air-core gauge" has appeared in tests to date to meet all the requirements for Army vehicles. The ACG is also an electromagnetic device, operating in conjunction with a linear resistive transducer as a sensing unit. Designed for operation through 90° of arc, it is rugged, durable, compact, verstaile and accurate.

The ACG complete assembly contains 28 component parts (21 different components). Construction with so few parts, due to multifunction components, points to outstanding mechanical reliability.

Spindle bearings, coil form, back plate locating bushings and silicone damping fluid container are formed by a single injection-molded plastic housing.

Reliability is improved also by soldering the coil wires directly to the mounting studs, reducing the internal electrical connections to a minimum.

The coil is contained within a metal can that provides magnetic shielding. Gauges thus can be mounted in close proximity without interaction, enhancing development of new, compact instrument clusters.

With variation from 24 to 31 volts under 70 ± 50 ambient temperature, the accuracy of the ACG is specified in angular degrees at minimum, half- and full-scale deflections as follows:

Scale Position	*Sender Resistance*	*Tolerance*
Zero	0.6 ohms	−2° to 0°
Half	45 ohms	−3° to +3°
Full	88 ohms	0° to +4°

(Under the same conditions, sliding-coil gauges have a tolerance of ±4° in all positions and their scale is compressed by 30 angular degrees.)

Figure 2 illustrates the electrical circuit diagram for the air-core gauge. The symbols are defined as follows: R_1, R_2, R_3, coil resistance; R_A, resistor; R_S, sensor resistance; I_1, I_2, coil currents.

With the sending unit set at zero, the series combination of R_2 and R_3 is shorted (Figure 2). Hence, there is no I_3 and flux is produced only by the first coil. The armature aligns itself with this flux, producing the zero indication.

With the sending unit set at the one-half position, current flows in all three coils; the resultant flux aligns the armature in the half-scale position.

When the sending unit is set at maximum, enough current flows through coils 2 and 3 so that the flux produced aligns the armature in the maximum deflection position.

By using air-core gauges without waterproof cases and sealing them in a waterproof cluster, USATACOM engineers developed a basic, compact, versatile instrument panel suitable for application to many military general-purpose vheicles (Figure 3).

Because these instruments can be mounted in any position without degrading performance, this type of panel also can be adapted to many special-purpose vehicles.

This new panel has received extensive testing and is currently operational in the M551 General Sheridan Assault vehicle now in use in Southeast Asia. Performance reports on this panel are encouraging enough to introduce these instruments in more vehicles in the near future. Later they could become the standard instruments for all U. S. Army vehicles.

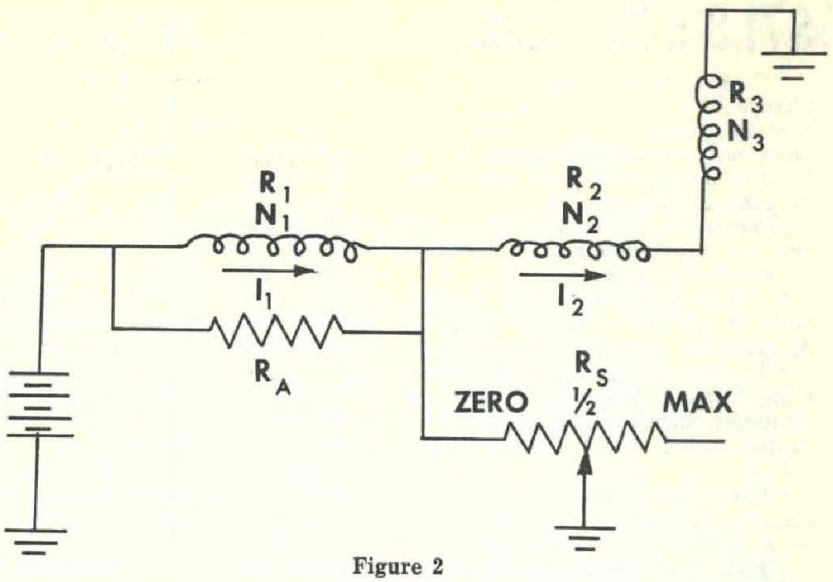


Figure 2

Figure 3. Compact Instrument Cluster

WES Tests Polymeric Foam for Landing Pads

Rapid-reaction polymeric foam that can be sprayed and used as a dust-free landing pad for VTOL aircraft less than an hour after application, serve as a hard surface for truck traffic, has been demonstrated successfully by Army agencies in recent months.

Tests are continuing at the Waterways Experiment Station, a U.S. Army Corps of Engineers activity at Vicksburg, Miss. Earlier tests were performed by the U.S. Army Materiel Command's Advanced Materiel Concepts Agency (AMCA) at the Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va.

Interested also in the test program is the Army Materiel Command project manager for Southeast Asia Night Operations, and the U.S. Army Aviation Center, Fort Rucker, Ala. The foam appears to offer advantages for landing pads over existing materials in service, in shortened application and "curing" (hardening) time.

Results of further tests are expected to assist the Advanced Materiel Concepts Agency and the Combat Development Command's Institute of Land Combat in determining potential materiel options for Army aviation during the next two decades. Hopefully, rapid-reaction foam could result in future Army VTOL aircraft concepts utilizing high disc loading, with resultant high downward vertical velocities.

The polymeric foam was provided by Uniroyal, Inc., and is similar to that avilable from a number of other U.S. manufacturers. In the tests at the MERDC, one 50 x 50-foot pad was sprayed on barren soil and a 40 x 50-foot pad was applied on moderate vegetation.

Tests at Vicksburg have used the foam for roadways into water and for varying distances upon the water to support trucks. The foam forms into a lightweight, hard and durable surface. One of the featured demonstrations at the 1969 annual meeting of the Association of the United States Army was the use of a similar foam to support a jeep upon water.

Scientific Calendar

24th Annual Frequency Control Symposium, sponsored by AMC and ECOM, Atlantic City, N.J., Apr. 27–29.

National Telemetering Conference and Exposition, sponsored by IEEE, Los Angeles, Calif., Apr. 27–30.

Annual Conference of the Society of Aeronautical Weight Engineers, Washington, D.C., May 3–7.

Transducer Conference, sponsored by IEEE, Gaithersburg, Md., May 4–5.

Symposium on Nonlinear Programing, sponsored by MRC, Madison, Wis., May 4–6.

4th Conference on Aerospace Meteorology, sponsored by AMS and AIAA, Las Vegas, Nev., May 4–7.

21st Annual Appliance Technical Conference, sponsored by IEEE, Mansfield, Ohio, May 5–6.

Spring Joint Computer Conference, sponsored by IEEE, Atlantic City, N.J., May 5–7.

Midwest Symposium on Circuit Theory, sponsored by IEEE, Minneapolis, Minn., May 7–8.

7th National Colloquium on Information Retrieval, sponsored by AMC and MUCOM, Philadelphia, Pa., May 7–8.

1970 International Science Fair, Baltimore, Md., May 10–15.

2d International Conference on Chemical Vapor Deposition, Los Angeles, Calif., May 10–15.

4th Conference of the International Electron and Ion Beam Science and Technology, Los Angeles, Calif., May 10–15.

International Symposium on Microwave Theory and Techniques, Long Beach, Calif., May 11–13.

Design Engineering Conference, sponsored by ASME, Chicago, Ill., May 11–14.

Controls and Systems Conference, sponsored by the Fluid Power Society, Chicago, Ill., May 13–14.

$71.8 Billion Budget Hits Low Percent of Total Level Since 1950

(*Continued from page 3*)

picture of the future strategic environment emerges. This should come from our own continuing review and from such other factors as SALT and the changing threat. . . ."

Selected major strategic programs and associated funding for FY 1971 were outlined as follows:

- Initiation of engineering development of Advanced Manned Strategic Aircraft (B–1, AMSA), $100 million.
- Initial procurement of Short-Range Attack Missile (SRAM) and continued development of Subsonic Cruise Armed Decoy (SCAD), $297 million.
- Continued procurement of Minuteman III missiles and Minuteman force modernization, $686 million.
- R&D on Minuteman hardening and rebasing concepts, $77 million.
- Conversion of six SSBNs to the Poseidon nuclear-powered submarine configuration, $1,017 million.
- Advanced development of the Undersea Long-Range Missile System (ULMS), $44 million.
- Continuation of engineering development on Airborne Warning and Control System (AWACS), $87 million.
- Development and deployment of new satellite strategic surveillance system, $219 million.
- Continued deployment of Safeguard ABM System, $1,490 million.

Under the heading of the General Purpose Forces Program for FY 1971, the proposal calls for 29⅓ Active and Reserve Division Force Equivalents at the end of FY 1970 (3⅓ less than at end of FY 1969).

The Active Army will decline from 19⅔ Division Force Equivalents at end of FY 1969 to 17⅓ at end of FY 1970.

The Marine Corps reduction is planned from four to three divisions.

Major active naval forces planned for FY 1971 maintenance include 15 attack carriers, four ASW carriers, 52 nuclear and 53 conventional attack submarines, over 500 ASW aircraft and 242 escort ships.

The program provides for about 8,300 tactical aircraft, including about 4,600 active fighter/attack aircraft organized into 85 squadrons (23 wings) in the Air Force, 72 squadrons in the Navy, and 25 squadrons (3 wings) in the Marine Corps.

General purpose forces major programs proposed for FY 1971 include:

Land Forces. Continued development of SAM–D, a surface-to-air missile, $89 million; development of new austere Main Battle Tank, $77 million; procurement of helicopters (UH–1s, CH–47s, AH–1s, OH–58s), $197 million; procurement of TOW antitank missiles, $106 million; procurement of improved Hawk and Chaparral missiles, $168 million.

Tactical Air Forces. Development of F–15 superiority fighter, $370 million; development of A–X close air support aircraft, $28 million; development of F–111s (or alternative aircraft), $484 million; development and procurement of F–14 multimission fighter, $841 million; procurement of AV–6Bs (Harrier) V/STOL aircraft, $96 million; procurement of A–7 attack aircraft, $350 million.

Naval Forces. Advanced procurement for the third Nimitz-class attack carrier, $152 million; development and initial procurement of the S–3 carrier-based ASW aircraft, $287 million; continued procurement of the P–3C land-based ASW aircraft, $160 million; development of new ship air defense system, $75 million; construction of 3 high-speed submarines, $476 million, 3 nuclear-powered guided missile destroyers, $221 million, 6 ASW destroyers, $460 million, and 2 multipurpose amphibious assault ships, $314 million.

Soviet Union offensive and defensive strength is increasing more rapidly than has been anticipated in U.S. intelligence estimates, Secretary Laird said, adding:

"The projections for ICBM and SLBM strengths for mid-1970 and mid-1971 have been revised upward in each of the past five years as additional information on Soviet deployments has become available.

"For example, the current estimates of total operational Soviet ICBM and SLBM launchers expected by mid-1970, when compared with the projections for mid-1970 made last year, show an increase of well over 100 launchers. The same basic trend is evident in the projections for 1971.

"The fact that our projections have not reflected all of the growth in Soviet offensive missile strength over the past several years is less important than the actual magnitude of this threat. . . .

"Soviet strategic offensive forces include intercontinental ballistic missiles (ICBMs), ballistic missile submarines, heavy bombers, medium-range and intermediate-range ballistic missiles (MR/IRBMs) and medium bombers.

"Soviet defensive forces, which are the most extensive in the world, include interceptor aircraft, surface-to-air missiles (SAMs), and ballistic missile defense (BMD). The interceptor aircraft and SAMS, together with the necessary air warning facilities, are considered air defense forces."

Soviet Union ICBM launcher strength is currently superior to that of the U.S. (1,100 as compared to 1,054) and more than 275 of the Soviet launchers are for the large SS–9 missile, Laird stated.

Soviet operational launcher strength is expected to increase to 1,250 by mid-1970, a phenomenal gain in that the 1966 total was 250. Qualitative improvements also are being made, including testing of multiple reentry vehicles with the SS–9.

The USSR also has made rapid progress on development of nuclear submarines, and at current construction rates could have 35 to 50 of the Y-class comparable to the U.S. Polaris (current strength, 51) by 1974–75.

"Should the Soviets follow a 'high force-high technology' approach . . . during the next several years," Laird said, "they could pose not only an overwhelming threat to our cities but also a very formidable threat to our land-based missile forces and bombers. . . . As a defense planner, I would never guarantee the invulnerability of *any* strategic system beyond the very foreseeable future, say 5–7 years."

In expressing his views on the importance of research and development, he commented that it is "very difficult to determine with any degree of confidence what constitutes an adequate R&D effort. One factor contributing to this uncertainty is our inability to project with any reasonable degree of accuracy the technological threat to our national security over the next 10 to 20 years.

"There is one thing we do know: we cannot settle for anything short of technological leadership in R&D related to national security. The FY 1971 Defense budget request for research, development, test and evaluation (RDT&E) is intended to meet this objective.

"It reflects our changing priorities within a constrained budget by reducing the funds for the latter stages of development and by sustaining the technological base required to meet possible future requirements. *I regard this RDT&E budget as the minimum with which we can have some confidence of meeting our needs in the future* (italics added).

"The most formidable technological threat confronting the United States today is the already large and rapidly growing military-related R&D effort of the Soviet Union. Measured in terms of money expended, the Soviet Union is devoting more effort to mili-

tary-related R&D than is the United States. . . ."

Laird explained that it is very difficult to compare with any assurance of accuracy the results of U.S. and Soviet R&D programs, "because the Soviet Union, as a closed society, can and does conduct much of its R&D programs in secrecy. . . .

"As you know, we have been able to observe a number of new Soviet systems which use highly advanced technology and production techniques: the FOXBAT aircraft, nuclear-powered ballistic missile submarines, new types of attack submarines, new radars and missiles both for missile and air defense, antiship missiles, new ASW ships equipped for helicopter operations, and smaller items such as the advanced rocker-launcher introduced effectively into Vietnam.

"The technology of many of these systems is comparable to U.S. technology. In some cases, however, our current systems are clearly more advanced. Nevertheless, we simply do not know enough about the specific details of the Soviet R&D program inside their laboratories and research institutes to assess the entire threat.

"Under these circumstances, the only course we can prudently follow is to advance our own knowledge at a reasonable pace in every area judged to be important to our future military strength.

"This does not mean developing and procuring new systems just because it becomes possible to do so. It does mean that to ensure our future safety, we must invest each year a reasonable amount of resources, not only for development of new military equipment and weapon systems, but also for improvement and expansion of our technological base. . . ."

MEDIHC Program Seeks Jobs for Veteran Medics

Opportunities for some 30,000 U.S. Armed Forces medical personnel annually released from medical service to enter civilian careers in about 200 health occupational specialties are offered in a new joint-agency program.

Secretary of Defense Melvin R. Laird and Secretary of Health, Education and Welfare Robert Finch announced the cooperative effort Mar. 18, saying:

"These highly trained and highly skilled men and women represent a relatively untapped resource in the medical fields. They can and should be given the opportunity to play an important role in improving health care in our nation."

Conceived in response to President Nixon's request that strong action be taken to meet demands for better health care, the program known as MEDIHC (Military Experience Directed into Health Careers) offers additional education or direct employment for Armed Forces medical personnel upon release from military service.

Through its Transition Program, the DoD is counselling and referring medically trained individuals who are approaching discharge to the appropriate Health, Education and Welfare (HEW) Regional Office for additional information, accreditation and placement in medical occupational fields.

Regional Offices of HEW are determining which agency within each state will administer the MEDIHC Program. The Transition Program is distributing forms to these medically trained servicemen and is counselling them on the desirability of applying either for more training or for health-connected positions. These forms will be sent to the designated health agency in the veteran's state. Counselling on career direction and placement will follow.

States are being assisted in developing these plans by the MEDIHC Coordination and Planning Committees in each of the HEW Regional Offices.

Texas, the first state to become operational, has located its program in the State Comprehensive Health Planning Agency. Other agencies that may be assigned among the states are State Health Departments, State Hospital Associations and State Health Career Councils, depending on the capacity of the agency to do the most thorough and rapid job.

HEW Regional Office MEDIHC coordinators are:

Region I (Connecticut, Maine, Massachusetts. New Hampshire, Rhode Island, Vermont)—Daniel DeMatteis/PHS, John F. Kennedy Federal Building, Government Center, Boston, Mass. 02203.

Region II (Delaware, New Jersey, New York, Pennsylvania)—Rees Jones/PHS, 26 Federal Plaza, New York, N.Y. 10007.

Region III (District of Columbia, Kentucky, Maryland, North Carolina, Virginia, West Virginia, Puerto Rico, Virgin Islands)—Dorothy Carroll/PHS, 220—7th Street, N.E., Charlottesville, Va. 22901.

Region IV (Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee)—Eddie Sessions/PHS, 50—7th Street, N.E. Room 404, Atlanta, Ga. 30323.

Region V (Illinois, Indiana, Michigan, Ohio, Wisconsin)—James Lore, PhD/PHS, Room 712, New P.O. Building, 433 West Van Buren Street, Chicago, Ill. 60607.

Region VI (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota)—Arthur Kramish, PhD/PHS, Federal Office Building, 601 East 12th Street, Kansas City, Mo. 64106.

Region VII (Arkansas, Louisiana, New Mexico, Oklahoma, Texas)—Estelle Hunt/PHS, 114 Commerce Street, Dallas, Tex. 75202.

Region VIII (Colorado, Idaho, Montana, Utah, Wyoming)—J. Joseph Stevens, Ed.D., 9017 Federal Office Building, 19th and Stout Street, Denver, Colo. 80202.

Region IX (Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washington, Guam, American Samoa)—Ruth Sumner, PhD, Federal Office Building, 50 Fulton Street, San Francisco, Calif. 94102.

Army Announces Deployment of 4 LCSS Units to Europe

Deployment of the first four production models of the Army Land Combat Support System (LCSS) with fully trained tactical units, bound for Europe in support of the Sheridan/Shillelagh weapon system, was announced Apr. 10.

The LCSS is a multipurpose system developed by the Army Missile Command at Redstone (Ala.) Arsenal to test electronic guidance and control components of the Shillelagh, TOW, Dragon and Lance missile systems. Mounted in two readily transportable shelters, the LCSS is designed for employment near the weapons it serves. One shelter contains test equipment; the other provides repair and storage facilities.

When a soldier determines that his weapon system is malfunctioning, a contact team is called forward. Equipped with LCSS test equipment, the team determines which major assembly of the guidance and control components is causing malfunction.

Replacement of the faulty assembly returns the weapon system to full operational status. The malfunctioning assembly is returned to the LCSS, which automatically isolates the faults. LCSS is also capable of self-testing.

The program is managed at the Missile Command by the Land Combat Support Systems Product office, under Lt Col F. A. Matthews, product manager.

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total national research and development efforts. Here the Soviet Union is clearly our strongest competitor. Ten years ago, our total funding for research and development, public and private, was almost twice that of the Soviet Union. Today the U.S. total is only some 20 percent greater. By the mid-1970s the trends would put us in second position.

If we compare the efforts of the two countries in terms of technical manpower, we find that the Soviet Union over the past 15 years increased the rate at which it graduated engineers by a factor of almost four—and brought its rate to six times ours. In terms of graduating scientists, the U.S. still retains a substantial lead, however—a rate twice that of the Soviet Union.

Over-all, the U.S. and the Soviet Union now have roughly the same number of full-time scientists and engineers engaged in research and development. However, if present trends persist, by the mid-1980s the Soviet Union will have a total R&D force one-third larger than ours.

I am concerned about this impressive Soviet commitment to the expansion of their technical manpower, even though I recognize that we probably train and use our technical people more effectively.

The Soviet Union is clearly creating a national research and development base larger than ours. Furthermore, we know that the Soviets can use their people and their money effectively when they want to. There is no dodging these facts.

Let us now move from the over-all national picture to the defense-related R&D. Here we must include atomic energy and space as well as the work more narrowly focused on the Armed Forces.

This year the Soviet Union is investing the equivalent of $16 to $17 billion in such defense-related research, development and applications. The United States is investing $13–$14 billion in comparable activities.

It is disquieting to realize that Soviet defense-related research and development efforts are already more than 20 percent larger than ours. More alarming is the rate at which their efforts are still increasing.

The Soviet Union achieved its new position after a decade of growth at the average annual rate of about 10–13 percent per year. Measured in constant purchasing power, our own efforts have, in fact, declined in the past few years.

The Soviet budgetary and manpower data I have just described are consistent with the resources required to support the growing numbers and types of aircraft, missiles, ships, nuclear facilities and other equipment which the Soviets have been developing recently. Their test facilities, for instance, are impressive in size, in diversity, in staffing and in steady growth.

In assessing the quality of Soviet defense-related research and development, I can give you two judgments. First, the United States retains a clear but narrowing over-all technical lead. But second, the Soviet Union already has the resources and the advanced technology required for a vigorous challenge to the United States in many areas.

The trend is grim—grim because we Americans have enjoyed a well-founded confidence in our ability to meet any challenge in defense, in atomic energy and in space.

In the past, our confidence has sprung from our scientific and technological leadership. The unavoidable question is: which country will be the more confident in the 1970s and 1980s? (Italics added.)

There are uncertainties in what we can know about the Soviet Union. As long as the Soviet system does not lose its talents for secrecy and guile, we will not know whether Russia is doing even more in science and technology than we can see. So long as we had clear technological leadership, there was small risk that we might one day be confronted with a major surprise in weapons.

One of the fruits of our technological pioneering has been an ability to analyze fragmentary intelligence about Soviet developments. Let us fall behind technologically, however, and then the task of estimating what is happening behind the shroud of Soviet secrecy—which still obscures practically all of the early stages of Russian technical work—will be much more difficult and risky.

If the Soviet Union should be able to combine a freshly won technological leadership with its traditional secrecy, then the world would indeed face a more formidable and less predictable potential adversary.

Let us look now at the non-Defense side of advanced science and technology. Are we still on the leader's edge of the civilian "technological gap?" Again, evidence is not encouraging.

Many foreign countries are driving hard toward "technological parity" with us. After a long time as Number Two, Thee, or Four, these countries are striving to overtake Number One. Often these countries have exploited our innovations with their lower-cost production base.

In some important instances, they have surpassed the confident leader. Japan, perhaps the most gifted challenger, is progressing spectacularly across a broad range of advanced technology.

Japan's growth rate in technologically intensive manufactured products was 22.5 percent per year during the period 1955–65 compared with West German's 8.4 percent rate and our own 3.9 percent. Number One should have good reason to feel insecure.

If these trends were to continue, the time would come when we would have to concede that the stereotype of the United States as "the technological giant of the world" had become obsolete.

Our balance-of-payments situation, the marking difficulties of our industry abroad, reflect the trends now. The prospect is not bright for a quick reversal. Like it or not, we face strong technological and economic challenges by countries that were gathering momentum while we were coasting.

Let me turn now to the next question: What are the reasons for these troubling trends?

Clearly, each of the catch-up countries has had its own national purposes which are now being reflected in vastly improved scientific and technical capabilities. We cannot greatly affect the purposes of our friends—and much less the ambitions of our potential enemies. It would be fruitless, in particular, to speculate here on any long-term intentions of the Soviets.

The trends in our own country are not completely clear, nor are they easy to influence. The trends reflect many complex national policies, moods and constraints. They are difficult to sort out and weigh. But we can identify many of them.

There is, to begin with, an anti-Defense Establishment feeling—rooted in the traditional American suspicion of large standing armies, and deepened by the chilling prospect of nuclear war. This feeling has been sharpened by criticism of the war in Vietnam and of our other commitments abroad. And the feeling has been compounded by the rising costs of weapons and criticism of Defense management.

In addition, there is no readily visible strategic threat. Soviet missile and naval strength is growing—but

not where the American public can see it.

There is, too, a hope shared I am sure by everyone—including the people in the Defense Department—for success in the talks with the Soviet Union on limiting strategic arms.

There are some other, more specific reasons for our slow-down in research and development. There seem to be fewer great and emotionally gripping technical challenges today.

Nationally, there is no common conviction that we must pursue some new technical projects—as we were convinced in past years that we should revolutionize industrial processes, develop our nuclear deterrent, or land a man on the moon.

But there are great technical challenges and opportunities today—*in electronics*, to radically increase the reliability of equipment; *in health research*, to reduce or eliminate cancer and heart disease; *in environmental science*, to reverse the tides of pollution; *in meteorology*, to achieve long-range and accurate weather-prediction; *in oceanography*, to exploit the seas; *in information sciences* and learning research to enrich our educational system—in short, in many areas in which America has wonderful talent and a running start.

Nevertheless, there are people who feel that research and development has had its fair share of the nation's resources, and that further funding would distort our priorities.

To make things worse, there is a small group in our society which damns technology, asserting that technology inevitably gives us nothing but pollution and an arms race. One can point out the uncountable bounties which technology has brought us and will bring us. One can point out the need for technology for defense, and point out that technical understanding permits low-risk arms control. But some critics will not listen.

There is also the persistent myth about the so-called military-industrial complex and its supposed overbearing and uncontrolled purposes and powers. This myth, like the ancient myths, has a life of its own, apart from reason and impervious to facts.

According to one version of this corrosive myth, there is a vast and interlocking national conspiracy to increase endlessly our military power, to force the country to over-spend on defense, and to dominate every district in our country, every country in the world. *This myth is misleading, divisive and wrong. But it is hard to shake* (italics added).

Among our national trends, there is an increasing tendency also to polarize debate about national security issues. In my opinion, overblown rhetoric and oversimplified choices are two of the best ways to ensure that serious, rational debate *cannot* take place.

There has emerged, rather recently, another curious commitment by a small but active minority to an essentially irresponsible theory that they can heal the country by bleeding away the strength of the very institutions which protect that errant minority from internal and external tyrannies.

There is another, this time widespread and wholly justifiable, view that we must use more of our resources to meet obviously growing and pressing domestic needs—for the poor, for education, for the environment, for our cities. The challenge of perfecting our land, the President has said, is the summons of the seventies.

Surely everyone also shares the President's conviction that inflation must be stopped, and that all deferrable Federal expenditures must be reduced or cut until that goal is fulfilled.

All of these national tendencies seem to explain many of the disturbing trends which I sketched earlier. They probably do not form a definitive diagnosis of the causes of the decline in the American zest for technological excellence. But they do lead me to conclude that the problems lie deep and pervasive through major elements of our society. They will not easily be solved.

But assume that most of the general trends persist—then what would be the consequences?

In military-related research and development, we can be sure about the consequences. With a larger effort, the Soviet Union will explore more areas of science and technology than will the United States. They will study many areas more thoroughly than will the United States. They will learn more. Having learned more, they will find more paths leading to higher performance military hardware of all kinds.

Mr. Kosygin's successor will have more choices in his weapons and strategy than will Mr. Nixon's. Then, if the Russians so desired, they could choose to develop and deploy more kinds of advanced weapon systems. Some Soviet choices would be surprises. There would be more Soviet "firsts" than American "firsts." In short, our ability to deter war would be weakened. The risks of war would rise.

As for probable consequences in civilian research and development, we had better brace ourselves for greater pressure from our trading allies and competitors in technologically intensive products.

A sluggish technical base, combined with inflation, ensures a poor competitive position. New commercial products may originate more often abroad. Even when we do have ideas first, we may lose out in the international marketplace because of our higher costs. In general, our balance-of-payments will remain a serious problem, and may worsen.

Does all of this mean we have a crisis now? No, not today. The United States still commands a larger accumulated investment and capability in its technological base.

When then will the anticipated danger arrive? No one can precisely state a date of danger. It all depends, obviously, on how long Americans are prepared to ignore, and endure, the prevailing trends, on whether Americans are temperamentally disposed to reassert technical vigor or will be satisfied to retrench.

Thus, the problem. The trends are real enough, and most of the reasons for the trends are clear enough. But no dramatic deadline looms ahead of us.

Still, we cannot allow the risks to rise indefinitely, unchecked.

What is to be done?

Some people say: "Let the pendulum swing—sooner or later the country will recognize the risks, and the pendulum will swing back." I do not think this course is satisfactory, nor is the analogy apt. Pendulums return only because of a restoring force in nature.

If we are to remain a great world power, the restoring force must be provided by human action—by vision, evaluation, planning, and sacrifice. Otherwise it could take an economic collapse or a military shock to center things (italics added).

There are those who say: "Depend on arms control—slow down the arms race, trust the Soviet Union, run greater risks to negotiate arms limitations."

I agree that an arms control agreement equitable to both sides must be resolutely and imaginatively pursued. But this cannot now be the sole answer. We must negotiate realistically from the prospect of reasonable strength or there may be no meaningful negotiation, no hope for an equitable outcome, no safe end to tension.

There are other suggestions about what we could do.

Some suggest that we simply suppress technology—as if technology were itself the main cause of our problems; as if technology were not needed in the solution of those prob-

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lems; and as if one country could for very long affect the pace, results and uses of innovation throughout the world.

Others argue for even larger cuts in funding to our military—as if threats to freedom can now be ignored; as if controls were only a matter of money; and as if economies were not already under way.

Unfortunately, problems as fundamental and as long in unfolding as these do not yield to facile proposals.

Still, there are sensible ways to shore up the technological base and attend at the same time to urgent social responsibilities.

Being second-class in science and technology is no safe way out of our present dilemmas. To solve the social problems requires that we satisfy the expanding human expectations, and this requires that our economic growth be continued. And this, in turn, requires the enrichment of our technological base (italics added).

I would like to emphasize six essential ways to maintain technological leadership in the service of our national goals. I raise these points in the spirit of President Kennedy's warning in his first State of the Union Message. He said:

"I speak today in an hour of national peril and national opportunity. Before my term has ended we shall have to test anew whether a nation organized and governed such as ours can endure. The outcome is by no means certain."

I hope the following six points may make that outcome more certain.

First, we must limit our goals and adopt only the most essential. Through President Nixon's Vietnamization Program, we are winding down our participation in the war in Vietnam. Through the new National Security Council machinery, we are clarifying our priorities in military and foreign policies. Through further stern analysis of our economic position, we can integrate and better utilize our civilian-technology activities to meet domestic needs and international markets. Through fiscal restraint, we must stop the inflationary spiral.

The country's research and development program will increasingly reflect this searching reorder of our priorities.

Second, we must pursue an arms limitation agreement with the Soviet Union. What we seek in Vienna makes sense: to reduce uncertainties in the strategic balance; to create greater assurance in avoiding world nuclear war; and, frankly, to the extent the arms talks succeed, we can permit both countries to make greater investments in domestic programs.

Third, we must cut the over-all costs of the Defense Department, without assuming unacceptably greater risks. We will modify our missions and reevaluate our commitments—so that we can reduce forces and do our full part to curb inflation and release resources to the civilian sector. More will be done along this line than has been accomplished so far, but less can be done than some observers wishfully hope.

Fourth, we must revamp—and thoroughly—the design philosophy in every corner of the Defense Department and defense industry. This task falls within my responsibilities—and there is no other matter about which I feel more strongly.

We shall not in the future indulge the present syndrome of incorporating into every system the most advanced technology, as soon as it seems to be available or merely because it is advanced. We shall ask only for what we really need—the minimum necessary performance—and we shall match, wherever possible, proven technology to that essential, realistic need (italics added).

We shall insist relentlessly—as a point without peer in our management—that price has as much priority as performance. This does not rule out vigorous pursuit of new technology where that technology is required or can pay its way.

Frequently, new technology can be

Water Resources Engineers Meet at WES

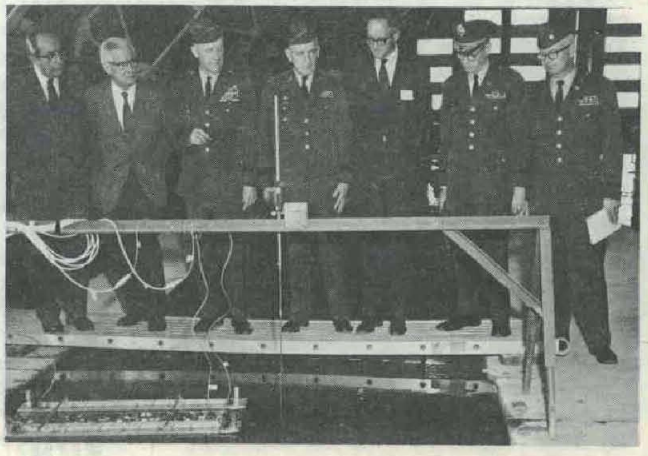
U.S. Army Coastal Engineering Research Board members joined with representatives of several U.S. Government agencies and installations for a recent meeting at the Waterways Experiment Station, Vicksburg, Miss.

Established in 1963, the board serves in an advisory capacity to the Army Chief of Engineers with regard to the research program of the Coastal Engineering Research Center in Washington, D.C. CERC was created as successor to the Beach Erosion Board.

During the meeting at the Waterways Experiment Station, technical papers were presented at sessions devoted to inlet studies, mathematical modeling for studies pertaining to development of water resources, coastal ecology, submarine soil mechanics, research piers and riprap stability.

Other presentations covered ice studies made by the Lake Survey District, and problems in restoring and preserving the Louisiana coastal marshes by the Lower Mississippi Valley Division.

Officials from the Office of the Chief of Engineers discussed the Chesapeake Bay and National Shoreline studies, and use of high-altitude photography in coastal research.



COASTAL ENGINEERING RESEARCH BOARD members, standing on a walk over model of the Manhattan Channel of East River, New York, observe a tunnel section held in place by barges ready to be sunk to the bottom to form part of an underwater rapid transit system at the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Left to right are Dean M. P. O'Brien, University of California; Dr. A. T. Ippen, Massachusetts Institute of Technology; Maj Gen Richard H. Free, South Atlantic Division Engineer; Maj Gen F. P. Koisch, Deputy Chief of Engineers for Civil Works and president of the board; Dr. R. G. Dean, University of Florida; Col Levi A. Brown, director of WES, and Lt Col E. M. Willis, executive secretary of the board.

used to reduce costs. Yet we must design-to-a-price, a much lower price, or else we will not be able to afford what we need. Defense budgets are going down. The costs of what we need, just our essential needs, are going up. Our only solution is to make cost a principal design parameter. That is how we must now define what is "best." We have no other choice.

You have heard such assertions before. But we have made and you have made far too few changes. Now we must adopt the fundamental reforms that will affect every designer, every officer, every specification-writer throughout the Defense Department and throughout industry.

Fifth, and a crucial point today, we must use national technology more wisely—and in that way maximize the benefits and minimize the adverse side-effects of technology. The quality of life, nationally and internationally, depends in fact upon the quality of the management of technology.

This is what President Nixon pointed out in his State of the Union Message when he said: *"America, which has pioneered in the new abundance, and in the new technology, is called upon today to pioneer in meeting the concerns which have followed in their wake—in turning the wonders of science to the service of man."* (Italics added.)

Sixth, and last. To help us maintain technological leadership and national security in the long-range future, we must spend now at substantial levels on basic and applied research—even given our current fiscal constraints. We cannot permit our technological wellsprings to dry up.

To accomplish these six tasks will not be easy. Yet if we do not work hard on these six challenges, the American people are going to be in deepening trouble.

Without technolgical leadership, there will be greater erosion of our economic strength and greater jeopardy to our goals at home.

To default on technical leadership will be to accept even greater risks to our national security. And without this security all else is theoretical musing or vain hope.

President Eisenhower—the first recipient of the Forrestal Award—coined the phrase "military-industrial complex" in 1961 and admonished us to watch it closely, along with its cohort, the scientific-technological elite. We have watched them.

President Eisenhower's words were appropriate for the 1960s. We had unmistakable military and technical leadership then, and the power growing out of that leadership could have been abused. It was not. His warning was heeded.

Yet that was the 1960s. Trends I have reviewed tonight were scarcely perceptible as that decade opened.

Now we open a new decade. Now we confront new challenges. Now we are caught up in new trends. Now we must begin difficult and demanding tasks.

Let us start now. Let us think deeply whether, as I believe to be the case, a new principle of survival among nations has emerged in the last third of the 20th century. This increasingly decisive principle seems clear: A nation's vigor in science and technology determines its success in commerce, welfare and security.

Let us start now—urgently and deliberately—to reestablish the authentic technological leadership that helped to create and to preserve our country.

Let us take to heart the words of James Forrestal:

"The odds today are not on the power of despotism, nor on the inevitability of war. The odds still are on the United States and peace. And if the United States acts with firm and resolute purpose, the odds will continue on America and peace through the years to come."

BESRL Publishes Human Factors Performance Reports

Human performance factors under varying conditions in Army Command and Surveillance Systems are discussed in three recent reports published by the Army Behavioral Science Research Laboratory (BESRL).

BESRL was reorganized and renamed Behavior and Systems Research Laboratory recently as one of three laboratories in a new U.S. Army Manpower Resources Research and Development Center, Commonwealth Building, Arlington, Va.

A study was conducted jointly by personnel of BESRL and of HRB-Singer, Inc., to examine human factors problems related to error rate, processing time and confidence in message format selection for an experimental version of the automated Tactical Operation System (TOS).

The TOS is being developed and evaluated as part of the Army-wide Automatic Data Systems within the Army in the Field (ADSAF) master plan. TOS utilizes over 40 different message formats from which G3 staff action officers must determine the appropriate format or formats to use with each set of incoming data.

Technical Research Note 212, AD 697 716, *The Transform Operation in TOS: Assessment of the Human Component,* is authored by James D. Baker, BESRL, and Douglas J. Mace and James M. McKendry, HRB-Singer, Inc.

An experimental investigation on rapid screening performance with transmitted imagery differing in scale, resolution (quality) and rate of presentation is reported in Technical Research Note 213, AD 698 455, *Study of Near Real-Time Screening Performance, 1: Scale, Resolution, and Presentation Rate,* by J. Richard Lepkowski, System Development Corp. (SDC), Falls Church, Va.

The study was conducted jointly by personnel of the SDC and BESRL to find what degrees of screening thoroughness and accuracy can be expected for imagery of varying quality under different conditions.

Technical Research Note 214, AD 700 127, *Checker Confidence Statements as Affected by Performance of Initial Image Interpreter,* by Michael G. Samet, BESRL, reports on one aspect of assigning interpreters to work as 2-man teams in which one interpreter checks interpretations made independently by his teammate.

The study was concerned specifically with determining how different levels of identification accuracy and of confidence validity associated with an initial interpreter affect the confidence validity of the checker.

Budgetary Cutbacks Close Army Pictorial Center

Relocation of the Army Pictorial Center at Long Island City, N.Y., as part of the military activity cutbacks effected in March by the Department of Defense, will give portions to three Army installations.

Under over-all direction of the U.S. Army Materiel Command, the Army Missile Command at Redstone (Ala.) Arsenal, the Test and Evaluation Command at Aberdeen (Md.) Proving Ground, and the Tobyhanna (Pa.) Army Depot will assume a part of the Army Pictorial Center functions.

Closing of the APC and relocating its missions is expected to save the Army more than $20 million over a 5-year period.

The Missile Command's Arsenal Support Operations Directorate will assume contract management for contracts involving 80 to 100 projects a year, under direction of the assistant for Communications-Electronics. About 30 civilian spaces and possibly some military personnel will be added to MICOM for this function.

Weathermen Recall Decade of TIROS

"What a difference a decade makes" was noted by Fort Monmouth, N.J., scientists Apr. 1 as they recalled the launching of one of their proudest creations—Tiros I, the world's first successful meteorological satellite.

Tiros I televised and recorded on tape the cloud pictures transmitted to major ground stations at Fort Monmouth and at Kaena Point, Hawaii. Operating perfectly, it sent 22,952 cloud cover photographs to Washington, D.C., between Apr. 1 and June 17, 1960.

Photographs showed weather-breeding cyclonic cloud patterns and also, in clear weather, spectacular pictures of major geographic features such as the Red Sea, the Nile Valley, West Coast of Africa, and Florida.

Satellite pictures of cloud cover around the world are now a commonplace tool of meteorologists and a major aid to better forecasting of weather conditions. But Tiros I was the trailblazer achievement that pioneered this modern technique.

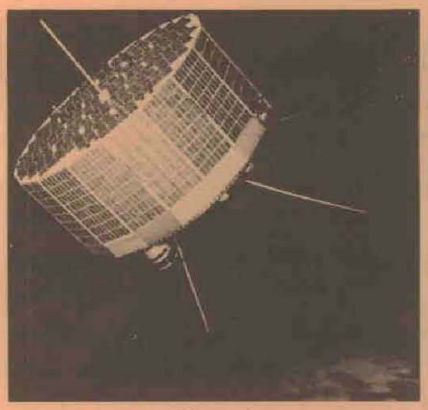
Under the technical supervision of Fort Monmouth scientists, the pillbox-shaped satellite—42 inches in diameter, 19 inches high and containing two television cameras—was built by Radio Corp. of America.

Although it had several sponsors since the idea was conceived in the mid-1950s, Tiros I was launched as a project of the National Aeronautics and Space Administration, with the Air Force providing the Thor-Able launch vehicle. The Army Signal Corps was responsible for payload instrumentation and for operation of the ground station at Fort Monmouth.

Dr. Hans K. Ziegler, now the deputy for science and chief scientist of the Army Electronics Command, had over-all responsibility for the Tiros program. Herbert I. Butler, then with the Fort Monmouth laboratories and now with the National Aeronautics and Space Administration, was the project officer.

Fort Monmouth scientists, engineers and technicians were space veterans by the time Tiros I was launched. They had been the first in the United States to receive and track signals from the Russian Sputnik satellites in 1957, and they had built the successful Vanguard I, the tiny "grapefruit" that beeped in space for many years after its launch on Mar. 17, 1958.

The Fort Monmouth team also had launched Vanguard II as a meteorological satellite in February 1969, but it failed to send back satisfactory data. Their big moment of triumph came in 1958 when the payload they designed for Score, the world's first successful communications satellite, carried the late President Eisenhower's Christmas message of peace to the world.



Tiros I

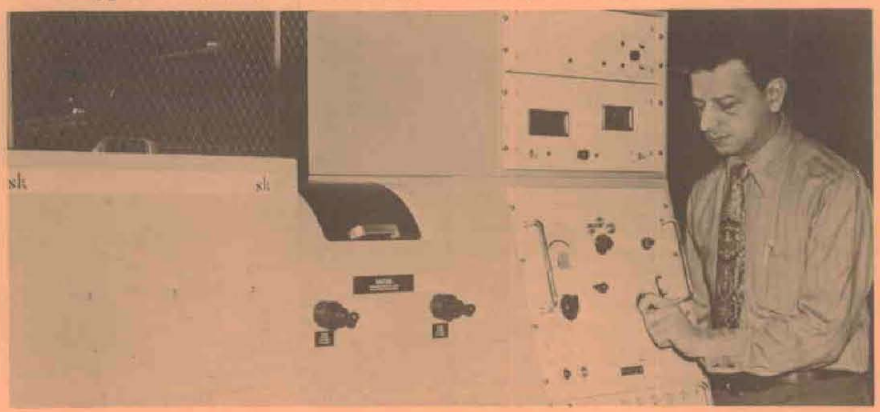
Photometric Test Sets Delivered to Sacramento Depot

Precision-controlled light sources used to test automatically the light gain of image intensifier tubes in military night-vision devices are incorporated in five Photometric Test Sets delivered recently to the Army.

With these units, produced by Kollsman Instrument Corp., Syosset, N.Y., measurements can be made of the spectral response of image intensifier tubes, and the minimum amount of light a tube can perceive (light source).

Two types of sets are used, one for evaluating the entire tube and the other for evaluating individual modules. Both units have integral computers, thus eliminating the need for computations by the operator. Both are capable of testing 18, 25 and 40 millimeter tubes and all information is presented in digital readout form.

The three module testers and two full assembly testers were delivered to the Sacramento (Calif.) Army Depot under an $800,000 contract awarded in 1968. The sets were first developed in 1967.



Photometric Test Set

MERDC Develops Portable Lab To Field Test Aviation Fuels

Quality surveillance of aviation fuels can be accomplished by airborne units in Southeast Asia by using an air-portable laboratory with updated components developed by the U.S. Army Mobility Equipment R&D Center.

Shipped to Vietnam for use by the 101st Airborne Division (Airmobile), the prototype unit was developed by the MERDC Military Engineering Division and built under contract by the Hopmann Corp. in Springfield, Va., in response to a stated urgent requirement.

Termed unique by the MERDC in that all facilities and equipment in the unit carry FSNs (federal stock numbers), the laboratory is housed in a Military Standard equipment shelter (S-280 B/G). Replacement components thus can be ordered readily from stock.

Tests that can be performed are vapor pressure of petroleum products, distillation, copper-strip-corrosion, gravity determination, moisture determination in J-4 fuel, and millipore filter test for determining solid contamination in JP-4—all of which serve to detect contamination of fuels that could lead to aircraft or vehicle disasters.

The unit is 142 x 81 x 83 inches and weighs approximately 1½ tons. An eye bolt and plate assembly facilitates air-lifting by helicopters, or it can be used to secure the unit to the bed of a truck.

A 15-kw generator operates the 9,000 Btu/hour air conditioner and other electrical components.

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