ARMY RESEARCH AND DEVELOPMENT

MONTHLY NEWSMAGAZINE OF THE OFFICE OF THE CHIEF, RESEARCH AND DEVELOPMENT

Vol. 7, No. 4 April 1966 • HEADQUARTERS, DEPARTMENT OF THE ARMY • Washington, D.C.

Betts Appointed New CRD As Dick Commands Allied Land Forces, SE Europe

Departure of Chief of Research and Development Lt Gen William W. Dick, Jr., to take command of Allied Land Forces Southeastern Europe, Apr. 1, elevated Deputy CRD Lt Gen Austin W. Betts as his successor.

Raised to 3-star rank when he assumed his new duties, General Betts has been deputy since July 1964.

General Lyman L. Lemnitzer, Supreme Allied Commander Europe and Commander-in-Chief, United States European Command, announced appointment of Lt Gen Dick to succeed Lt Gen John H. Michaelis,

(Continued on page 6)

Army Selects Col Chavis For Major Research Post

Assistant Chief of Staff (G–2) Col Thomas N. Chavis, Central Army Group Europe (NATO), has been selected as Assistant Director of Army Research, Office of the Chief of Research and Development, and commanding officer, Army Research Office.

Scheduled to report for his new assignment in April, Col Chavis has served with the Central Army Group Europe (CENTAG) since May 1965, after a year of duty as deputy commander 32nd Artillery Brigade, U.S. Army Europe.

(Continued on page 5)

Army's Fifth Science Conference Agenda Features Prominent Defense, Industry, Academic Leaders

Director of Defense Research and Engineering Dr. John S. Foster, Jr., Secretary of the Army Stanley R. Resor and other leaders of the Department of Defense, industry and universities have been invited to take prominent roles in the Army's Fifth Science Conference, June 14-17.

Tentative plans for the discussions at the United States Military Academy, West Point, N.Y., call for a keynote address at the opening general session. Secretary Resor has accepted an invitation to award honors to prize-winning authors selected from the 96 papers programed for the four concurrent technical sessions.

Approximately 500 of the Army's leading scientists and engineers, along with representatives of other U.S. Armed Forces and Federal agencies are expected to participate. High-ranking officials of the British, Canadian, Australian and New Zealand de-

(Continued on page 3)

DCSPER R&D Unit Set Up With Clement as Director

Establishment of a new Directorate of Personnel Studies and Research in the Office of the Deputy Chief of Staff for Personnel and selection of Col Wallace L. Clement as director, effective Mar. 15, has been announced.

Confirmed by the Senate for promotion to brigadier general within the near future, Col Clement has served as Assistant Director of Army Research and commanding officer of the Army Research Office, Office of the Chief of Research and Development, since July 1964.

Col Leo E. Benade, acting director of the new directorate when it was established Mar. 1, will serve as chief of the Military Compensation Review Division, one of the three divisions under Col Clement. The Personnel Research Division is headed by Col Charles F. Austin. Col Eugene C. Camp is chief of the Personnel Studies Division.

Created as a result of recent Army Manpower and Management Studies,

(Continued on page 3)

Featured in This Issue . . .

Lt Gen W. W. Dick, Jr.

Lt Gen A. W. Betts

Col W. L. Clement

Col T. N. Chavis

Army R&D Newsmagazine

Vol. 7, No. 4 April 1966

Editor.....Clarence T. Smith
Associate Editor.....George J. Makuta
Assistant Editor.....Joseph R. Weikel
Assistant Editor.....Read Wynn

Published monthly by the Army Research Office, Office of the Chief of Research and Development, Department of the Army, Washington, D.C. 20310, in coordination with the Technical and Industrial Liaison Office, OCRD. Grateful acknowledgment is made for the valuable assistance of Technical Liaison Offices within the U.S. Army Materiel Command, the U.S. Army Combat Developments Command, U.S. Continental Army Command, Office of the Chief of Engineers, and Office of The Surgeon General. Publication is authorized by AR 310-1, as extended by the Army Publications Board on Sept. 15, 1964.

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.

Picture Credits: Unless otherwise indicated, all illustrations are by the U.S. Army.

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

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

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

Distribution on an individual name basis is restricted to members of the U.S. Army Atomic Energy and R&D Officer Specialist Programs and to members of the U.S. Army Reserve R&D Unit Program. Otherwise, distribution is made only to the Army installation, office or organizational element to which the requester is assigned.

CHANGES OF ADDRESS for AE and R&D Officer Specialist Program enrollees should be addressed to: Specialist Branch, ECP, OPD, Office of Personnel Operations, Department of the Army, Washington, D.C. 20315. Reserve R&D Unit members should contact: Special Assistant for Reserve Affairs, OCRD, Department of the Army, Washington, D.C. 20310.

OTHER GOVERNMENT AGENCIES' requirements should be submitted directly to the Army Research Office, OCRD, Department of the Army, Washington, D.C. 20310, ATTN: Scientific and Technical Information Division.

ALL NON-U.S. GOVERNMENT agencies, firms and organizations must obtain this publication through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Single copies sell for 20 cents. Subscription rates (12 issues annually) are: Domestic, APO and FPO addresses, $2.25; Foreign, $3.00

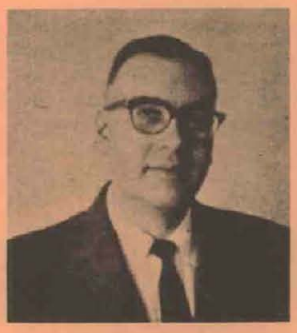
FY 1967 RDTE Budget Goes to Congress

By Lawrence Cohen

(Supported by excerpts from Lt Gen Dick's presentations to Congress.)

Congress is completing committee hearings on an Army Research, Development, Testing and Evaluation (RDTE) FY 1967 proposed budget of $1,518.9 million, $14.4 million less than the amount requested in FY 1966.

Chief of Research and Development Lt Gen William W. Dick, Jr., made presentations before the Senate Appropriations Committee Feb. 21 and the Armed Services Committee Mar. 10. Hearings before other Congressional committees are expected to end early in April.



Lawrence Cohen

Each year's Army RDTE budget requests funds to continue efforts begun in previous years as well as funds to initiate new work. As presented, the FY 1967 request encompasses requirements to meet Army long-range responsibilities, and to emphasize an immediate responsiveness to growing needs in Southeast Asia and pressure points around the world.

In FY 1966, the total approved RDTE funding of the Army was $1,432.8 million, including $26.3 million of previously appropriated funds and $27.6 million from the Secretary of Defense's Emergency Fund, primarily to support specific requirements for Southeast Asia. This year a supplemental request to Congress has been made for $28 million in RDTE funds to support additional Southeast Asia needs.

The Army R&D mission is to develop weapons, equipment and techniques qualitatively superior to those of any potential enemy, in any environment, and under all conditions of war. The almost infinite variety of efforts involved results in a diversified program, currently consisting of 122 elements broken down into almost 500 projects with 1,100 subordinate tasks.

Analysis of the budget is possible in numerous ways. The "pie chart" used with this article shows a percentage breakout for four broad program purposes—Army Developments; Testing and Facilities Operation; Future Systems; and National Programs.

About 32 percent of the budget is allocated to sizeable development projects, most of which are project managed. Approximately 21 percent provides for the basic effort in science and technology leading toward future systems. Service testing and operation of RDTE facilities account for about 8 percent.

The largest portion, 39 percent, supports projects which are conducted as Army responsibilities but are of significant interest to the Nation as well as other agencies within the Department of Defense.

These include items such as Nike-X and its associated test site at Kwajalein, the White Sands Missile Range (a national range used by all Services), and the ground environment elements of the DoD Communications Satellite Program.

The budget is submitted to Congress in terms of Budget Activities, a framework for formal accounting for R&D funds used for all the military services. Activities are commodity/industry oriented. Table 1 compares the FY 1967 request with the current FY 1966 program (including the FY 1966 proposed supplemental).

Table 1

BUDGET ACTIVITY	BUDGET PLAN FY 1966	BUDGET PLAN FY 1967
	(millions)	
Military Science	$159.6	$161.5
Aircraft	105.1	92.6
Missiles	681.4	718.7
Military Astronautics	23.0	13.2
Ships and Small Craft	1.6	1.1
Ordnance and Combat Vehicles	201.3	187.4
Other Equipment	258.2	266.6
Program Wide Management and Support	74.3	77.8
Total	$1,504.5	$1,518.9

While funds are appropriated in terms of budget activities, it is diffi-

Table 2

PROGRAM CATEGORY	BUDGET PLAN FY 1966	BUDGET PLAN FY 1967
	(millions)	
Research	$ 79.3	$ 87.0
Exploratory Development	267.2	231.3
Advanced Development	108.6	159.9
Engineering Development	697.7	609.3
Management and Support	247.7	259.3
Operational Systems Development	104.0	172.1
Total	$1,504.5	$1,518.9

(Continued on page 4)

LAWRENCE COHEN is chief, Budget Branch, Programs and Budget Division, Office Chief of Research and Development, Department of the Army.

Army Science Conference Features DoD, Industry, Academic Leaders

(*Continued from page 1*)

fense establishments also will be invited as representatives of the ABCA Army Standardization Program.

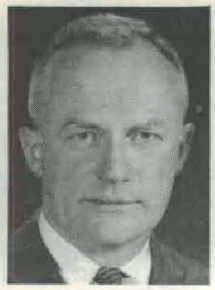
In his role as sponsor of the Conference, Chief of Research and Development Lt Gen Austin W. Betts will welcome the conferees. Assistant Secretary of the Army (R&D) Willis M. Hawkins will introduce the keynote speaker.

Dr. Richard A. Weiss, general chairman of the conference and the deputy and scientific director of Army Research, will sound the opening gavel. As host, Academy Superintendent Maj Gen Donald V. Bennett will extend a welcome.

Two "fixtures" of the conference will fill their traditional roles. Dr. Harold C. Weber, chief scientific adviser, Office of the Chief of Research and Development, will be the presiding chairman for the fifth time. Dr. Ralph G. H. Siu, acting deputy director, Research and Development, Army Materiel Command, will equal that record as toastmaster at the banquet.

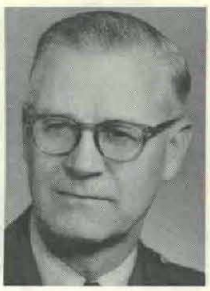
New to the conference this year will be a panel discussion that will be moderated by one of the Nation's outstanding industrial leaders. The theme will be "Basic Research and Practical Relevancy." It will be explored in all of its concepts by distinguished representatives of the Government, academic and nonprofit research community, industry, and the press.

Dr. J. S. Foster

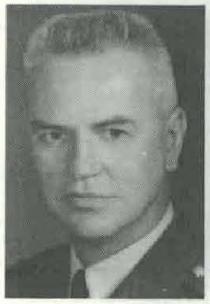


Stanley R. Resor

Willis M. Hawkins

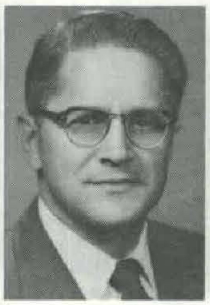


Lt Gen A. W. Betts



Maj Gen D. V. Bennett

Dr. Harold Weber



Dr. Richard A. Weiss

Dr. Ralph G. H. Siu

Another innovation is one that should appeal to military authors. For the first time, they will be eligible for cash awards on an equal competitive basis with civilian authors of technical papers. President Johnson signed on Sept. 22, 1965, legislation for a change in the Federal Incentive Awards Program permitting military personnel to share in benefits.

In the past, the Association of the United States Army has contributed generously for each of the Army Science Conferences to enable military authors to receive cash awards, while civilians were paid out of Incentive Awards Program funds. In 1964, the conference awards totaled $3,800, including two top awards of $750 each.

Dr. Harold C. Weber again heads the panel of judges that will select the award-winning papers. Distinguished scientists from the Army Scientific Advisory Panel (ASAP) will complete the panel and each will be selected on the basis of his knowledge in a particular scientific discipline, to ensure well-balanced competent evaluation of the work reported.

Dr. John C. Hayes, chief of the Programs and Concepts Branch, Army Research Office, is project officer for the conference, assisted by Lt Col John J. Walsh, Jr. Project officer for the U.S. Military Academy as host is Lt Col C. A. Mitchell.

Special emphasis is being directed this year toward encouraging conferees and guests to bring their wives to participate in the banquet and a program of tours and social activities specially arranged for the ladies. Accommodations will be made available insofar as possible at the Hotel Thayer, registration center for all participants, and nearby motels will be used as necessary.

DCSPER R&D Unit Set Up With Clement as Director

(*Continued from page 1*)

the Directorate of Personnel Studies and Research is an outgrowth of realignments within DSCPER directorates and divisions. Its mission is:

- To develop a complete personnel research program and plan of action which will achieve the military personnel policy objectives of the DCSPER.
- To direct and conduct long-range personnel studies, special studies and personnel research in all areas of DCSPER military personnel responsibility, including, but not limited to, personnel management requirement-procurement, classification - selection, individual training, utilization-performance, compensation and retention-separation.

A graduate of the U.S. Military Academy and the U.S. Army War College, where he served on the faculty, Col Clement is completing his thesis for a master's degree in international affairs at George Washington University. He was assigned as Assistant Director of Army Research after 15 months as commander of the 14th Armored Cavalry in Germany.

Assigned in 1960 to the U.S. Army Standardization Group in London, he became commander of the group after one year as deputy. Earlier he served as military adviser to the Operations Research Office of Johns Hopkins University, Baltimore, Md.

After graduating from the Miltary Academy in 1940, he was with the 11th Cavalry at Camp Lockett, Calif. During World War II, he served in Ireland, North Africa and Italy with the 804th Tank Destroyer Battalion. Following liberation as a prisoner of war for 20 days in Italy, he commanded the 804th Battalion until it was deactivated in Texas in 1945. During the Korean War he commanded tank and infantry battalions in the 45th Division.

A native of Cambridge, Mass., Col Clement has been awarded the Distinguished Service Cross, Legion of Merit, Bronze Star, Army Commendation Medal with Oak Leaf Cluster, Combat Infantryman's Badge and the Italian Cross for Military Valor.

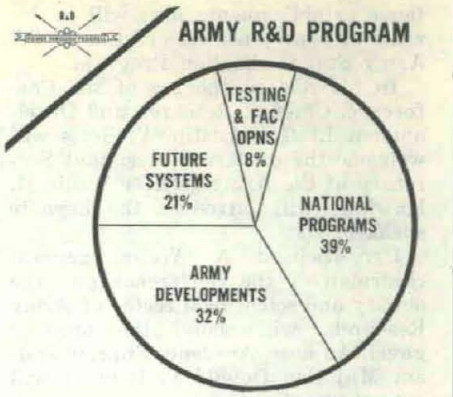
FY 1967 Army RDTE Budget Plan Presented to Congress

(*Continued from page 2*)

Table 3

(Millions of Dollars)

Budget Activity	PROGRAM CATEGORY: Research	Exploratory Development	Advanced Development	Engineering Development	Management & Support	Operational System	Total
Military Sciences	87.0	62.3	1.0	—	11.2	—	161.5
Aircraft	—	23.8	16.9	51.8	—	.1	92.6
Missiles	—	33.1	43.0	417.5	113.9	111.2	718.7
Military Astronautics	—	—	13.2	—	—	—	13.2
Ships and Small Craft	—	—	—	1.1	—	—	1.1
Ordnance and Combat Vehicles	—	50.6	26.4	74.0	—	36.4	187.6
Other Equipment	—	61.5	59.4	64.9	57.1	23.7	266.6
Program-wide Management and Support	—	—	—	—	77.1	.7	77.8
TOTAL	87.0	231.3	159.9	609.3	259.3	172.1	1,518.9



cult to trace R&D accomplishment, since various stages of development, and research, are included in each activity. R&D management uses a somewhat different plan of program categorization. These are formalized in the DoD program system and they represent, in a simplified way, the steps through which ideas are turned into useful military hardware. Table 2 compares the FY 1967 program to FY 1966 in terms of these categories.

The relationship of the budget activities and program categories is more easily seen by Table 3. This table shows the progression through the various stages of development.

The budget does not contemplate any significant increase in overall manpower, either civilian or military. However, provision has been made for the selective replacement of military with civilian personnel under the substitutability program. These increases were offset by requirements to provide for improvements in productivity of assigned personnel.

The result of these actions and the civilian pay raise is to raise the dollar level of the Army in-house laboratories program slightly. Increased costs due to the civilian pay raise were recognized during the review of the budget. A specific increase requested was denied, however, and the increase absorbed within the finally approved total. This will require that substantial attention is paid to reducing the costs of performing the RDTE program, as well as a need to be more highly selective in choosing areas of investigation.

Throughout the budget are funds for the support of combat operations having a counterinsurgency application. These are part of Project PROVOST—a priority research and development program to respond quickly to Viet Nam needs. Project PROVOST provides funding for the acceleration of a specific list of relatively short-term projects for Viet Nam. As such, it is not an exclusive category but is an identified and highlighted portion of the total.

Army funds for Project PROVOST include $14.6 million of FY 66 emergency funds made available by the Secretary of Defense, $28 million in the FY 66 supplemental request, and $15.4 million in the FY 67 request for the continuation of these projects.

Fifty-six projects and tasks are involved in Project PROVOST–38 received accelerated effort in FY 1966 and development work on 18 will be accelerated in FY 67. Examples are an expendable flamethrower, a jungle canopy platform to enhance airmobile operations, and a personnel detector.

In addition to support for Viet Nam, budget programs provide for forward deployment of U.S. Forces overseas as well as for Continental and STRIKE forces based in the U.S.

GENERAL DICK, in presentations to Congress, discussed activities involved in the RDTE budget as follows:

Military Sciences. This program finances research where the goal is primarily an increase in the reservoir of fundamental knowledge adaptable to the solution of widely variant future operational requirements; also, exploratory development, which applies new knowledge to solutions of known or anticipated military requirements.

Scientific experimentation is fundamental to the balance of our R&D effort because most of our technological advances are rooted in this basic research, this exploring of the unknown. The In-house Laboratory Independent Research Program (which is reported on annually in the *Army R&D Newsmagazine*) is continued at a $10 million annual funding level.

Some of the areas which OCRD will concentrate on in FY 1967 are:

Quantum Electronics. The development of the Laser has opened new fields of investigation in areas of medical research. Army interest in Lasers has specifically been directed toward range finding and other fire control techniques. This project seeks through these techniques to identify new Laser knowledge for future application to Army equipment.

Lightweight Armor. In the development of advanced ballistic protective systems, significant advancements are underway in design and analysis of potential armor materials. A series of experiments have been conducted to show the effects of a projectile upon impacting on various armor materials. These experiments will make it possible to provide armor protection for both ground troops and crew members of Army aircraft.

The Fuel Cell. Military fuel cells are a continuous-feed chemical device in which the chemical energy of a fuel and oxidizer is converted to usable electrical energy. In application, the cell can be carried and operated by two men. A fuel cell power source for field use is scheduled for testing in Viet Nam later this year.

Studies and Analyses. Funding provides for efforts such as the support of the Combat Developments Command, which investigates the areas of doctrine, organization and weapons and equipment needed in the field.

Aircraft. This activity provides for R&D on piloted aircraft, aircraft components and accessories, aircraft suppressive fire systems and associated fire control systems, and avionics. The effort is in support of the Army's role in aviation, part of which is "to

develop Army aircraft with a selective capability for movement of personnel, equipment and supplies within the battlefield more rapidly than could be accomplished using surface vehicles."

Under Air Mobility, for example, the Army will continue its investigation into new technology to improve the handling qualities and safety of future Army aircraft. Additionally, efforts are continuing to reduce vulnerability of our aircraft to detection and attack.

Equally important is the development of aircraft which can provide intimate fire support for Army elements in the combat zone and provide suppressive fires for special operations.

Currently, the Advanced Aerial Fire Support System, referred to as AAFSS, is the Army's highest priority aircraft program. Together with the associated suppressive fire developments, a substantial amount will be devoted toward the AAFSS. It is being developed to satisfy a requirement for an armed air vehicle that can be integrated into U.S. Army maneuver elements to provide commanders with responsive mobile firepower.

The AAFSS design is in direct response to requirements for a better armed helicopter stated by both General Harkins and General Westmoreland as the past and present commanding generals of MAC V. The Army reprogramed FY 66 resources to add impetus to this urgent requirement.

The AAFSS anticipated effectiveness can be translated into the following unique operational capabilities: Operation without a prepared air strip under weather conditions of reduced visibility and ceiling; accurate fire control of highly effective, flexible direct-fire weapons; flexible flight operating characteristics from hover to relatively high speeds.

Its primary role will be to escort troop-carrying helicopters in airmobile operations and provide suppressive fires in the landing zones. For secondary mission, it is designed to engage and destroy area and point targets, including fixed emplacements and armored vehicles.

A compound helicopter, the AAFS will have twice the speed of armed helicopters now in Viet Nam. Transportable in cargo aircraft, it will have a self-deployable ferry range for combat operations.

In battle, the AAFSS will employ a a variety of weapons, including machineguns, grenade launchers, rockets and antitank missiles. The airborne TOW missile is under engineering development for selective use on the AAFSS. It will be used to destroy point targets such as bunkers and hard-gun emplacements.

Progress in the Army Research Helicopter Program has already provided valuable technical data on compound helicopters being used in the AAFSS program. In FY 1967, the Army will investigate more advanced composite aircraft, that is, aircraft which will better combine the advantages of the helicopter with the lift-to-drag ratios more normally associated with fixed-wing aircraft. Ideas such as stopping the rotor or stowing it or turning the rotor 90° and using it as a propeller will be evaluated.

The remainder of the Aircraft program is devoted to supporting research to improve air-drop equipment; increase the efficiency and reduce the cost of parachutes; and develop a more precise means of aerial delivery, such as rocket deceleration for high-rate-of-descent parachutes.

Missiles. This activity finances work on surface-to-air missile systems for air defense of fired defense areas, and mobile combat forces, work on surface-to-surface missile systems for support of land, amphibious and airborne troops in combat operations in potential battle areas, supporting research for propulsion, components, warheads and ancillary equipment; and supports missile R&D through operation of the White Sands (N. Mex.) Missile Range and the Kwajalein Test Site in the Pacific.

R&D in this area includes research in missiles and missile propulsion. A major effort in this program is directed toward improving the Pershing missile system's capability.

Another major R&D effort is the surface-to-surface missile program with the Lance. An engineering model has undergone extensive testing which began in mid-March 1965. Environmental testing has included ground mobility, swimming, and air-drop tests.

Work is continuing on Forward Area Air Defense. As a result of termination of the developmental program on the Mauler system, the Army plans to concentrate on the Chaparral and the Vulcan Gun Forward Area Air Defense System in FY 67.

The Chaparral missile system is designed to provide low-altitude air defense protection within the forward area. Prototypes of the system have been successfully tested at the Naval Ordnance Test Station in California.

The Vulcan Gun fires approximately 3,000 rounds per minute using a simple lead-computing sight, which will be augmented by a range-only-radar when development is complete. Towed versions of the Vulcan and the Chaparral are under development. A simple alert radar to provide early warning for both the Chaparral and gun fire units is presently under study.

The largest single item in the budget—the Nike-X—is in this activity. This major engineering development project, which received $390 million in FY 66, will require $417 million in the FY 67 RDTE funds for system development and a continuing reentry measurement program.

The recently completed "Nike-X De-

(*Continued on page 30*)

Army Selects Col Chavis for Major Research Post

(*Continued from page 1*)

After completing a 10-month course at the National War College in 1963, Col Chavis served with the 32nd Artillery Brigade in Europe as executive officer and until he became deputy brigade commander.

Following his first tour of duty in the Office of the Chief of Research and Development as a staff officer, Air Defense Division, from 1958 to 1960, he served two years with the Army Element, Office of the Joint Chiefs of Staff, Washington, D.C.

From 1955 to 1957, before attending the Armed Forces Staff College, Norfolk, Va., he was deputy chief of staff for administration with the 4052 SU AAU and GMC at Fort Bliss, Tex. For a year he was deputy chief of staff for operations, Air Defense Center, and later was the commander of the 495th AAA Battalion (Nike) at Fort Bliss, Tex.

After graduating from the Army Command and General Staff College, he served from August 1953 until January 1955 with Antiaircraft Artillery units in Korea as battalion commander and deputy chief of staff for administration and (later) operations.

Col Chavis studied law at San Diego (Calif.) State College before receiving a commission in the Army in 1942. During World War II, he had various assignments with Antiaircraft Artillery commands in Hawaii.

Col Chavis, a native of Collingdale, Pa., wears the Bronze Star medal, the Army Commendation Medal with two Oak Leaf Clusters and the Army Distinguished Service Medal in addition to various service medals of World War II and Korea.

Betts Appointed CRD as Dick Takes SE Europe Forces Command

(*Continued from page 1*)

under the overall command of Admiral Charles D. Griffin.

Secretary of Defense Robert S. McNamara announced selection of General Michaelis to succeed Lt Gen Charles G. Dodge upon his retirement as commanding general, Fifth U.S. Army Headquarters, Chicago, Ill.

During General Dick's tenure, a number of Army weapon systems and materiel items have progressed from research and development to production. Included in this category are: Armored reconnaissance and airborne assault vehicle (General Sheridan); Shillelagh antitank guided missile, Redeye, Chaparral air defense guided missile, 105mm lightweight towed howitzer M102;

Also, 40mm grenade launcher M5 for use with the UH-1B helicopter, the M2 helicopter armament subsystem (which includes twin 7.62mm machinegun), medium transport helicopter (Chinook), combat surveillance and target acquisition aircraft OV–1C (Mohawk), light observation helicopter, combat engineer vehicle M728, cargo carrier air transportable M548E1;

Also, radio set AN/PRC–52, infrared surveillance system AN/UAS–4 for the Mohawk, countermeasure set AN/MLQ–26, tactical imagery interpretation facility, small Starlight scope for night vision, and mobile floating assault bridge.

In addition to the major items, a large number of smaller but still important developments completed during General Dick's regime have added significantly to Army capabilities. Among these are the tropical combat boot and items of individual clothing and equipment, nuclear and nonnuclear artillery projectiles, communications terminals, infrared binoculars, and additional support items.

General Dick has served as Chief of Research and Development since Aug. 30, 1963, and was Deputy CRD from July 1960 to April 1961, when he took command of the 3rd Infantry Division, U.S. Army Europe. His first assignment to the Office of the Chief of Research and Development in 1958 was Director of Special Weapons.

Recipient of a Presidential appointment to the U.S. Military Academy, from which he graduated in 1931, General Dick was born in 1910 at Montgomery, Ala., as the son of a colonel (deceased).

On duty with the 25th Infantry Division in Hawaii when Pearl Harbor was attacked, he served four years in the Pacific as a battalion and division Artillery commander, executive officer and chief of staff.

General Dick was with the 25th Infantry Division in Japan when the Korean War broke out and served with the Division in six campaigns of that conflict. Later he was assigned to the 31st Division Artillery, followed by duty as an Artillery commander and then chief of staff with the Seventh U.S. Army in Germany.

Decorations General Dick has received include the Legion of Merit (with two Oak Leaf Clusters), Bronze Star, and presidential citations from the Republic of Korea and the Republic of the Philippines.

MAJ GEN BETTS has a distinguished 20-year record of high-level association with scientific activities to prepare him for his responsibilities as Chief of Research and Development. Graduated from the U.S. Military Academy in 1934, he earned a master of science degree from Massachusetts Institute of Technology in 1938. He is also a graduate from the Industrial College of the Armed Forces.

In February 1965, Army Chief of Staff General Harold K. Johnson presented General Betts with the first Oak Leaf Cluster to the Legion of Merit. The award recognized a year of outstanding service as special assistant for a Nike-X Threat Analysis Study.

From January 1961 until assigned to the Nike-X study, General Betts was Director of Military Application, U.S. Atomic Energy Commission. Assigned to the Director of Defense Research and Engineering as a military assistant, he served one year and then was appointed Director of the Advanced Research Project Agency (ARPA) in 1960.

Among General Bett's other assignments are a 3–year tour as chief, Combat Developments Branch, U.S. Army Europe from November 1955 to March 1960; and Chief, Atomic Energy Branch, Research and Development Division, G–4, Department of the Army.

World War II service in training new battalions and planning construction of U.S. B29 air bases in India and China earned General Betts his first Legion of Merit. In 1945, he began his research and development career at the nuclear bomb testing ground at Los Alamos, N. Mex., and remained there to become associate director of the scientific laboratory.

HDL Engineer Wins D.C. Outstanding Award

Development of a specialized temperature-measuring fleuric device has gained an Army employee recognition as "Outstanding Young Professional Engineer for 1966," in the form of the National Capital Award.

Richard N. Gottron, a research mechanical engineer at the U.S. Army Materiel Command's Harry Diamond Laboratories in Washington, D.C., was selected from 45 nominees, all under 35 years of age. All candidates had to be employed within a 35-mile radius from the White House.

HDL COMMANDING OFFICER Lt Col M. S. Hochmuth congratulates Richard Gottron, recipient of National Capital Award as "Outstanding Young Professional Engineer of 1966."

The National Capital Award is sponsored annually by the Washington Academy of Sciences and the District of Columbia Council of Engineering and Architectural Societies. It consists of a gold key, a certificate of achievement and an all-expense-paid, 2-day visit to research laboratories in the New York City area.

Several patent applications have been filed by Gottron on the measuring device that earned the award. The device accomplishes measuring functions not previously attainable.

Graduated from the United States Military Academy at West Point in 1955, Gottron attended Purdue University while on active military duty. He received an MS degree in mechanical engineering while assigned to the Harry Diamond Laboratories in 1960 and became an HDL employee in 1964.

New Low-Cost Proximity Fuze Battery Holds Promise at HDL

Possible impact of an ingenious new low-cost battery for proximity-fuze-type ammunition is getting low-key publicity treatment at the Army Materiel Command's Harry Diamond Laboratories, but it is no secret that developers are highly hopeful.

Tests to date indicate that the battery can be mass produced at substantial cost economies as compared to equipment currently in use. Extensive evaluation tests remain to be completed. Developers envision that the cost reduction may be made on millions of artillery shells.

Many types of modern ammunition depend on in-flight electronic power for the operation of proximity fuzes and other electronic components. The estimated unit cost of the new device in quantity procurement approximates 80 cents, excluding manufacturing overhead charges.

A project group headed by Allan M. Biggar, a general engineer in the Materials Branch at HDL, Washington, D.C., has completed first-and second-phase development of the battery. Laboratory and field firing tests have demonstrated that it is feasible and practicable.

Two complete 35-volt, 400-watt-second batteries and a 50-cent piece pictured with this article give an idea of the size and shape of the device. Technically, this is a liquid electrolyte, series-connected, reserve battery (the same general type as a 12-volt dry-charged lead-acid automobile storage battery).

The electrolyte is confined in a sealed metal container at one end of the battery, and is kept away from the cells by a thin metal foil diaphragm until the shell is fired.

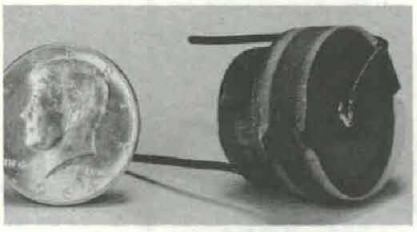
A particular combination of impact forces and angular acceleration forces, which is not likely to be encountered anywhere except in gun firing, causes a novel cutting device mounted within the electrolyte container to break the diaphragm. Centrifugal forces resulting from spin of the shell then drive electrolyte from the container into the cells, thereby activating the battery.

Further unusual features of the design are its caseless construction, and the use of a novel system for purging electrolyte from the fill channel after the cells have filled.

Power sources of artillery shells are exposed to extremely severe worldwide climatic differences and the forces experienced in shipping, rough handling, and gun firing. They must operate anywhere between 40 degrees below zero and 165 degrees above zero Fahrenheit, at spin rates up to several hundred revolutions per second, after being subjected to many thousands of "g's" during gun launching.

Power sources also have to be small, lightweight, reliable, inexpensive, suitable for long-term storage, impervious to humidity extremes, and capable of manufacture even in wartime economy. These factors, and others not listed here, present design problems quite different from those encountered with batteries for use in more familiar applications, such as the typical transistor radio.

The new battery represents the combined efforts of many HDL employees; in addition to the project leader, those closely asociated with developmental work are Mrs. Judith B. Lipnick, chemist, Harrison L. Malmberg, supervisory tool and die maker, Thomas C. Lanning and Wade G. Hay, tool and die makers.



FIFTY-CENT PIECE illustrates size of 35-volt, 400-watt battery recently developed by Harry Diamond Laboratories for artillery ammunition applications involving proximity-fire fuzes.

MEMBERS OF ARMY CIVILIAN TEAM that developed new battery at HDL (l. to r.) are Allan M. Biggar, general engineer and group leader, Judith B. Lipnich, chemist, Harrison L. Malmberg, supervisory tool and die-maker, Thomas C. Lanning and Wade G. Hay, tool and die-makers.

Subzero Tests Probing TOW Antitank Weapon

Big Delta, a settlement near Fort Greeley, Alaska, where temperatures plunge to 25 degrees below zero, is the scene of man-equipment tests being carried out with the Army's heavy antitank assault weapon TOW.

Missilemen from Redstone Arsenal, Ala., and officials from Hughes Aircraft Co., TOW prime contractor, are conducting the tests to determine the effectiveness and compatability of the system and soldiers under extreme weather conditions.

These engineering tests represent a major milestone in the development of the tank killer designed for use by infantryman against hard-point targets, gun emplacements and other field fortifications.

Several missiles are being fired to determine operational capabilities of the hardware. Among other tests, troops will carry the equipment, assemble it, run through firing procedures and disassemble the equipment.

The TOW system is managed by the Missile Command at Redstone Arsenal under Lt Col Ballard B. Small, project manager. Conducting the tests for the command is Frank Bunn, team leader from the Test and Reliability Evaluation Laboratory.

Representing Hughes are George B. Clow and J. M. Oddino, contractor team leaders, and Dr. Donald W. Fraser, who is responsible for coordination and planning of the tests. Dr. John M. McGinnis Psychology Laboratories, Pioneering Research Division, Natick (Mass.) Laboratories, will evaluate the man-equipment relationship.

Microminiaturization Miracle . . .

Generator Like Grain of Rice Sends Signals

A radio-wave signal generator the size of a grain of rice is out-performing standard devices that use 10 times as much power and range up to hundreds of times larger in tests at the U.S. Army Electronics Command.

Researchers at the Electronic Components Laboratory, Fort Monmouth, N.J., believe the device promises major breakthroughs in its areas of potential use. Signal generators, or oscillators, are basic to the operation of radios, radars, and all other equipment used to propagate radio waves that serve as information carriers.

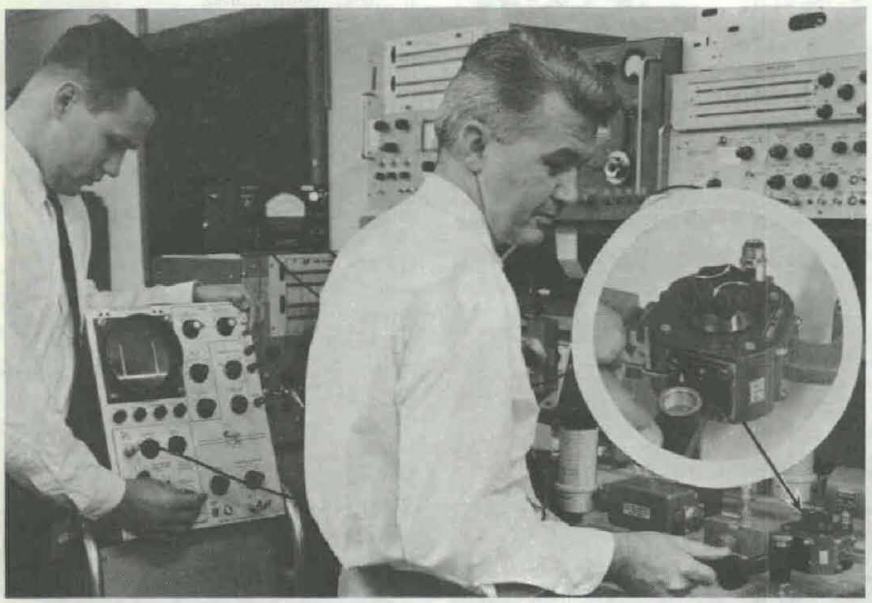
Projects already are under way to use the development in such experimental Army combat items as miniature radars and communications equipment, including advanced microwave radio relay systems. Among the projected items is a purely exploratory grapefruit-size radar.

The rice-grain size of the signal generator includes its package. The essential material, gallium arsenide, is a speck invisible to the naked eye.

Principal members of the group experimenting with the device are physicists Frank A. Brand and Vincent J. Higgins, and Joseph J. Baranowski, an electronic engineer. They report that experiments so far have established for the device these salient features:

- Highly efficient, it has an almost unprecedented signal strength output in comparison to electrical power input.
- Unusually stable, it does not drift off frequency.
- Easy to tune, it operates over wide frequency ranges in the microwave and millimeter portions of the spectrum; tests have been pushed up to 40 gigacycles. (A gigacycle is a billion cycles per second.)
- As a solid-state device, the signal generator is inherently rugged, long-lived, and, in mass production, would be cheap to produce.
- It is highly compatible with the microelectronic circuitry now being produced for a growing number of other electronic functions.

The device's low power needs also have wide implications for military logistics. In many cases, batteries could provide equipment operating voltages, making it feasible to expand greatly the number of highly portable field equipments whose development the Army is stressing.



RADIO-WAVE GENERATOR, so small it requires tweezers for handling, promises to supplant devices up to hundreds of times larger in some of the Army's future models of lightweight communications and radar equipment. The solid-state generator's essential material, a speck of gallium arsenide invisible to the naked, eye, is contained within the package shown in the inset above. As part of the tests, physicist Vincent Higgins (right tunes desired frequencies while engineer Joseph J. Baranowski watches the oscilloscope.

Largely a product of the low power level and high efficiency, the low operating temperatures could eliminate, for example, the bulky energy-consuming cooling fans used in some radar sets.

The device was not at the outset visualized as a signal generator. Instead, it was produced to Electronics Command specifications by Sylvania Electronic Products Inc. as a diode for a low-noise parametric amplifier.

Semiconductor diodes have the general property of allowing an easy flow of current in one direction while restricting the flow in the opposite direction. However, as voltage continues to climb in the reverse direction, a point is reached where an abrupt increase in current takes place through what is known as an "avalanche" process. Under the right conditions, this generates microwave oscillations.

Army researchers at Fort Monmouth emphasize that the broad research that made the new signal generator possible has been done by a number of persons both in and out of the Electronics Command.

Historical Volume Recounts AMEDS Dramatic War Years

From the beaches of Algeria to the mountains and swollen streams of Italy, the U.S. Army Medical Service (AMEDS) supported Allied military forces that fought and won the battles of World War II in Europe.

The dramatic story of AMEDS support is recounted in *The Medical Department: Medical Service in the Mediterranean and Minor Theaters* by Dr. Charles M. Wiltse, chief historian, U.S. Army Medical Service.

This is the latest volume of the series, *United States Army in World War II*. The book is the second medical volume and the 63rd volume in the series of official Army histories published by the Office of the Chief of Military History.

Dr. Wiltse, author of many works of history, has held positions with the National Resources Committee, the National Youth Administration, the War Production Board, the National Security Resources Board, the National Production Authority and the Defense Production Administration.

Medical Service in the Mediterranean has 664 pages, maps, tables, photographs and an index. It is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20401, at a cost of $5.00.

Role of Women in Army Science Exemplified by 2 of 3 Top Army Awards

Increasing importance of women scientists in Army research and development is exemplified by two of three U.S. Army Materiel Command researchers honored recently with the Exceptional Civilian Service Award.

General Frank S. Besson, Jr., CG of the AMC, presented the awards to Dr. Dorothy G. Smith and Dr. Frances M. Latterell, both of the Army Biological Laboratories, Fort Detrick, Md., and Dr. Andrew Assur, Army Cold Regions Research and Engineering Laboratory, Hanover, N.H.

Dr. Frances Latterell

Dr. Dorothy G. Smith

Dr. Andrew Assur

Currently assigned as deputy director of biological research at the Biological Laboratories, Dr. Smith was cited by General Besson for outstanding contributions to the Army biomedical research program. Acclaimed was her work on diagnosis, pathogenesis, prophylaxis and therapy of infectious diseases.

In 1961, Dr. Smith received the Army Meritorious Civilian Service Award for her "significant contributions" to a wide variety of research on infectious diseases. That same year, she was certified in Public Health and Medical Laboratory Virology as Diplomate of the Board of American Academy of Microbiology.

In 1961, also, then Secretary of the Army Elvis J. Starr signed a Certificate of Achievement presented to Dr. Smith when she was the Army nominee for the Second Annual Federal Women's Awards.

Another honor came in June 1965 when Deputy Director Colin M. MacLeod of the Office of Science and Technology, Executive Office of the President, sent a letter of appreciation for her reports on research findings.

Dr. Smith collaborated with Dr. S. A. Waksman, 1952 Nobel Laureate, on his work with antibiotics. She also received a monetary award for her contributions to the research and discovery of streptomycin during the period 1944–47.

Most of her 29 publications in major professional journals have reported on gas gangrene, chemotherapeutic agents, and antibiotics. She is a charter member of the American Academy of Microbiology, and a member of the Scientific Research Society of America, the Society of Experimental Biology and Medicine, and Sigma Xi.

Born in the British West Indies, Dr. Smith attended Radcliffe College in Cambridge, Mass., for three years before reciving a BA degree in 1940 from Queen's University, Ontario, Canada. After receiving a doctorate from Rutgers University in 1947, she was associated with Merck Institute for Therapeutic Research until she joined the Army BioLabs staff.

DR. ANDREW ASSUR is scientific adviser to the technical director and commanding officer of the Cold Regions Research and Engineering Laboratory. Recognized internationally as an expert in snow, ice and frozen ground research, he has developed solutions to engineering, transportation and other logistics operations, in cold regions essential to Army missions.

Graduated from the Civil Engineering School in Rezeken, Latvia, in 1941, Dr. Assur is a native of Caucasus, USSR. He received his doctorate in science from Hamburg University, Germany, in 1950, and began his U.S. Civil Service career as a translator with the Army Corps of Engineers Snow, Ice and Permafrost Research Establishment in 1954.

Dr. Assur is a member of the American Geophysical Union and the American Polar Society, author of snow, ice and permafrost research articles in professional journals, and has participated in various Arctic and Antarctic research misisons.

DR. FRANCES LATTERELL was awarded the Exceptional Civilian Service Medal for her work in pioneering and developing a system for identifying the physiological races of rice blast fungus.

The citation stated in part: "Through her vigorous and dynamic effort, Dr. Latterell has accumulated a vast subject matter knowledge which has provided an outstanding contribution to the Department of the Army, to fellow scientists, and the rice-growing community of the world."

Assigned to the Crops Division of the BioLabs at Fort Detrick, she has been employed since 1949 as a plant pathologist. During this period she has received the Research Society of America Award for Scientific Achievement, the Department of the Army Special Service Award, and the Army Meritorious Civilian Service Award.

In 1963, she presented two technical papers at the International Symposium on the rice blast disease at the International Rice Research Institute in the Philippines. Acknowledged as one of three people in the world to whom rice blast cultures can be sent for accurate and official race identification, Dr. Latterell has achieved international renown.

Graduated from Kansas City Missouri Junior College (AA), the University of Kansas City (BA), and Iowa State University (MS and PhD), she is a native of Kansas City. Author of many publications on her research activities, she is a member of the Research Society of America, American Phytopathological Society, Maryland Academy of Science, and Sigma Xi.

AFIP Sets Short Course Dates

"Pathology of Laboratory Animals" is the title of a short course to be held Sept. 19-23, 1966 at the Armed Forces Institute of Pathology (AFIP), Washington, D.C.

Brig Gen Joe M. Blumberg, AFIP director, said the course is open to military and civilian veterinary, medical and dental personnel. It will provide training in recognition and interpretation of lesions in experimental animals. Aug. 1, 1966, is closing date for applications.

President Reports to Congress on U.S. Aerospace Activities

United States aeronautics and space activities during 1965 are comprehensively reviewed in a recently issued 172-page Presidential "Report to the Congress," prepared under supervision of the National Aeronautics and Space Council.

President Johnson states in the covering letter to Congress: "The record of American accomplishments in aeronautics and space . . . shows it to have been the most successful year in our history. . . ."

The report summarizes all significant activities of the 12 agencies linked in the Nation's aeronautics and space programs.

Major organizations given separate chapters in the President's report as coordinating in the national effort, in addition to the National Aeronautics and Space Council, are: National Aeronautics and Space Administration (NASA), Department of Defense (DoD), Atomic Energy Commission (AEC), Department of State, National Science Foundation (NSF), Department of Commerce, Space Science Board of the National Academy of Sciences, Smithsonian Astrophysical Observatory (SAO), Federal Aviation Agency (FAA), Federal Communications Commission (FCC), United States Information Agency (USIA) and the Arms Control and Disarmament Agency (ACDA).

The report recognizes Army cooperation in the following areas:

• The November 6 successful launching of NASA's Explorer XXIX satellite (Geos I), which is still in orbit as a geodetic vehicle, carries an Army SECOR (sequential collation of range) transponder, a NASA Range-Rate transponder and Laser reflector, an Air Force optical beacon and a Navy Doppler beacon. (*Army R&D Newsmagazine*, December 1965-January 1966 edition, page 6.)

• Two additional geodetic SECOR satellites were successfully orbited in 1965. These spacecraft are being used, as part of the DoD effort, in the Army Corps of Engineers (OCE) geodetic satellite program to locate the positions of certain Pacific Islands and the North American datum. Objective of this program is to improve knowledge of the earth's diameter and to connect all major geodetic datums. The SECOR system is producing accuracies of one part in two hundred thousand. (*Army R&D Newsmagazine*, October 1965 edition, page 28.)

• During 1965 the Army awarded the initial production multiyear contract for 714 of the Army's newly developed Light Observation Helicopters (LOH), designated the OH-6A (Pawnee). This aircraft represents significant advances in the state-of-the-art for light helicopters. (*Army R&D Newsmagazine*, August 1965 edition, page 6.)

• A high-speed helicopter research program was completed by the Army during the year. Several helicopters with different rotor and control systems were modified to a compound configuration by the installation of wings to unload the rotors at high speeds and auxiliary power systems for additional horizontal thrust. Three of the compound helicopters demonstrated a high-speed capability by flying in the 200-knot class. (*Army R&D Newsmagazine*, September 1965 edition, general review page 24.)

• A program for engineering development of prototypes for the Advanced Aerial Fire Support System (AAFSS) for the Army was approved. This system will use a winged compound helicopter designed for use in providing organic aerial gunfire support for Army units. (*Army R&D Newsmagazine*, December 1965-January 1966 edition, page 10.)

• As part of the V/STOL (vertical short takeoff and landing) program the XV-5A (fan-in-wing) aircraft has completed both the contractor and the military flight evaluation. One of the XV-5As is being modified

GIMRADA Places Order For 2 SECOR Stations

Two new ground stations will be delivered to the Army by 1967 to enhance the geodetic satellite tracking program conducted by the Army Engineer Geodesy, Intelligence and Mapping R&D Agency (GIMRADA).

A contract for $1,442,582 was awarded by the Fort Belvoir, Va., agency to the Cubic Corp., San Diego, Calif. Delivery of the stations is scheduled within nine months.

The ground stations are electronically equipped to track SECOR (sequential collation of range) satellites. Radio signals between the stations and the satellites—three SECORs are presently in orbit—provide ranging data used to compute the positions of islands and give the Army more accurate geodetic information.

GIMRADA Exhibits Mapping Systems at Convention

GEODETIC SATELLITE exhibit is inspected by Prof. E. H. Thompson of London (England) University at the recent joint convention of the American Congress of Surveying and Mapping and the American Photogrammetric Society in Washington, D.C. Explaining the operation of the satellite is Max Roos of the U.S. Army Geodesy, Intelligence and Mapping R&D Agency (GIMRADA), Fort Belvoir, Va. Visitors to the GIMRADA exhibit could listen to telemetry signals being sent to tracking stations by an orbiting vehicle. Animated displays by GIMRADA demonstrated a rapid combat mapping system and a micromapping concept being developed for battlefield commanders. Prof. Thompson delivered the key technical address at the 3-day meeting. Scientists and engineers of the Fort Belvoir agency presented six technical papers.

to provide the Army with some operational data. The aircraft also will be used to train pilots from the other Armed Services and NASA to fly a fan-in-wing V/STOL aircraft. (*Army R&D Newsmagazine*, March 1965 edition, page 23.)

• The XV–6A (P–1127), a diverted thrust aircraft built in the United Kingdom, was used in a tripartite, tri-Service V/STOL operational concept evaluation in England between April and November 1965. This tri-Service V/STOL program is managed by the Army and entered the operational evaluation phase during 1965. Other V/STOL concepts in transport-type aircraft were continued by the Army, Navy and Air Force. These were the XC–142A tilt-wing V/STOL, the X–19A tandem-tilt propeller design and the X–22A rotating ducted-propeller design. (*Army R&D Newsmagazine*, September 1965 edition, general review on page 24.)

• Under "General Support, Research and Development" of the DoD chapter in the President's report, the U.S. Department of the Army-Canadian Department of Defence Production R&D of high-altitude research probes (HARP) was discussed.

• In February 1965, the Army and NASA entered into an agreement for use and support of certain facilities owned by NASA at Ames Research Center, Moffett Field, Calif. (*Army R&D Newsmagazine*, November 1965 edition, page 22.) Under this agreement NASA is making available a 7×10-foot wind tunnel for use by the Army which is also participating in NASA's low-speed aeronautical research at NASA-Ames.

• The Army performs a great variety of tasks for the support of NASA. The report cited in particular the Corps of Engineers' responsibility for design and construction of NASA facilities at many locations.

Other tasks listed include: The development of an omnidirectional accelerometer by Army Materiel Command's Harry Diamond Laboratories, Washington, D.C.; space vehicle destruction system at Aberdeen (Md.) Proving Ground; qualification and reliability testing of three additional Gemini space suits at the Natick (Mass.) Laboratories; thermal control of spacecraft at Fort Belvoir, Va. (Engineer Research and Development Laboratory); and extensiion of the state-of-the-art on foods for use in space at the Natick Laboratories.

• NASA is also supported by the assignment of 237 particularly qualified U.S. military officers. Of these, 80 are Army officers.

An appendix to the report, listing all successful satellite launchings in 1965, includes the Army geodetic vehicles SECOR III (launched Mar. 9), SECOR II (Mar. 11) and SECOR IV (Apr. 3) as "still in orbit."

ECOM Prepares Compendium on Boron Research

Boron, Volume 2, Properties and Applications, a 350-page volume based on papers presented at the International Symposium in Paris, has been published by Plenum Press, the Army Electronics Command announces.

Edited by Gerhart K. Gaule of ECOM's Institute for Exploratory Research, Fort Monmouth, N.J., the book is representative of the work of scientists from the United States, United Kingdom, the Federal Republic of Germany, Switzerland and Poland.

To give a picture of boron research which would be as comprehensive and up to date as possible, Gaule has included a number of important recent research reports. A survey of the present status of boron research is given.

Boron, the fifth element in the Periodic Table, is an unusual semiconductor material mainly because of the unusual bonding character of the boron atom, and the complex, now clarified structures (with up to 105 atoms per unit cell) resulting from it.

The unusual structure of boron is probably the indirect cause for the very low carrier mobilities in boron which prevent its use as a substitute for silicon, for example, the book points out.

On the other hand, the absence of the contact rectification effects usually observed in semiconductors makes boron an excellent choice for "ohmic" devices, such as temperature sensors ("thermistor"), thermally actuated overload switches, and others discussed in the new book.

The nuclear properties of boron are unusual inasfar as it has two stable, readily available isotopes, which differ by 100 percent in their masses and by many orders of magnitude in response to types of nuclear radiation.

The semiconductor combined with the nuclear properties of boron have been used to develop novel nuclear detectors, as shown in one of the chapters of the book. Other chapters describe avalanche currents observed at room temperature in bulk as well as in thin films of boron which may find use in nonlinear devices.

Gerhart K. Gaule

Of considerable theoretical as well as practical interest are the mechanical properties of boron—in particular, its rigorously elastic behavior—and its very favorable strength to weight ratio, which are discussed for bulk boron and filaments.

While the advanced methods for the preparation, analysis and the crystalization of boron, which are described in several chapters, now yield a material which is well controlled and reproducible in its properties, this purest available material still contains many parts per million of carbon.

ERDL Tests Air Conditioners To Protect Electronics Gear

Two "significantly advanced" air conditioners to protect Army electronics gear from high temperatures and humidity are being tested by the Army Engineer R&D Laboratories (ERDL), Fort Belvoir, Va.

The units are lightweight for their 36,000 and 60,000 B.t.u. per hour capacities and can operate in zero temperatures. Commercial units are designed for a low of 50 to 60 degree Fahrenheit.

The smaller unit weighs 390 pounds and the larger 520 pounds compared to the 450 and 1,200 pounds of currently used military units of similar capacities. Wrapper-type frame construction, plate-fin compact heat exchangers and lightweight materials account for the weight reduction.

The test units were built by the Trane Co., LaCrosse, Wis. Production units would be used for cooling and dehumidifying missile fire control vans, communications shelters and housings for electronic systems.

Army Lets T–64 Engine Contract

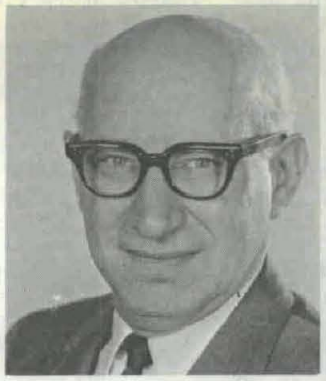
Power for a new type of helicopter, incorporated the Army's Advanced Aerial Fire Support System (AAFSS), will be furnished by T–64 engines produced under a $4,500,000 contract recently awarded by the Army.

The engines will generate 3,080 shaft horsepower to provide a cruising capability of 200 knots per hour and will be made by General Electric Co.

4 Scientists Win SARS Fellowships at Overseas Universities

William B. McKnight

Dr. Ronald Anthony Ward



Dr. Benjamin Witten

Dr. Duwayne M. Anderson

Secretary of the Army Research and Study (SARS) Fellowships awarded recently to four scientists recognize their research and potential for future service in diverse fields at Army in-house laboratories.

SARS awards enable outstanding Army career civilians to pursue research studies on a specific project for one year at home or abroad.

The winners are Dr. Duwayne M. Anderson, U.S. Army Cold Regions Research and Engineering Laboratories (CRREL), Hanover, N.H.; William B. McKnight, U.S. Army Missile Command (MICOM), Redstone Arsenal, Ala.; Dr. Ronald Anthony Ward, Walter Reed Army Institute of Research (WRAIR), Washington, D.C.; and Dr. Benjamin Witten, Chemical Research and Development Laboratories (CRDL), Edgewood Arsenal, Md.

DR. ANDERSON plans to study with Dr. Eric Forslind, an eminent scientist at the Royal Institute of Technology, Department of Physical Chemistry, in Stockholm, Sweden, beginning this fall. He will conduct investigations of hydro-gel transitions and properties of water in frozen clay water gels (gelatinous precipitates).

The CRREL geologist is currently engaged in laboratory research on the physics and chemistry of interfacial phenomena during the freezing and thawing of earth materials. Recently he spent some time in Alaska, examining the occurrence and significance to military operations of an extensive deposit of bentonite clay.

Prior to joining CRREL in 1963, he was professor of soil physics at the University of Arizona, and soil physicist with the Arizona Agricultural Experiment Station. While at the university, he helped organize the graduate study curriculum in hydrology.

Dr. Anderson received a BS degree in geology at Brigham Young University in 1954. Later, he became a research Fellow at Purdue University, and was awarded a PhD degree in 1957 for his work in the density of adsorbed water. He recently received a Department of the Army commendation for high quality performance in research.

Consulting editor of *Soil Science*, Dr. Anderson is the author of more than 50 articles, technical reports and other presentations in his field of research.

WILLIAM B. McKNIGHT, chief of the Applied Physics Branch at Redstone Arsenal, will begin his SARS Felowship year in July. He will study new types of gas Lasers at Oxford University, England.

McKnight has introduced many new concepts in infrared and high-energy Lasers, He received an Army Research and Development Achievement Award (1961) for developing a high-speed thermal imaging device.

Another Army R&D Achievement Award in 1964 recognized his concept and development of an induction-driven, high-energy Laser array. He received Outstanding Performance and Sustained Superior Performance ratings in 1960 for his service as a supervisory physicist (optics) with the Army Rocket and Guided Missile Agency.

He was also awarded the Army Missile Command Scientific and Engineering Award in 1964 for work with Lasers.

In addition to authoring about 25 technical reports and publications on rocket testing, instrumentation development, infrared guidance information, target data, and military and medical applications of Lasers, he holds five patents in connection with his work and six applications in process.

McKnight received his BS degree in physics from Purdue University in 1950, and later attended the University of Alabama. He is a member of the American Association for the Advancement of Science, the American Optical Society, the American Physical Society, the Association of the United States Army, Delta Rho Kappa, and Sigma Pi Sigma.

DR. WARD will spend from October 1966 to July 1967 at the London School of Hygiene and Tropical Medicine, London, England, where he will study for the University of London Academic Postgraduate Diploma in applied parasitology and entomology.

Presently serving as assistant chief of the WRAIR Department of Entomology and principal investigator, Malaria Section, Dr. Ward is responsible for investigations on anthropod-borne diseases of importance to the military, with special emphasis on malaria. Employed at WRAIR since June 1958, he has had formal training in biometry, epidemiology and immunology.

In addition to his analysis of the "Genetic Aspects of the Susceptibility of Mosquitoes to Malarial Infection" (experimental parasitology, 1963), Dr. Ward participated in malaria studies at the SEATO Medical Research Laboratory in Thailand during June-July 1963 and July-August 1965.

Invited to address the XIIth International Congress of Entomology in London in July 1964, he has published a number of scientific papers. Primarily they are concerned with the effects of extrinsic factors on the development of malarial parasites within the mosquito host. In 1965 he received an Outstanding and Sustained Superior Performance award.

Dr. Ward received his PhD in zoology from the University of

Chicago in 1955 and has a BSc in entomology from Cornell University.

DR. WITTEN intends to broaden his knowledge of the biological sciences through a year of study with several world-renowned investigators at the Hebrew University, Jerusalem, Israel. As chief, Chemical Research Division at CRDL, his major responsibilities are in the search for antipersonnel agents and study of their chemical properties.

Dr. Witten has been employed at CRDL and its predecessor organizations since 1940, when he received his PhD in organic chemistry from Johns Hopkins University. He has received the Mertiorious Civilian Service Award and a Department of the Army Certificate of Achievement.

In addition to his duties at CRDL, he has been serving as an assistant in surgery at Johns Hopkins University School of Medicine since 1955, and as a research associate, Division of Surgical Research, Department of Surgery, Sinai Hospital in Baltimore, Md., since 1956.

Missileman Pinyerd Heads Pershing Weapon System

Redstone Arsenal missileman Carl A. Pinyerd, Jr., has been named acting project manager of the Pershing weapon system.

Col Edwin I. Donley, who held that post, is serving as deputy commander for Land Combat Systems at the Army Missile Command, and has been nominated for brigadier general.

Since joining Redstone in 1953, Pinyerd held engineering and management positions on Honest John, Ajax, Hercules, Lacrosse and Redstone projects. He became assistant to the technical director of the old Army Ballistic Missile Agency in 1956.

Later he was responsible for management of feasibility and component development studies which ultimately provided the basis for the Pershing propulsion and control systems. He took over direction of R&D on the Pershing Project in 1960 and advanced to deputy project manager in 1961.

In 1964, the annual Holger N. Toftoy Award presented by the Alabama Section of the American Institute of Aeronautics and Astronautics recognized him for "Outstanding Technical Management of the Pershing Project."

Graduated from Auburn University in 1951 with a bachelor's degree in industrial management, he also has studied at the Universities of Illinois and Alabama.

Zierdt Briefs Industry on Missiles R&D

What the Army wants in missiles, where missile dollars are being spent, and recomended ways that industry might share in development efforts were outlined to Boston businessmen Mar. 4 by Maj Gen John G. Zierdt, the Army's top missileman.

"We want multipurpose missile systems," the commanding general of the U.S. Army Missile Command noted, "and we're looking for systems featuring simplicity, reliability and low cost."

His remarks were directed to industrial leaders assembled in Boston for the National Security Industry Briefing, the first of five such briefings scheduled during March and April throughout the United States.

General Zierdt praised the audience "for what I think is the most heartening recent development in the missile business—the increased interest on your part in helping us find solutions to our problems."

Army missile expenditures for FY 67, General Zierdt said, will include about $447 million for continued development of the Nike-X missile defense system; $70 million to cover contractor and support operations in the Lance ballistic missile; about $120 million for missile repair parts; $150-200 million on critical component work and exploratory and advanced development on a new, forward area air defense system; $50 million which the Missile Command manages for the Advanced Research Projects Agency in support of advanced technology in missile defense research.

Initiating of engineering development on a medium antitank assault weapon and on SAM-D, a new mobile air defense system also is anticipated. Although production of several of the Army's major systems is essentially complete, General Zierdt said work has been initiated with the prime contractors development programs to upgrade the capabilities of three, the Pershing, Sergeant and Hawk.

To get in on part of the action, General Zierdt advised the industrial leaders:

Do work as a subcontractor or supplier to one of the major firms holding one of the Army's prime contractors; establish competition because "we are reviewing every one of our missile systems to introduce competition wherever possible"; produce missile repair parts; and develop new hardware which the Army can use.

The General said that among areas of prime interest to the Army are:

- An infrared seeker that would lock on target after launch.
- A low-cost gyro capable of withstanding high aceleration loadings.
- A way to identify targets for out-of-line-of-sight weapons.
- Subminiature optical sensors for passive homing.

Col Crane, Veteran Missile Officer, Retires From Army

Col Glenn Crane, deputy chief of staff, Army Missile Command at Redstone (Ala.) Arsenal retired from military service in March.

Indentified with Army missilery for more than 15 years, he completed courses at the Guided Missile School, Fort Sill, Okla., in 1950. He received a BS degree in electrical engineering at the University of Missouri in 1941, a master's degree in business administration from George Washington University, Washington, D.C., and attended Shrivenham University in England for advanced degree credits.

Col Glenn Crane

During World War II, he served in Army Ordance in North Africa, Sicily, Italy, France and Germany.

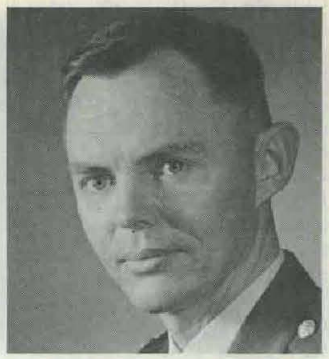
Col Crane attended the Command and General Staff College, Fort Leavenworth, Kans., and in 1953 was assigned to Redstone Arsenal with duty at the Bell Telephone Laboratories in Whippany, N.J. He became chief of the Army Ballistic Missile Field Office at Inglewood, Calif., in 1955.

Assigned in various capacities, including project director of Ballistic Missile and Space Defense in the Army Rocket and Guided Missile Agency, he left Redstone in 1962 to attend the Industrial College of the Armed Forces before taking over as chief of the Nike-X Kwajalein Test Site.

Col A. B. White

Dr. J. M. Majowicz

Lt Col W. H. Knipe



Maj M. P. Earle, Jr.

OCRD Announces 4 Personnel Changes

Lt Col Willis H. Knipe reported recently to the Office of the Chief of Research and Development as chief of the Range Branch, Nike-X and Space Division.

His most recent assignments have been: J–4, Military Assistance Command, Viet Nam, 1964–65; chief of Plans and Projects, White Sands (N. Mex.) Missile Range, 1962-64; U.S. Army Command and General Staff College (student), 1961–62; assistant military attache, American Embassy, Moscow, USSR, 1959–60; Corporal missile project officer, White Sands Missile Range, 1954–57.

Lt Col Knipe attended Purdue University for one year prior to graduating from the U.S. Military Academy in 1947. He has completed the Artillery Guided Missile School, Ordnance Advanced Course, Army Language School, and the Command and General Staff College.

MAJ MARSDEN P. EARLE, Jr., reported recently as assistant executive secretary to the Army Scientific Advisory Panel. Previous assignments have included; action officer, Doctrine Branch, U.S. Army Combat Developments Command Air Defense Agency; adviser, Field Artillery battalion in Viet Nam; and commanding officer, Nike Hercules battery in Germany.

Graduated from the U.S. Military Academy in 1952, he has completed the Artillery Advanced Course, Officer Guided Missile Course and the Command and General Staff College. His decorations include the Bronze Star Medal and the Army Commendation Medal.

DR. JOSEPH M. MAJOWICZ recently joined the Army Research Office (ARO), Arlington, Va., in the Chemistry and Materials Branch of the Physical Sciences Division. Formerly with the General Technologies Corp., Alexandria, Va., Dr. Majowicz was engaged in high strength high modulus, low density materials research. Previous Federal service as a civilian was with the Army Missile Command, Redstone Arsenal, Ala., as chief of the Chemistry Branch of the Physical Sciences Laboratory; the U.S. Naval Weapons Plant, Washington, D.C., as chief of the Chemistry Branch, Engineering and Evaluation Division and the Naval Ordnance Laboratory, White Oak, Md., where he conducted experimental and theoretical studies on the initiation of high explosives and propellants by shock.

Dr. Majowicz was senior engineer specializing in reentry vehicle technology at the Martin Marietta Corp., Baltimore, Md., before he joined the General Technologies Corp.

He received his BS degree in chemistry from Rutgers University, New Brunswick, N.J., and a doctorate in physical chemistry from the Catholic University of America, Washington. Dr. Majowicz served in the Infantry stateside and in the European Theater of Operations from 1943 to 1946. He is a member of Sigma Xi, professional fraternity, and American Men of Science. Dr. Majowicz has held teaching and research jobs at Catholic Univ.

COL ARTHUR B. WHITE is the new chief of the Army Technical and Industrial Liaison Office (TILO), OCRD. He has been with the OCRD Air Defense and Missiles Division since May 1964. Col White is a 1942 graduate of Yale University, BA (premedical) and graduated from Officer Candidate School in April 1943 in Field Artillery. He attended the Command and General Staff College, 1956–1957. Tours of duty have been in Europe in the G3 Section, Headquarters Seventh Army and as Headquarters Battery Commander, 575th Field Artillery Battalion from March 1944 to July 1945.

He was aide to the chief of the Joint U.S. Military Advisory Group in China from July 1946 to December 1948 and served in the G3 division, Central Army Group (NATO) in Germany from 1959 to 1962. Col White comanded the Nike Hercules battalion in Minneapolis, Minn., from 1962 to 1964. He holds the Bronze Star Medal, Army Commendation Medal with three Oak Leaf Clusters, Order of the Cloud and Banner (China) and the Army-Navy-Air Force Medal (China).

ERDL Slates 2-Week Reserve R&D Seminar in July

Army Engineer Corps R&D Reservists will converge on Fort Belvoir, Va., July 17 for two weeks of training at the 9th annual Research and Development Seminar conducted by the 2243rd R&D Reserve Unit.

As in previous years, the objective is to give Army Reserve officers up-to-date information on the Engineer Laboratories research and development programs, as well as provide a channel through which they may contribute to the solution of current and future problems.

Lt Col Adolph H. Humphreys, commanding officer of the Reserve organization at Belvoir's Engineer Research and Development Laboratories (ERDL), said the 1966 seminar will be limited to 55 Reserve officers. Attendees at the past two seminars are not eligible.

The program will include a series of lectures and demonstrations on various types of equipment under development. Guest speakers will represent the Office of the Chief of Research and Development, Army Materiel Command, Combat Development Command, and Office of the Chief of Engineers. Field trips to installations in the Washington area are set.

Army R&D Reservists interested in attending should submit DA Form 1058, "Application for Active Duty Training," through channels to the Commanding Officer of the Laboratories to arrive no later than May 20.

Lt Col F. G. Bohannon

Lt Col C. T. Anders

Lt Col Rex R. Blewett

Lt Col D. B. Millar

(Photos of remaining officers assigned to OCRD who have been selected for promotion were not available when the Newsmagazine went to press.)

Colonels List Includes 33 Who Have Served in OCRD

Ten officers currently assigned to the Office of the Chief of Research and Development (OCRD) and one scheduled for OCRD assignment have been selected for temporary promotion to colonel.

Of the total 773 lieutenant colonels named in the recently released list of selectees for promotion, there are also 23 former OCRD officers.

Lt Col Walter E. Rafert, currently attending the Army War College at Carlisle Barracks, Pa., was selected and is on orders to report to OCRD this summer. Lt Cols Thomas Fitzpatrick and Richard McConnell have been selected from the secondary promotion zone and, according to the Military Personnel Branch, will receive promotions ahead of their contemporaries.

Col Fitzpatrick is a staff officer with the Nike-X and Space Division while Col McConnell is in Canada with the Army Standardization Group as Military Engineering and Standardization Loan Representative.

Other OCRD officers on the selection list are: Charles T. Anders, staff officer in the Review and Analysis Division; Rex R. Blewett, assistant executive officer in the OCRD Administration Office; Frederick Bohannon, U.S. member of the Primary Standardization Office;

Also, Richard L. Clarkson, staff officer in the Plans Division; Louis F. Felder, assistant executive officer for International Programs; Raymond F. Hodgdon, Army Standardization Group, Canada, General Materiel and Airborne Equipment Representative; Charles S. Johnson and Donald B. Millar, staff officers in the Plans Division.

Among the former OCRD officers selected is Lt Col Kenneth R. Bull, who served until June 1965 as secretary of the Army Scientific Advisory Panel (ASAP). Others are:

Robert L. Andreoli, Raymond F. Aquilina, Roy L. Baber, Jr., Spencer R. Baen, Erwin R. Brigham, Leslie G. Callahan, June C. Caton, Richard E. Ellis, Robert E. Hayes, John S. Howland, Wilmer R. Lochrie, James N. Lothrop, Jr., Eugene M. Lynch, William J. Maddox, Nelson A. Mahone, Jr., Burton F. Parker, Robert M. Pearce, Patrick W. Powers, John S. Sullivan, Jr., Alan R. Toffler, James R. Young and Robert M. Young.

Army Materiel Command Wins 1965 Safety Award of Honor

For the third consecutive year, the Army Materiel Command (AMC) has been awarded the National Safety Council Award of Honor for 1965.

Howard N. Pyle, former governor of Arizona and president of the National Safety Council, presented the award to AMC commander, General Frank S. Besson, Jr.

During the same recent ceremony at AMC Headquarters, Washington, D.C., General Besson also received the Department of the Army Safety Award of Merit. This is one of six annual Army awards given for effectiveness in the prevention of accidents. Maj Gen R. F. Seedlock, director of military personnel in the Office of the Deputy Chief of Staff for Personnel, made the presentation.

In worldwide competition, AMC is the only major field comand in the United States to receive such recognition for FY 1965. AMC's rate of disabling civilian injuries was 1.5 per million manhours of operation. All manufacturing industries reported a rate of 12.6.

Governor Names Dr. Gaon Colorado Physician of 1965

Colorado physician of the year for 1965 is Dr. Maurice D. Gaon, medical director of U.S. Army Rocky Mountain Arsenal, Denver, Colo., and commanding officer of the U.S. Army Hospital.

The award was presented by order of Colorado Governor John A. Love. A Governor's committee selects the winner for service and accomplishment in support of the statewide handicapped training program.

Dr. Gaon has served as chairman of the medical committee of the Governor's Committee for the Handicapped and was invited by President Johnson to attend the meeting of the President's Committee for the Handicapped in Washington, D.C.

He also commands a Reserve unit with the mission of providing medical backup or augmentation of medical facilities at a permanent installation in the event of mobilization. His men train alongside regular medical specialists of Fitzsimons General Hospital. The unit has received superior ratings each year that Col Gaon has been in command.

Dr. Maurice D. Gaon

Growing STRATCOM Maintains 24-Hour Worldwide Wartime Vigilance

Personnel strength of 24,000 by June 1966 is projected for the global Army Strategic Communications Command (STRATCOM), partly as a result of the continuing U.S. military buildup in Southeast Asia.

Advances in various modes of communication throughout the world also are contributing to STRATCOM's rapid growth since it was established as a major Army field command Mar. 1, 1964.

Commanded by Maj Gen Richard J. Meyer, STRATCOM performs on a wartime readiness basis around the clock. Four subordinate commands are in the continental United States, Europe, the Pacific and Latin America. STRATCOM serves as the single point of contact between the Defense Communications Agency and the Army.

The key STRATCOM communications station in the Pacific today is at Phu Lam, 12 miles from Saigon, Viet Nam. This barricaded, well-fortified complex serving all the military in Southeast Asia has headquarters at STRATCOM-Pacific near Honolulu, Hawaii.

STRATCOM-CONUS, which operates automatic relays at Fort Detrick, Md., and Davis, Calif., is headquartered at Suitland, Md. Heidelberg, Germany is headquarters for STRATCOM-Europe, and STRATCOM-South is at Panama, C.Z.

General Meyer maintains command headquarters primarily in the Lynn Building in the Rosslyn community of Arlington, Va. Some of the headquarters elements are located elsewhere in the Washington, D.C., area. The command controls and operates the Army's long-haul, or strategic, communications extending into more than 30 nations.

When STRATCOM was established in 1964 by the Army Chief of Staff, 5,000 technicians—military and civilian—comprised the new command. By September 1965, worldwide personnel strength was more than 12,250, rising to nearly 20,000 before the end of the second year. Of this number, approximately 3,500 were civilian technicians, a ratio which probably will be maintained, according to General Meyer.

During a recent briefing, General Meyer told newsmen that the Phu Lam station in Southeast Asia had processed more than 500,000 messages in the past year and 1.5 million communications data cards are being processed monthly. Worldwide, STRATCOM handled some 60-million messages during 1965. Communications traffic in Southeast Asia, he said, is increasing at a "fantastic rate."

KEY COMMUNICATIONS site in Viet Nam is STRATCOM's huge Phu Lam facility near Saigon. Providing voice, teletype and data communications for all Armed Forces in Viet Nam, the facility handles almost half a million messages monthly. It is surrounded by minefields, flare-firing mortars and fences. The Phu Lam team won the Army Meritorious Unit Commendation.

STRATCOM provides communications support to the Department of Defense in the Pentagon, Washington, D.C., the State Department and other key Federal agencies, including Civil Defense. It also provides essential communications support to the Army Air Defense Command (ARADCOM) and the Army-assigned portions of the Defense Communications System in Southeast Asia.

Management direction, technical operations and maintenance of the Civil Defense communications systems includes the National Warning System which is tested periodically throughout the U.S. STRATCOM also provides communications support to the Nike-X project.

STRATCOM's nerve center consists largely of wire and cable lines plus switching centers, many of which are leased from commercial communications companies. These include underseas cables to every continent.

STRATCOM operates a variety of strategic and special communications including high frequency radio, radio relay, cable terminals and special communications centers and facilities. Three fast-growing communications systems in which STRATCOM is involved are AUTOVON (automatic voice network), the new AUTODIN (automatic digital network) and satellite communications.

Predecessor communications organizations and STRATCOM have pioneered in satellite communications since 1958, installing and operating ground stations that relayed by Score in 1958-1959, by Courier in 1960 and subsequently by SYNCOM.

The Army's share of SYNCOM development is the ground environment which is supervised and technically directed by the Satellite Communications Agency (SATCOM) at Fort Monmouth, N.J. STRATCOM operates and maintains satellite ground terminals.

Strategic or long-distance military communications continue to flow at a tremendous rate. General Meyer said that much of this traffic is of course the result of advanced communications methods. Daily communications traffic is now at least double that of World War II days.

"In the modern era of cold war, military communications traffic has steadily increased along with all the exacting requirements of securing and safeguarding large amounts of classified information. In so-called peace," the General said, "STRATCOM is continually involved in an 'at-war' task."

14 Marines, Sailors Qualify As First Redeye Instructors

Fourteen Marine Corps and Navy personnel are the first to qualify as instructors in the Redeye weapon system after completing a course at Fort Bliss, Tex.

A total of approximately 80 gunner-instructors — Army, Navy, Marine Corps and some allied troops —will receive training in a series of classes. Gunner training includes familiarization in handling and operating the 30-pound antiaircraft guided missile, the world's smallest.

About 75 Redeye maintenance men will be trained simultaneously with the gunners. The Redeye, managed by the Army Missile Command at Redstone (Ala.) Arsenal, is funded by the Army and Marine Corps.

ASA (R&D) Heads Speakers at Aviation Plans Briefing

Assistant Secretary of the Army (R&D) Willis M. Hawkins will keynote a 2-day Army Aviation Advanced Planning Briefing for Industry in St. Louis, Mo., May 4–5, in which many top Army leaders will participate.

General Frank S. Besson, Jr., Army Materiel Command leader, is programed to discuss "AMC Organization for Aviation." Lt Gen Ben Harrell, commanding general of the Combat Developments Command, will speak on "Army Procedures for Establishing Aviation Requirements."

Maj Gen John J. Tolson, III, commanding general, U.S. Army Aviation Center and Commandant, Army Aviation School, will discuss "V/STOL Trainer." Maj Gen William B. Bunker, AMC deputy commander for Research and Acquisition, will talk on "Objectives of Configuration Management." Director of Army Aviation Brig Gen Robert B. Williams is programmed for "Concepts and Objectives of Army Aviation."

Cosponsored by the U.S. Army Aviation Materiel Command (AVCOM) in St. Louis and the Lindbergh-St. Louis Chapter of the Army Aviation Association, the conference is expected to draw about 400 high-level Federal representatives and industrialists.

Maj Gen William W. Lapsley, CG of the Army Mobility Command (MOCOM), Warren, Mich., will introduce Secretary Hawkins. Brig Gen Howard F. Schiltze, commanding general of AVCOM, is host.

High-ranking military and civilian personnel of the Department of Defense, Army Materiel Command (AMC) and Army Combat Developments Command will lead sessions.

Other speakers and their subjects will include: Harold S. Johnson, Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va., "Light Observation Aircraft"; Col L. L. Leech, STAAS project manager, "Surveillance Target Acquisition Aircraft System (STAAS)"; Louis Gerback, project coordinator of MOCOM, "Utility Tactical Transport Aircraft System";

George T. Singley, Jr., of AVLABS, "Light Tactical Transport"; Lt Col John F. Denhart, project manager, Flying Cranes, "CH–54 Flying Crane"; Col L. W. Leeney, AAFSS project manager, "Armed Aerial Fire Suport System (AAFSS)"; Col Luther G. Jones, Jr., AVCOM director of maintenance, "Maintainability Requirements"; Capt James P. Woolnough of AVLABS, "VTOL Artillery";

Larry M. Hewin, AVLABS' technical director, "Airframe—Propulsion"; Theodore Sueda, deputy director of avionics laboratories, Army Electronics Command (ECOM), "Avionics and Surveillance Gear";

Also, Col Nelson L. Lindstrand, Jr., project manager Aircraft Weaponization, "Aircraft Weaponization"; William H. Gillispie, deputy chief, LOH field office, "Design Control Requirements"; Col Charles Campbell, chief of the AMC Technical Data Office, "Data Relationship Requirements"; and Paul Hendrickson, chief of AVCOM's Management Science and Systems Office, "Product Support Relationships."

General chairman of the seminar is D. E. Loveland, St. Louis representative of AVCO Corp.

Chaparral, Vulcan to Arm AA Battalions

New Army air defense battalions, organized to provide field commanders with a low altitude air defense system, will be equipped with the Chaparral guided missile (mounted on a M548 self-propelled vehicle) and the M61A, 20mm automatic gun (Vulcan).

Each battalion will consist of 755 men organized with a headquarters, a headquarters battery and four firing batteries. Two Chaparral and two Vulcan firing batteries will operate in each battalion, with a total of 16 firing elements.

The Chaparral system uses the modified Navy-developed Sidewinder 1-C missile. The Vulcan is an Air Force gun adapted by the Army for ground vehicle mounting. These two weapons systems will complement each other by combining the quick reaction and extremely low-altitude capability of the Vulcan with the longer range capability of the Chaparral.

Field army air defense is now provided by the Hawk, an all-weather, low- and medium-altitude guided missile, and the Nike Hercules, an all-weather medium- and high-altitude guided missile. Both the Hawk and the Nike Hercules will continue to provide air defense in the field army area.

When organized, the new gun/Chaparral battalions will complement the air defense capabilities of the hand-held Redeye missile now entering the inventory. Additional air defense support for the field will be provided with the activation of 40mm gun (Dusters) battalions and quad 50 batteries.

VULCAN, 20mm, M61 automatic gun, mounted on M113A1 vehicle, fires an average of 3,202 rounds per minute from a linkless ammunition feed system that stores 1,200 rounds of ammunition in a ready-to-fire condition. The vehicle carries another 800 rounds in reserve. Vulcan and the Chaparral guided missile comprise a new system designed to provide a highly effective defense against low-altitude air attack.

Army to Move AVLABS To Texas Air Force Base

Army Aviation Materiel Laboratories (AVLABS) will be moved from Fort Eustis, Va., to Biggs Air Force Base adjoining Fort Bliss near El Paso, Tex., the Department of the Army has announced.

The transfer to facilities being vacated by the Air Force is designed to provide more adequate laboratory spaces and to allow for AVLABS expansion. It was reported that Biggs AFB will be merged with Fort Bliss.

AVLABS, which conducts the Army's program of research for aircraft and associated equipment, is an element of the Army Mobility Command (headquarters in Warren, Mich.), a major component of Army Materiel Command, Washington, D.C.

Completion of the laboratories' move is planned by December 1967. Approximately 120 military and 230 civilian personnel will be affected by the transfer. No reduction in personnel force is expected.

$5,437,843 Awarded to AVCO

Two contracts totaling $5,437,843 for improvement of the Army T–53 and T–55 aircraft engines were awarded recently to the Lycoming Division of the AVCO Corp., Stratford, Conn., by the U.S. Army Aviation Materiel Command, St. Louis, Mo., to improve capability of engines used in the UH–1 Iroquois and CH–47 Chinook helicopters.

Army Lets Contracts Totaling $172 Million

The $172 million in U.S. Army research, development, testing and production contracts awarded in recent weeks will pay Remington Arms Co. $20,885,735 for 5.56 and 7.62 ammunition.

Page Communications Engineers, Inc., was issued a $20 million modification to a contract for work on Phase II of an Integrated Wide Band Communications System. Radio Corp. of America received two contracts totaling $18,208,400 for lightweight portable radio sets and electronic equipment.

Philco Corp. gained a $10 million modification to an existing contract for work on Phase II of an Integrated Wide Band Communications System. A. O. Smith Corp. was issued an $8,415,119 modification for ordnance items. American Machine and Foundry will produce ordnance items and fin assemblies under two contracts totaling $7,511,280.

Olin Mathieson Chemical Corp. received a $7,316,900 modification for ordnance items and for operation and maintenance activities at the Badger Army Ammunition Plant, Baraboo, Wis. R. G. LeTourneau, Inc., won a $7,140,015 modification to a contract for 750-pound bomb parts, fin assemblies and packing crates.

Harvey Aluminum Sales, Inc., received a $6,533,279 modification for loading, asesmbling and packing of ordnance items and for operation and maintenance activities at the Army Ammunition Plant, Milan, Tenn.

Hughes Aircraft Co. will get $5,888,450 for four satellite communications terminals, AN/MSC-46 (MARK-1B).

Firestone Tire and Rubber Co. was awarded $4,869,341 as the first increment to a 3-year contract for rubber track shoe assemblies (T107) for the M88 vehicle series. General Electric Co. was issued a $4,258,000 contract for repair parts for M61A1 20 mm guns and XM12 armament pods.

Raytheon Co. gained a $3,950,005 modification to a contract for communications equipment. Collins Radio Co. signed a $3,800,000 agreement for radio sets. Sperry Rand Corp. was granted a pair of contracts totaling $3,519,069 for loading, assembling and packing ordnance items and for fuzes for the Pershing weapons system.

Ford Motor Co. received two agreements totaling $3,215,234 for tank trucks and cargo pickup trucks. ITT Corp. was issued a $3,170,125 modification for repair parts for the radio network system—Tropospheric Army Communication System.

Lesser contracts included: Chrysler Motors Corp., $2,732,813, cargo pickup trucks; Canadian Commercial Corp., $2,660,567, doppler navigation sets and radio sets; Grumman Aircraft Engineering Corp., $2,575,415, modernization of OV-1C aircraft; General Motors Corp., $2,355,005, diesel engines for the M548 vehicle;

Western Electric Co., $2,240,000 modification for improved modification kits for the Nike Hercules weapon system; Olin Mathieson Chemical Corp., $2,104,040 modification for ordnance items; Standard Container Inc., $1,988,985, for boxes for packaging ordnance items;

International Harvester Co., $1,862,030, various types of tank trucks; Dow Chemical Corp., $1,704,281, air field aluminum landing mats; Magnavox Co., $1,675,000 for maintenance items for radio sets; Drillmation, Inc., $1,657,113, bolts for M2 carbines; Fairchild Space and Defense Systems division of Fairchild Camera and Instrument Corp., $1,512,115, ordnance items; Altech Inc., $1,497,232, tank and pump units;

Cubic Corp., $1,442,582 for two Sequential Collation of Range (SECOR) ground stations; SCM Corp., $1,410,872, teletypewriter sets; Kaiser Jeep Corp., $1,287,889 modification for 5-ton trucks with Government-furnished engines; Cadillac Gage Co., $1,125,266 for bolts for the M2 carbine; Viz Manufacturing Co., $1,355,898, radiosonde sets.

Picatinny Mine System Attacks Tanks From Side

Standardization of the M-24 unmanned, antitank mine system, utilizing the M-28 "Bazooka" rocket to attack a target from the side rather than underneath, as in most mine systems, was recently announced by the Department of the Army.

Conceived at Picatinny Arsenal, Dover, N.J., the 18-pound M-24 fires the 3.5-inch rocket from a plastic tube 3 feet shorter and 12 pounds lighter than the bazooka rocket launcher that was used to stop Russian-made armor in the Korean War.

Designed to defend avenues of approach against tracked and major untracked vehicles, the new off-route system fires when the vehicle crosses a pressure-actuated detector cable.

The M-24 supplements standard vertical effects mines and off-route emplacement permits mining of locations not previously mineable. It results in a substantial reduction in required mine density per meter of front with an attendant easing of the logistic burden.

M-24 antitank system is set up off-route and fired automatically when actuator is tripped by oncoming tank or heavy vehicle. (artist concept)

Army Workshops Explain Rocket Motor Analysis

An improved stress analysis program developed for use in designing and evaluating solid propellant rocket motors was explained in two recent 3-day workshops held for employees of Government agencies, colleges and universities, and the aerospace industry.

Called the "Finite Element Method," the automated program provides engineers with a new capability to analyze more complex structures than was previously possible.

The analysis breaks the motor body down into small quadrilateral elements. "Stiffness" relations are solved by a computer program developed through the assistance of Bobby Todd of the U.S. Army Computation Center at Redstone Arsenal, Ala.

Program formulation and development was accomplished by the Rohm & Haas Co. Redstone Research Laboratories. Eric Beckner, John Brisbane, Tom Cost and Charles Parr, instructors from this firm taught the 3-day workshops on the University of Alabama Huntsville Campus.

Dissemination of the system principles to Government and industry is termed by William B. Thomas of the R&D Directorate's Propulsion Laboratory as a "significant enhancement of our ability to analyze and correct structural problems in solid-propellant rocket motors."

MICOM Plans 300 Space Project Manager Shift

Termed a "refinement" of the project manager concept, a 300-space manpower shift will take place this summer at Army Missile Command Headquarters, Redstone (Ala.) Arsenal, without any reduction in force.

Maj Gen John G. Zierdt, MICOM commanding general, announced that the spaces are being shifted over a period of months from originally established projects to newer activities.

Involved are the Directorates of Research and Development, Procurement and Production, and Supply and Maintenance. When completed, the moves are designed to:

- Provide additional capability for growing new missile projects,
- Give the functional directorates greater depth and flexibility to support all projects, and
- Refine all project management offices to a "hard core" of managerial personnel for direction, control and management of each project.

Missile Command management planners say the adjustment will move many functional personnel (such as those in procurement and production and system support activities) to the functional directorates.

The Pershing, Hercules and Sergeant missile system offices will yield most of the spaces to the directorates. Project offices which will be filled out by additional manpower authorizations include Shillelagh, Redeye, TOW, MAW, SAM-D and, to a lesser extent, Lance.

Almost two years have been spent in planning the realignment of manpower spaces. Since some positions are not presently filled, fewer individuals will be affected than the total number of shifts planned. A physical relocation from one office to another and in some cases from one building to another will be made.

Sixty employees were transferred recently from the Sergeant and Pershing project offices to the Supply and Maintenance Directorate and another 60 were moved from the Hercules Project Office. Among the directorates, Supply and Maintenance will receive the most spaces, followed by Procurement and Production, and Research and Development, in that order. Thirteen persons have already been transferred to R&D. Project offices will be subject to some readjustments, including field offices.

Management personnel at MICOM say the refinement is the first major adjustment since the project management concept was instituted by the Missile Command in 1962. A steering committee set up by General Zierdt more than a year ago analyzed the concept and made recommendations on how it could be more effective. Task groups studied functional areas such as systems engineering, procurement and production and supply and maintenance.

The result will be project offices made up of a small force of key personnel to perform managerial work. Functional directorates will provide in-depth support in their respective areas of responsibility. The studies emphasized that this arrangement promises to enhance the project office operation by concentrating on important managerial aspects.

In some cases a project manager may retain various functional directorate personnel under his own control for a special reason over a short period. For example, a 10-man unit from the Supply and Maintenance Directorate will remain located in the Pershing Office for the time being to carry out a system modification program.

Of the originally established missile projects, Hawk will be least affected because of its current logistics buildup. Lance, which lies somewhat between the management arrangement of the new and old project-managed systems, will be relatively untouched because its staffing buildup was originally confined to management-type personnel in line with the new organizational concepts.

Col Dooley Takes Over SAM-D Project

Project manager of the SAM-D air defense system now under development at the U.S. Army Missile Command, Redstone Arsenal, Ala., is Col Edward M. Dooley.

A veteran Army Ordnance Corps officer, he succeeds Col Bernard R. Luczak, nominated for brigadier general and transferred to the headquarters of the Army Ammunition Procurement and Supply Agency, Joliet, Ill.

SAM-D (Surface-to-Air Missile — Development) is a missile system concept to be fielded in the 1970s as a replacement for the Hawk and Hercules missiles.

Col Dooley served with the Nike-X Project in Washington, D.C., before his present assignment. He has been involved in management of the Nike Zeus/Nike-X program since its beginning in 1957. During a previous tour at Redstone, he organized the Anti-Missile Missile Office at the Army Ordnance Missile Command and was chief of that office until 1960.

He also served as deputy chief and later chief of the Pacific Field Office, predecessor of the Nike-X Kwajalein Test Site in the Marshall Islands, at Springfield (Mass.) Armory, in Austria and in the European theater during World War II.

A mechanical engineering graduate of the University of Cincinnati, he holds an MS degree from Massachusetts Institute of Technology and has completed the Army War College.

Col Edward M. Dooley

SCIENTIFIC CALENDAR

Meeting of the American Institute of Chemical Engineers, Columbus, Ohio, May 1-4.

Meeting of the American Society for Microbiology, Los Angeles, Calif., May 1-5.

Electrochemical Society Spring Meeting, Cleveland, Ohio, May 1-5.

Symposium on Electrode Processes, sponsored by AFOSR and the Electrochemical Society, Inc., Cleveland, Ohio, May 1-6.

Communications Satellite Systems Conference, sponsored by AIAA, Washington, D.C., May 2-4.

12th National Aerospace Instrumentation Symposium, sponsored by ISA, Philadelphia, Pa., May 2-4.

Electronic Components Conference, sponsored by IEEE, Washington, D.C., May 4-6.

Society for Experimental Stress Analysis Spring Meeting, Detroit, Mich., May 4-6.

Lightweight Armor Materials II—Protection Against Latest Threat, sponsored by AMRA (AMC), Pittsburgh, Pa., May 5-6.

7th Symposium on Human Factors in Electronics, sponsored by IEEE, Minneapolis, Minn., May 5-7.

National Aerospace Electronics Conference, Dayton, Ohio, May 9-11.

15th National Telemetering Conference and Exhibition, sponsored by ISA, AIAA and IEEE, Boston, Mass., May 10-12.

9th Symposium on Hydrogen Thyratrons and Modulators, sponsored by ECOM and the Advisory Group on Electron Devices, Fort Monmouth, N.J., May 10-12.

3rd National Colloquium on Information Retrieval, sponsored by MUCOM (AMC), Moore School of Electronics Engineers, IEEE, Special Interest Group on Information Retrieval, American Documentation Institute, and the Association for Computing Machinery, Philadelphia, Pa., May 11-13.

National Aerospace Electronics Conference, sponsored by IEEE and AIAA, Dayton, Ohio, May 16-18.

9th National Power Instrumentation Symposium, sponsored by ISA, Detroit, Mich., May 16-18.

Meeting of American Society of Civil Engineers, Denver, Colo., May 16-20.

Meeting of the Operations Research Society of America, Santa Monica, Calif., May 17-20.

7th National Chemical and Petroleum Instrumentation Symposium, sponsored by ISA, San Francisco Calif., May 23-25.

20th Annual Power Sources Conference, sponsored by ECOM, Atlantic City, N.J., May 24-26.

Dr. Kenneth E. Clark

Prof. L. H. O'Neill

Dr. Andrew Longacre

Donald G. Fink

Resor Appoints 8 Scientists to ASAP for 2 Years

Secretary of the Army Stanley R. Resor has announced 2-year-appointments of eight distinguished scientists to the Army Scientific Advisory Panel (ASAP), increasing the membership to 22, with 25 authorized. In addition, there are 41 consultants.

Dr. Andrew Longacre, professor of engineering sciences at Syracuse (N.Y.) University, accepted reappointment to serve on the Panel an additional two years. Two former ASAP consultants and five others who accepted appointments are:

Prof. Lawrence H. O'Neill, associate dean of the School of Engineering and Applied Science at Columbia University. He is a former ASAP consultant and currently active on two of the Panel's ad hoc groups.

Donald G. Fink, general manager of the Institute of Electrical and Electronics Engineers, New York, N.Y. He is also a former consultant and an ASAP member from 1957-63.

Dr. Kenneth E. Clark, dean of the College of Arts and Science, University of Rochester, N.Y., is author of *America's Psychologists* and other vocational books, and editor of the *Journal of Applied Psychology*.

Martin Goland, president of Southwest Research Institute, San Antonio, Tex., also serves as chairman of the Weapons Advisory Group, U.S. Army Materiel Command.

Dr. Jack W. Rosengren, associate director of nuclear design at Lawrence Radiation Laboratory, Livermore, Calif.

Herbert K. Weiss, manager of mission analysis, Data Systems Division, Litton Systems, Inc., Van Nuys, Calif. He is former manager of military systems planning, Aeronautics Division, Ford Motor Co.

Rene H. Miller, Slater professor of flight transportation, Massachusetts Institute of Technology's School of Engineering. Prof. Miller serves as a member of the U.S. Air Scientific Advisory Board.

Dr. Kumar, Ballard Represent OCRD at AIAA Science Meet

Some 250 scientists from universities, industry and Government attended the recent Third Aerospace Sciences Meeting of the American Institute of Aeronautics and Astronautics (AIAA) in New York City.

Representing OCRD were Dr. Sudhir Kumar, assistant director of the Engineering-Science Division of the Army Research Office, Durham, N.C., and Richard L. Ballard of the Physics and Engineering Branch, Army Research Office, Arlington, Va.

CSC Offers Management Institute

The U.S. Civil Service Commission is sponsoring a Management Institute for Supervisory Scientist and Engineers, May 9-13. The program is intended for individuals at GS 11-14 who are filling, or being trained to assume, supervisory and managerial positions in research and development activities in the Federal Government.

Further information may be obtained from the Director, Management and Intern Programs, U.S. Civil Service Commission, Washington, D.C. 20415.

Meteorologist Cuts Research Parachute Costs

Simplicity in design of material may have reached the ultimate in a sheet of plastic that opens into high-altitude meteorological research parachutes bearing radiosonde instrumentation—with potential estimated annual savings of $400,000 as compared to procurement cost of displaced parachutes.

Credited with the novel idea, and recognized by the Department of Defense in a letter of appreciation, is Arthur V. Carlson, a meteorologist with the Atmospheric Research Division, U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz.

Opportunity leading to his practical solution of a cost-cutting problem came as a member of a special radiosondes value engineering team representing the Army, Navy, Air Force and the U.S. Weather Bureau.

Balloon-borne radiosonde equipment measures temperature, pressure and humidity of the atmosphere and transmits data to ground receiving stations.

Currently receiving further evaluation tests by the Army, the new parachute is a sheet of plastic with sealed seams. Air trapped in the seams expands as the atmosphere thins, forcing rigid tubes to open the parachute before the balloon vehicle bursts. The instrument package is lowered to earth with little or no danger of injuring the instruments, property or persons.

Arthur V. Carlson

The new device costs about one dollar less in mass procurement than that now in use, a paper parachute with a rigid circular opener. Some 200,000 radiosonde equipment packages annually are used currently by Federal agencies. The first-year estimate of $200,000 savings to the Government is expected to increase.

Deputy Assistant Secretary of Defense (Equipment Maintenance and Readiness) George E. Fouch signed the letter of appreciation to Carlson for his value engineering idea. Carlson has been employed at Fort Huachuca since 1945 and is a 24-year Civil Service career veteran.

GETA Tests New Kit to Ease Chaplains' Mission

These days, even Army chaplains have a requirement for research, development and evaluation.

Fast-paced modern warfare places heavy demands on the "Sky Pilots" and "Padres" — as soldiers affectionately call their spiritual leaders—who must pack their church or synagogue with them.

The present 25-pound ecclesiastical kit is bulky to carry over rough terrain, in confining aircraft, or for "parachuting in." A lightweight modernized "package" is being developed at the Army General Equipment Test Activity (GETA), Fort Lee, Va. The compact carrying case of mildew-resistant, waterproof fabric are being tested for use by Protestant, Catholic and Jewish chaplains.

Eccliastical items carried in a case will vary for each denomination, but some essential equipment for all faiths will be available to chaplains who "double in brass" when religious need arises.

When conducting the engineering portion of an integrated engineering service test at Fort Lee, GETA engineers will subject the test kit and its contents to a series of subtests to include environmental, rough handling, safety- maintenance, human, factors, value analysis and performance acceptability.

FORT LEE CHAPLAINS, Maj Cyprian M. Lauletta (Catholic) at right, and Lt John T. Shaddix (Protestant), left, examine contents of experimental combat chaplains' kits as Sp/4 Manassieth Meyer (Jewish chaplain's assistant) looks on. The kits, equipped with ecclestiastical items used by both Catholic and Protestant chaplains were developed for use in combat areas. A third kit currently is being developed for use by chaplains of the Jewish faith.

During field testing, the kit will be made available to several chaplains who are to accompany troop units (Airborne, air assault and special forces) engaging in simulated combat operations. After each service, chaplains will be interviewed by GETA observer-recorders monitoring each field operation and asked to comment on the use of the experimental kit under field conditions.

Information received from these interviews, coupled with other pertinent data gathered throughout the evaluation, will be analyzed. Results, conclusions and recommendations formulated by the General Equipment Test Activity will be compiled and reported to GETA's parent organization, the U.S. Army Test and Evaluation Command, Aberdeen (Md.) Proving Ground.

The experimental combat chaplain's kit will be evaluated under GETA's supervision in hot-wet and cold-dry environments at the U.S. Army's Tropic and Arctic Test Centers.

AFIP Drug Register Lists 202 Cases in 7 Months

Since the Registry of Tissue Reactions to Drugs was founded Sept. 1, 1965, at the Armed Forces Institute of Pathology (AFIP), the Registry has accumulated 202 cases involving 92 drugs and 18 organs, systems or tissues.

Some of the cases have been contributed by practicing pathologists and from AFIP files. Others have been referred through the reporting systems of the American Medical Association (AMA) and the Food and Drug Administration (FDA). Consultation with other AFIP branches and registries has furnished the remainder.

Sponsored jointly by the AMA, FDA and the Pharmaceutical Manufacturers Association Foundation (PMAF), the Registry was established to obtain autopsy and biopsy specimens from suspected adverse drug reaction cases. It is located in the AFIP Annex in Washington, D.C.

Submission of cases having biopsy or autopsy material available is solicited by the Registry. Success of its operations hinges on the collection of statistically significant numbers of cases so that reaction patterns and their variations can be derived and casual relationships can be strengthened.

The Registry's interest as to the alleged drug includes not only the new and recent ones, but also the older and established medications.

The Registry will accept material directly from pathologists, and individual physicians may submit material through their pathologists. All case material should be packed in the same manner as other shipments to the AFIP and should include slides, blocks, biopsy and autopsy reports, clinical history, photographs, X rays and other pertinent material and information.

All material submitted to the Registry must be as complete and as detailed as possible, since it will be reviewed by the Registry in consultation with other appropriate AFIP pathologists.

Case material should be addressed to The Director, ATTN: Registry of Tissue Reactions to Drugs, Armed Forces Institute of Pathology, Washington, D.C. 20305. Detailed information for submitting material may be obtained by writing the AFIP.

BRL Computer Chief Wins Col Zoring Award for 1965

Winner of the 1965 Zornig award at the U.S. Army Ballistic Research Laboratories (USABRL), Aberdeen Proving Ground, Md., is Chester H. Wallin, chief of the USABRL Electronic Scientific Computer Section for the past four years.

Named for a pioneer in ballistic research at Aberdeen, Col H. H. Zornig, the award is presented for accomplishments of USABRL personnel in technical, administrative, mechanical and other fields. Col Zornig was recognized for being largely responsible for the present laboratory organization and was director until 1941.

Col Charles D. L. Ostrom, Jr., commanding officer of USABRL, presented the award to Wallin, who previously served as EDVAC system chief in the computer research branch and as a project engineer.

A graduate of Purdue University, Wallin spent two years with the Scientific and Professional Enlisted Personnel Program, U. S. Army Ordnance Corps, before joining the laboratories staff.

CE Creates New Nuclear Department

Realignment of functions within the Nuclear Power Field Office operated by the Army Corps of Engineers at Fort Belvoir, Va., has created a Research and Technology Department.

Winfred M. Crim Jr., who was chief of the Advanced Power Conversion Development Branch, has been named to head the department. Branch chiefs are: John R. Hoffman, Advanced Power Conversion; George B. Manning, Applied Research; Edward D. Collins, Jr., Exlporatory Research; Capt. Donald J. Fitchett, Nuclear Investigation and Analysis.

Efforts will be directed toward advanced nuclear power systems employing both dynamic and static energy conversion systems, using either a nuclear reactor or an isotopic heat source. Work will be coordinated with the Atomic Energy Commission (AEC) in the development of compact nuclear power technologies for the Engineer Reactors Group of the Corps of Engineers.

WINFRED CRIM entered Civil Service in 1941 and has been associated with the NPFO since 1955. A veteran of World War II, and the Korean War, he received a BS degree in industrial engineering in 1950 from Virginia Polytechnic Institute. Since then, he has attended the Oak Ridge (Tenn.) School of Reactor Technology, received BS, MS and PhD degrees in mechanical engineering at Catholic University, and earned the equivalent of a master of nuclear science degree from the University of Florida.

Winfred M. Crim, Jr.

JOHN HOFFMAN graduated from Virginia Polytechnic Institute in 1950 with a BS degree in mechanical engineering. He entered Civil Service in 1952 and was employed at the Army Engineer Research and Development Laboratories prior to transferring to the NPFO several years ago.

GEORGE MANNING received a BS degree in mechanical engineering from the University of Arizona in 1947. He entered Civil Service in 1963 and was employed at the NASA Lewis Research Center, Cleveland, Ohio, prior to transferring to Fort Belvoir in 1964.

EDWARD COLLINS is a 1956 graduate of Virginia Polytechnic Institute with a BS degree in mechanical engineering, and has been employed at Fort Belvoir since 1961.

CAPT FITCHETT is a 1959 graduate of the U. S. Military Academy. He attended the Air Force Institute of Technology and received his master's degree in nuclear engineering in 1965.

8 New Members Join DoD Science Board

Appointment of eight new members to the 28-man Defense Science Board, the senior technical advisory body in the Department of Defense, was announced recently by the Office of the Secretary of Defense.

Composed of academic and industrial leaders and representatives of major Federal agencies, the Board advises the Secretary of Defense, through the Director of Defense Research and Engineering, on scientific and technical matters.

New members are: Dr. Daniel Alpert, dean of the Graduate College, University of Illinois and a former member of the Board; Dr. Alexander Bravelas, Department of Psychology, Stanford University; Dr. Eugene G. Fubini, vice-president of International Business Machines and former Assistant Secretary of Defense;

Dr. Richard L. Garwin, director of Applied Research for the T. J. Watson Research Center; Dr. Richard Latter, RAND Corp.; Dr. Thomas C. Schelling, Center for International Affairs, Harvard University;

Dr .Leonard S. Sheingold, vice president for Advanced Technology, Sylvania Electronic Systems, and a former chief scientist for the Air Force; Dr. Robert L. Sproull, vice president for Academic Affairs, Cornell University, and former director of the Advanced Research Projects Agency.

In addition, the following have become members ex-officio of the Board: Dr. Harold M. Agnew, chairman of the Army Scientific Advisory Panel; Dr. Robert C. Seamans, Jr., deputy administrator of the National Aeronautics and Space Administration; and Mr. Garrison Norton, chairman of the Naval Research Advisory Committee.

USCS Offers 2 Management Seminars to Careerists

In the Management Information Series, two seminars are offered by the U.S. Civil Service Commission for career Federal executives GS-15 and above.

An Executive Seminar in Management Reporting Systems will be held May 12-13 in Room 4H15, U. S. Civil Service Commission, 1900 E Street, N.W., Washington, D.C. The nomination deadline is Apr. 18.

Purpose of the seminar is to bring to the attention of Federal executives examples of operational information reporting systems, both manual and automated, which are designed to assist management in the exercise of its control and planning responsibilities.

Case studies from Government and industry will be presented by persons directly concerned with the development of information systems in their organizations.

An Executive Seminar in Interagency Management Information Systems will be presented June 13-14 in Room 1340B at the Civil Service Commission. Nominations must be received by May 20.

This seminar is designed to examine some of the major problems inherent in the coordination of information-handling practices and the development of information systems for communities of agencies such as the research and development community. Discussion will focus on positive steps already taken or recommended to speed development of compatible systems for effective information flow and exchange among agencies.

The initial seminar in the series, Executive Seminar in Management Information Theory, presented Mar. 31 to Apr. 1, was designed to explore the concept of information management in the context of organizational structure.

The Civil Service Commission also has announced an advanced course in Employee Development, scheduled May 23-27 in Room 1347 A&B, 1900 E Street, N.W., in Washington. The nomination deadline is May 9. Participants must be career employees at grade GS-9 and above with significant responsibilities in the employee development function of the personnel management field.

Cagwin Takes Over TECOM May 15

Brig Gen Leland G. Cagwin has been nominated for promotion to major general and selected to take over about May 15 as commander of the U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

As leader of the Army's principal testing agency, General Cagwin will direct a network of 16 proving grounds, service test boards, environmental centers and special test activities in the continental United States, Panama and Alaska.

Since July 1, 1965, he has headed the Experimentation Command, Fort Ord, Calif., an element of the U.S. Army Combat Developments Command. In his new duties, he will relieve Maj Gen Benjamin H. Pochyla, CG of the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz., who has doubled in brass since December 1965.

Recent assignments which have helped to prepare General Cagwin for the TECOM mission include: chief, Military Assistance Advisory Group, Addis Ababa, May 1963 to May 1965; chief, STRICOM Operations Support Division, J–3, October 1961 to March 1963; special assistant to the chief of staff, Supreme Headquarters Allied Powers Europe, 1957-60.

Graduated from the United States Military Academy in 1940 and commissioned in the Infantry, he served with the 25th Infantry Division during World War II and again during the Korean War. Prior to attending the USMA, he attended the Massachusetts Institute of Technology.

When Pearl Harbor was attacked he was a member of the division's 35th Infantry Regiment at Schoffield Barracks, Hawaii. He remained with the regiment until 1945, participating in the South and Southwest Pacific campaigns, and was awarded the Distinguished Service Cross for extraordinary heroism on Guadalcanal.

After the war he taught tactics at the Infantry School, completed a 3-year tour with the Plans and Operations Division, Department of the Army, and graduated from both the Command and General Staff College and the Armed Forces Staff College.

Brig Gen Leland G. Cagwin

Assigned to the Far East Command in 1952, he rejoined the 25th Infantry Division in Korea. He served as executive officer and regimental commander of the 27th Infantry Regiment on Heartbreak Ridge, at Sandbag Castle and in the Iron Triangle.

Leaving the 27th Infantry in January 1953, he became the senior adviser to the Third Turkish Brigade in Korea and served during the heroic defense of the Imjin River crossings. The brigade won the U.S. Distinguished Unit Citation during this action.

General Cagwin was named director of the Infantry School's Airborne Department in September 1953 and then director of its Airborne-Army Aviation Department. He was graduated from the National War College in 1957.

In addition to the DSC, General Cagwin has been awarded the Silver Star, Legion of Merit with two Oak Leaf Clusters, Bronze Star Medal, Army Commendation Medal, and the Distinguished Unit Citation with Oak Leaf Cluster.

ERDL Adapts Construction Equipment for Airlift

Techniques of sectionalizing heavy construction equipment to permit airlift delivery to remote areas by the Chinook helicopter and the Caribou fixed-wing aircraft are being developed by the Army Engineer R&D Laboratories, Fort Belvoir, Va.

In a speech titled "Combat Construction Equipment for Viet Nam," ERDL Commander Col Frank Milner described the new methods to the recent annual Earthmoving Industry Conference of the Society of Automotive Engineers in Peoria, Ill.

Shown below are some of the construction vehicles that have been adapted by USAERDL for airlift to remote areas. In the center is an Austin-Western 6-ton crane. The crane is holding a 4½-cubic-yard Martin scraper that can be used in place of the grader assembly of the machine in the right background.

In the foreground is a 9-wheel compactor manufactured by BROS Co. Others are, left to right, a Clark 4,000-pound capacity rough terrain fork lift, an Allis-Chalmers 4 x 4 tractor with a Murray 10-cubic-yard scraper, an Austin-Western Super 100 grader, and a Euclid 1¾-cubic-yard bucket loader.

The tractor, grader and bucket loader have all been cut in half for airlift by the Chinook. Following delivery, the equipment can be joined in 15 minutes by men using hand tools.

Optometrists Face Army Draft

If volunteers are insufficient to meet the Army's need for 100 optometrists in uniform by July 1966, Selective Service will eye these professionals for the first time as "special draft" material.

The Department of Defense has requested that qualified specialists who examine eyes and measure vision be called under the authority of Executive Order 11266 signed by the President Jan. 18, 1966.

Prior to the Executive Order, only physicians, dentists and veterinarians were subject to the so-called "doctor draft." All such professionals serve in commissioned grades whether they volunteer or are drafted.

TECOM Requires Broad Range of Specialized Personnel

Scrutiny of U.S. Army Test and Evaluation Command personnel records at TECOM Headquarters, Aberdeen (Md.) Proving Ground, supports the claim that few R&D commands require a broader blend of scientific skills.

The TECOM complex of 17 proving grounds, service test boards, environmental centers and special test activities requires qualified personnel in half of the U.S. Civil Service Commission's 975 occupational codes.

Further, 55 percent of the Army's 825 military occupational specialties are required to round out the TECOM team of approximately 23,000 soldiers, civilian and contract employees. Some are representative of rare, almost one-of-a-kind specialists.

Nearly every piece of military hardware that finds its way into the Army inventory comes first under extremely critical consideration by TECOM personnel. Thoroughness of test and evaluation methodology leaves nothing to chance. No effort is spared to assure conformance to acceptable standards.

The command provides the Army with an independent, unbiased appraisal of combat materiel. From test reports, TECOM's only product, the Army can determine if an item conforms to specifications, is capable of doing what it was built to do, and will serve the needs of the American soldier on some future, undefined battlefield.

TEST DETACHMENT erects hand grenade targets at Camp Pickett, Va., for use in combat effectiveness studies of Infantry clothing and equipment conducted by the General Equipment Test Activity, Fort Lee, Va. Consisting of a window and surrounding target rings, the electronic scoring devices automatically measure the throwing accuracy of soldiers engaged in simulated street fighting while wearing test clothing and protective gear.

TECOM is one of the seven major components of the Army Materiel Command (AMC) which is responsible for providing the military materiel needed by the Army and for regulating the flow from producer to user.

The Army Materiel Command functions through five commodity commands directly concerned with mobility, missiles, weapons, munitions and electronics. As a separate agency, TECOM evaluates the products and executes related test missions. The Supply and Maintenance Command is also a distinct functional-type command.

While TECOM's interest in Army materiel is most actively engaged with a specific item during the research, development, test and evaluation (RDTE) phases of its life cycle, concern does not end there.

Production models, for instance, must match the bench-made prototype in quality, performance and other established standards. Ammunition must be proofed constantly to insure that one lot does not differ materially from another or does not deteriorate significantly in storage. Modifications must check out with the same precision as the original test models. Frequently they must be sent through the same laboratory and field trials.

Directly or indirectly, TECOM is concerned with the entire range of tests associated with the life cycle of materiel, from conception to ultimate disposition — from the RDTE phase through production, procurement, distribution and phase-out.

Tests fall into two broad categories:

- In Category I are the engineering and service tests performed for AMC as part of the RDTE process. In these instances, test plans, objectives, funding and other details are established by TECOM. Handled in the same way are the environmental, confirmatory and check tests that supplement the engineering and service tests.
- Category II tests, the major area of TECOM effort, are conducted as a service for the commodity commands and other agencies in accordance with their requirements. Examples are engineer design tests, acceptance and comparison tests, surveillance tests, initial production tests, feasibility and military potential tests.

A formal coordinated test program is initiated in each instance with the assistance of the sponsoring agency. This is done for new items as early in the R&D stage as practicable to fix the basic blueprint for the entire project.

Maj Gen J. W. Sutherland, Jr.
Commanding General, TECOM

Provided with this document, the cognizant TECOM testing directorate is ready to send a test project into the field. In some instances, the engineering, service and necessary environmental tests can be accomplished simultaneously. In others, prototypes may move to a succession of test sites, depending on the facilities that must be brought into play and the number of models available for the trials.

Eight engineering test activities, six service test boards and three environmental test centers make up the TECOM "workshop." The huge proving ground extends from the frigid tundra of the Arctic to the humid jungles of the tropics.

The Army Arctic Test Center is at Fort Greely, Alaska, and the Army Tropic Test Center is at Fort Clayton, the Canal Zone, Panama. Available at these locations are facilities and staffs for checking out weapons and equipment under the most rigidly controlled laboratory conditions with troops in the field and under all extremes of climate.

Engineering tests are conducted at five proving grounds, at the national missile range operated by TECOM at White Sands, N. Mex., by the General Equipment Test Activity, Fort Lee, Va., and by the Aviation Test Activity, Edwards Air Force Base, Calif.

The purpose of engineering tests is to determine to what degree the test items involved meet the performance characteristics desired by the Army, and whether they are safe for service testing by troops.

Tests characterized by investigations under controlled conditions are intended to eliminate as many human errors of judgment as possible. To ac-

complish this, extensive use is made of environmental chambers, physical measurement techniques, controlled lab, shop and field trials, statistical methodology and personnel skilled in engineering and scientific fields.

Items scheduled for engineering tests are usually routed to test activities as follows:

Aberdeen Proving Ground: Artillery, infantry and aircraft weapons, weapons systems (excluding rockets and guided missiles systems), ammunition, wheeled and tracked vehicles, armor, control and guidance equipment.

White Sands Missile Range: Missiles, rockets, space vehicles and other devices.

Electronic Proving Ground, Fort Huachuca, Ariz.: Electronic equipment and systems, communications items, surveillance instruments, devices for disrupting communications. (Also operates an electromagnetic environmental test facility.)

Dugway (Utah) Proving Ground: CBR munitions, agents, defense systems.

Jefferson Proving Ground, Madison, Ind.: Ammunition, mines, fuses.

Erie Proving Ground, Port Clinton, Ohio: Conventional weapons, armor plate, castings, forgings, weapons mounts.

Aviation Test Activity: Aircraft, ground measurements, flying performance, aerial gunnery.

General Equipment Test Activity: Quartermaster-type materiel, Logistics-over-the-Shore (LOTS) materiel, non-combat and commercial vehicles and accessories, rail and marine equipment, and other materiel.

TECOM's six service test boards prepare user reports. The service test is conducted under simulated or actual field conditions using soldiers representative of those expected to operate and maintain the equipment in the field. It is characterized by qualitative observations and the judgment of selected military personnel who have a background of field experience with the type of materiel under test. Instrumentation is kept to a minimum.

Specific service test missions of the various boards cover materiel as follows:

Airborne, Electronics and Special Warfare Board, Fort Bragg, N.C.: Airborne equipment, including aircraft, designed to facilitate air drop or air transport of troops, supplies and equipment; communications equipment normally used at division level and below; combat surveillance and special warfare items.

Air Defense Board, Fort Bliss, Tex.: Air defense weapons systems, fire distribution systems, air defense electronic countermeasures and counter-countermeasures, equipment and devices, target devices, atomic demolition munitions.

Armor-Engineer Board, Fort Knox, Ky.: Armor and engineer items, automotive systems and materiel.

Aviation Board, Fort Rucker, Ala.: Aircraft items, systems and related equipment.

Infantry Board, Fort Benning, Ga.: Equipment and other items used by infantry units for target acquisition, fire power, ground surveillance, fire control and ground mobility; field-type clothing, equipment and rations for individuals and small units; antipersonnel mines, CW and BW equipment for individuals and small units; clothing and equipment for parachutists.

Artillery Board, Fort Sill, Okla.: Field Artillery materiel and related equipment.

Studies of the effectiveness of materiel and equipment to be operated under climatic extremes are an integral part of the test package.

In addition to the environmental test centers operated in central Alaska and Panama, desert test facilities are maintained at Yuma (Ariz.) Proving Ground where trials can be run under extreme arid conditions. All three stations perform the environmental phases of engineering and service tests as well as other investigations assigned by TECOM test directorates.

New equipment training is a requirement for all personnel concerned with test and evaluation work, regardless of their highly specialized skills and long years of testing experience. Of necessity, personnel selected for a test project must be given the specific knowledge, skills and proficiency associated with the test item. The Fiscal Year 1965 training program involved 586 individuals and 71 separate items.

New equipment training for TECOM personnel is usually confined to R&D prototypes and limited production models. In most cases, it is undertaken before similar training can be offered at Army service schools and training centers.

Instruction ranges from comprehensive courses at military and contractor facilities to on-site on-the-job training by contractor technical representatives or previously schooled members of the command.

Approximately 40 percent of the total TECOM workforce is military. Always in demand are officers and men with combat experience, logistic know-how or a grasp of industrial techniques. Aviators and electronics specialists are among those always in short supply.

Despite the relatively high Regular Army reenlistment rate, the usual vacancies in a wide range of grades and skills in TECOM are continuing evidence of the diversified scientific requirements in this vital chain of test and evaluation activities.

Army Contracts for Further Development of MAW System

Further development of the shoulder-fired, medium antitank assault weapon system (MAW) has been ordered by the U.S. Army Missile Command (MICOM), Redstone Arsenal, Ala.

MAW (artist's concept)

A $485,000 development contract has been awarded to the McDonnell Aircraft Corp., St. Louis, Mo. Successful exploratory development firings have been made at Redstone Arsenal, Ala.

Being developed to fill the Army's need for a man-carried system big enough to knock out most armor and other hard targets on the battlefield, MAW will be superior in range and accuracy to existing weapons used in the same role. It will be used as a defensive weapon against tanks and armored vehicles and as an assault weapon against infantry combat targets.

In operation, the gunner sights a target through a telescopic sight and then launches the missile which follows the line of sight. The gunner has only to keep the crosshairs of the sight on the target and the missile is automatically guided throughout flight.

The system can be set up and fired by one man on any terrain.

Engineers Expanding R&D Work on U.S. Water Resources

Nationwide responsibilities assigned to the Army Corps of Engineers in the Federal program of water resources development and conservation, on which Government expenditures currently exceed $1 billion annually, are broadening research and development emphasis.

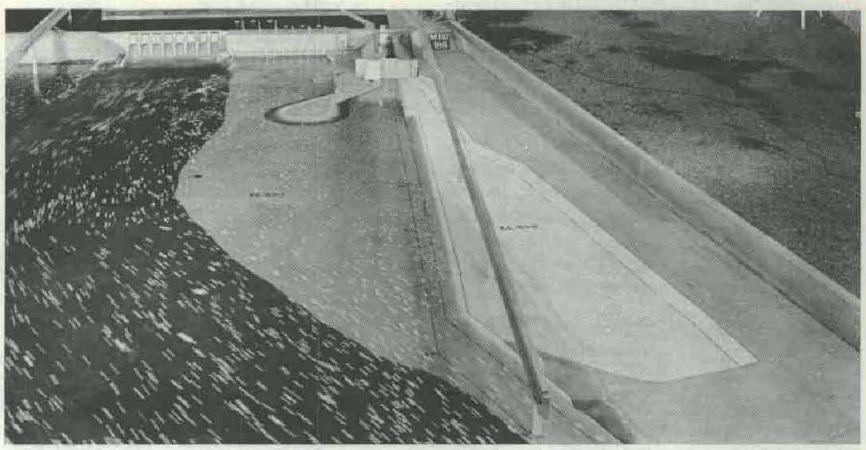
Army Engineers carry out a nationwide program of water resource activities for the benefit of navigation, flood control, hydroelectric power development, municipal and industrial water supply, pollution abatement, recreation, shore erosion control, and for related other improvements.

Research and development facilities are maintained at strategic locations across the Nation to help find the answers to problems arising from the program's many complex phases. The principal research and testing facility in the Corps of Engineers water resource operations is the internationally known U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss. WES has facilities also at Jackson, Miss.

Waterways Experiment Station is a name that does not properly describe the size and scope of its current missions and operations. Since it was established following one of the Nation's great flood disasters in 1927, WES has grown from the original small hydraulics laboratory into a large and varied organization.

WES now engages in basic and applied research in the additional technical fields of soil mechanics and geology; concrete technology; flexible (asphalt) and prefabricated pavements; ground mobility; area environmental effects on military operations; and the blast effects of nuclear weapons on structures, waterways and terrain.

The Hydraulics Division is engaged primarily in work supporting the water resource program—in particular, the development of hydraulic design criteria, and the construction and operation of hydraulic models for project design.



SURFACE FLOW PATTERNS, in tailrace of Little Goose project, are shown for a simulated river discharge of 225,000 cfs. The eight spillway bays and three powerhouse units installed initially are in operation. Little Goose Dam is one of four multiple-purpose projects on the lower Snake River in southeastern Washington that will extend navigation 140 miles up the Snake from its confluence with the Columbia River to Lewiston, Idaho. The four dams are Ice Harbor, which is completed and in operation, Lower Monumental, Little Goose and Lower Granite. In addition to navigation, the projects will provide power, irrigation, and recreation benefits. Little Goose Dam is scheduled for completion in June 1971. The Little Goose model displayed here is scaled 1:100.

Currently in operation are about 60 scaled-down versions of proposed hydraulic structures, harbors and waterways. The models are engineering tools, used to predict future behavior and to work out the most efficient or economical design. In many major water resource construction projects, the advance knowledge provided by a hydraulic model study is regarded as of the greatest value.

The Corps of Engineers Coastal Engineering Research Center, located in Washington, D.C., was established by Congress in November 1963. The Center superseded the Beach Erosion Board, with a mission to undertake a broadened and intensified program of research, development and design in beach and coastal preservation and control.

Research and development conducted by the Center in the field of coastal engineering seek to provide better understanding of shore processes, winds, waves, tides and currents as they apply to navigation, flood and storm protection, beach erosion, and shore structures.

ARMY ENGINEER prepares to lower miniature current meter into a model of waters immediately in front of miniature San Francisco-Oakland Bay Bridge. The tiny meter is at one of 11 stations where current velocity, salinity and sediment were measured in the bay by Army engineers. When conditions of the bay are duplicated in the model, experiments have the same results as they would when conducted in the bay itself. The engineer is standing on a scale model replica of Yerba Buena Island, located in San Francisco Bay.

Assistance of the Center in the planning and design of coastal works includes determination of probable effects of such works on adjacent shorelines, establishment of hurricane protection criteria, and evaluation of the effectiveness of proposed coastal navigation improvements.

The Center received an appropriation of $1.1 million for coastal research investigations in Fiscal Year 1966. One of its key facilities is a wave tank 635 feet long, used in determining action of ocean waves on beaches, breakwaters and other shoreline structures.

New methods of wave recording and analysis are being studied at the Center through a telephone line hookup of recording equipment at the Center and a wave gauge at Atlantic City, N.J. This is part of the program for improving the Center's program of ocean wave measurements around the shorelines of the United States.

Corps of Engineers Division Laboratories for the basic mission of performing tests and evaluations are located in the North Pacific, South Pacific, Missouri River, North Central, Southwestern, Ohio River, South Atlantic and New England Divisions. Staffs of the major laboratories range in size from 20 to 70.

The North Pacific Division Hydraulic Laboratory is located near Bonneville Dam, about 40 miles east of Portland, Ore. Since its establishment in 1938, studies have been made on approximately 100 models of Corps of Engineers water resource projects.

Among these major dam construction projects are Bonneville, Mud Mountain, Lookout Point, Chief Joseph, The Dalles, John Day and Ice Harbor. Studies of fish-passing facilities are prominent in the model testing program. Such facilities enable the fish to pass upstream into the reservoir.

In the South Pacific Division, at Sausalito, Calif., the Corps of Engineers has constructed a hydraulic model of San Francisco Bay. It is the largest estuarine hydraulic model constructed and operated by the Corps outside the Waterways Experiment Station.

The purpose of the San Francisco Bay Model is: (a) to study how best to prevent the encroachment of salt water into the fresh water Sacramento delta area; and (b) to find means of reducing silting in navigation channels and maintenance dredging costs. More than 200,000 persons have visited the model since it was placed in operation in 1957.

About a year ago, the Chief of Engineers established a Hydrologic Engineering Center at Sacramento, Calif. The mission of the Center is to provide services to all divisions and districts of the Corps.

Included in this mission is the conducting of selected hydrologic research; the training of engineers in hydrology engineering; the systemization of methods in hydrology engineering; and the providing of expert assistance to Corps of Engineers divisions and districts on specialized phases of hydrologic engineering.

The Lake Survey District of the Corps of Engineers, located at Detroit, Mich., has important hydrographic functions. In addition, it has been expanding its research studies on the Great Lakes in the field of water motion, water characteristics, water quantity, shore processes, and ice and snow effects. These studies encompass lake and harbor currents, lake waves, water-level disturbances, coastal-area sedimentation, sediment-barrier effects, precipitation and evaporation.

Because the required research has expanded so greatly, the Corps is establishing a Great Lakes Research Center, within the Lake Survey District at Detroit. The program is aimed at a better understanding of the natural conditions which, when considered with existing or proposed man-made conditions, affect the full utilization of the Great Lakes waters.

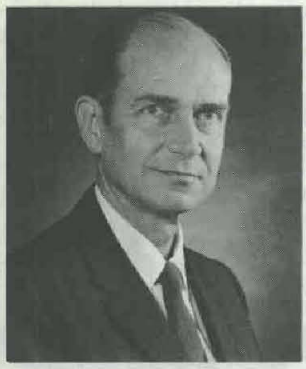
The Lake Survey District presently operates the research vessel, SHENAHON, which is an instrument, water and sediment laboratory; a research station on South Manitou Island; and a tower in Lake Michigan for the mounting of instruments to record research data. Plans for the next several years include erection of a similar research tower in Lake Huron and two in Lake Erie.

The Center is expected to contribute valuable information on the subject of waterway de-icing systems and other measures that will help the Corps of Engineers determine the practicability, means and economic justification for extending the navigation season on the Great Lakes, and the St. Lawrence Seaway.

NEW YORK HARBOR AREA (looking from upper New York Bay toward Manhattan Island, with Statue of Liberty in foreground) is reproduced to a scale of 1:100 vertically and 1:1000 horizontally. Tides and tidal currents are reproduced to scale by means of a primary tide generator at the lower New York Bay model limit and secondary tide generators at the Raritan River, East River, and Hudson River extremities of the model. Salinities throughout the area and the effects of salinities on velocity distribution and therefore on shoaling, are reproduced to scale by operating the model with salt water in the downstream portions and introducing fresh water upstream to simulate upland runoff. Silting is reproduced and studied by means of a lightweight granular material which moves and deposits under the influence of the model forces in the same manner that the natural sediments move and deposit under the influence of natural forces. Tests are conducted to reduce shoaling of the navigation channels or to develop more economical methods for dredging.

The Exceptional Civilian Service Award was presented recently to Dr. Robert E. Stowell, scientific director of the Armed Forces Institute of Pathology, by Brig Gen Joe M. Blumberg, AFIP director.

Dr. Stowell was particularly cited for his investigations on the effects of



Dr. Robert E. Stowell

agents such as freezing, radiofrequency, Laser radiation and anoxia on cells.

The citation stated, in part: ". . . He has manifested the characteristics of professional skill, leadership, and helpfulness, the results of which have augmented the achievements and influenced the reputation of military medicine, and, particularly, the Armed Forces Institute of Pathology.

"His reputation as a teacher, as a researcher, and as a director of research was accomplished on a solid foundation of keen scientific insight and devoted application to work. By his research, writing and teaching, Dr. Stowell has gained national and international recognition."

Prior to joining the Institute in April 1959, Dr. Stowell served as chairman of the Department of Pathology and Oncology, University of Kansas Medical Center. He has been a consultant to the U.S. Public Health Service, the National Institutes of Health, the Atomic Energy Commission, the American Cancer Society and the National Academy of Sciences-National Research Council.

Dr. Stowell holds AB and MD degrees from Stanford University and a PhD degree from Washington University, St. Louis, Mo. He is a member of numerous scientific and professional organizations and has served as president of the American Society for Experimental Pathology, the International Academy of Pathology and the Intersociety Committee for Research Potential in Pathology, Inc.

Department of Defense Cost Reduction Program achievements have earned the Secretary of Defense Meritorious Civilian Service Medal for Harrell B. Altizer, deputy director for Cost Reduction Policy, Office, Assistant Secretary of Defense (Installations and Logistics).

Assistant Secretary of Defense (I&L) Paul R. Ignatius presented the award and a citation signed by Secretary of Defense Robert S. McNamara. The citation stated, in part: "His broad knowledge of logistics, specific comprehension in each resource area, constructive and cooperative negotiating techniques and his diligence and dedication were decisive in producing the Department of Defense Instruction which serves as the foundation of the program."

Altizer, 39, entered Civil Service in 1950 and joined the Office of the Secretary of Defense in 1956. He headed the task group that performed the spadework for the Defense Cost Reduction Program.

The Legion of Merit was presented Mar. 7 to Col Tyron E. Huber for exceptionally meritorious service from 1960-65, as chief, Life Sciences Division, U.S. Army Research Office, Arlington, Va., and also as a member of The Army Research Council since it was established in January 1964.

The award recognized his "conspicuously superior professional ability, mature judgment and dynamic leadership" in the changing role of military medicine, its relation to the worldwide support of the Army and in expansion of the Army Medical research and development programs.

Singled out for mention were his untiring efforts in the initiation of the accelerated malaria research program and the Military Medical Research Program in Southeast Asia.

The Legion of Merit also was presented to Col Arvey C. Sanders for his outstanding work in aiding expansion of the Army's research programs in Asia as commanding officer of the U.S. Army Research and Development Group-Far East.

Col Arvey C. Sanders

Presently he is a special assistant to the director, Walter Reed Army Institute of Research.

The citation recognized his "superb rapport with the Japanese biomedical research community, evidenced by his election as an honorary member of the Kitsato Institute, one of only four non-Japanese to be so honored.

"Under his inspiring leadership . . . [the U.S. Army Research and Development Group-Far East] "progressed from the status of an Army liaison office to designation by the United States Ambassador to Japan as the scientific point of contact for the military service in Japan."

Another recent Legion of Merit recipient is Col Jack G. Sweek. The vet-

Col Jack G. Sweek

eran Artillery officer was cited for his work in organizing the Air Defense Materiel Testing Directorate, U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md. He headed the Directorate from 1962 when it was formed until his recent retirement after 30 years of military service. He was commended also for establishing test procedures covering air defense materiel for application throughout the command.

Assistant Secretary of Defense (Public Affairs) Arthur Sylvester recently

presented to Col Rodger R. Bankson the second Oak Leaf Cluster to the Legion of Merit. Col Bankson was recently appointed public affairs officer for the U.S. Military Assistance Command, Viet Nam.

He had served as special assistant for Viet Nam to Mr. Sylvester since June 1964. The citation noted his exceptional professional competence in public affairs matters during the buildup of U.S. Forces in Southeast Asia.

Posthumous award of the Legion of Merit to M/Sgt Andrew J. Weber was made to his widow in a ceremony at Fort Bliss, Tex. Acting president of the U.S. Army Air Defense Board Col David G. Gauvreau made the presentation to Mrs. Weber.

During the period of the award, M/Sgt Weber served as test noncommissioned officer in the Nike Zeus-Nike X Engineering Service Test effort at White Sands Missile Range, N. Mex., and Kawajalein Island, Marshall Islands, Pacific.

The citation stated that his "dedicated devotion to duty and exceptional professional ability" contributed materially to the defense effort of the United States.

Mrs. Kathryn H. Harden was presented the Meritorious Civilian Service Award by Col John L. Klingenhagen, CO, U.S. Army Aviation Materiel Laboratories at Fort Eustis, Va. Mrs. Harden is a clerk-stenographer in the AVLABS Engineering Laboratories Division.

The award recognized her outstanding service as executive secretary to the chief, Combat Materiel Division, U.S. Army Combat Developments Command Infantry Agency, Fort Benning, Ga.

Army Plans to Use Giant Atlas ICBM for Nike-X Tests

Mighty Atlas, the Air Force intercontinental ballistic missile (ICBM) being retired to make way for newer and more powerful missiles, has found usefulness with the Army—for a substantial saving to the Government.

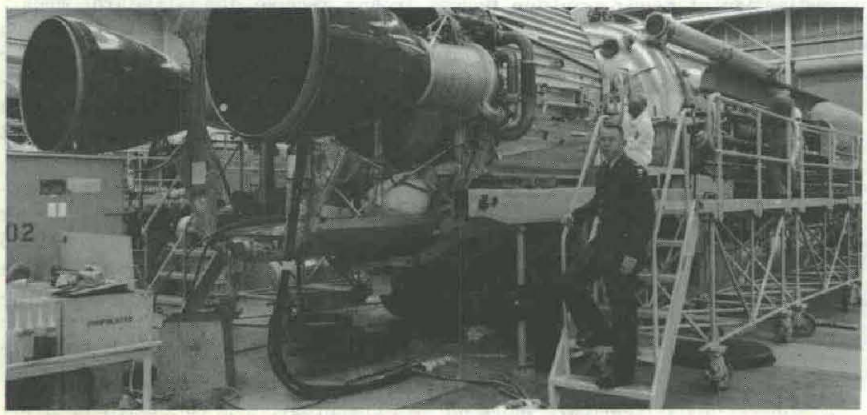
The Army's Nike-X missile defense project office at Redstone (Ala.) Arsenal has bought 12 Atlas D missiles, the same type that put Astronaut John Glenn into orbit, to be used as boosters for Nike-X targets. The Army had planned to spend $13 million for new missiles.

Modifications costing $2.5 million are required before the Atlas missiles can be used by the Army. Col I. O. Drewry, Nike-X project manager, said that the Air Force at Vandenberg Air Force Base, Calif., will handle the modifications and launchings.

The 12 ICBMs will be used to study missile reentry phenomena and new "noses" are being installed to simulate various type of warheads the Nike-X system might need to engage in event of an attack.

Launching from Vandenberg, the Atlas missiles will be flown some 5,000 miles downrange to the Nike-X Kwajalein Test Site.

At the Kwajalein site, located on nine islands in the Kwajalein Atoll some 2,000 miles southwest of Hawaii, continuing studies of various types of reentry vehicles are made by the Air Force, Navy, Nike-X and ARPA (Advanced Research Projects Agency) in their respective development mission areas.



BIG BOOSTER for Nike-X targets is this giant Air Force Atlas D. The 12 Atlases acquired by the Army will be used to launch targets for the Nike-X system. Above is Maj Howard Dyer, chief, Nike-X field office, Vandenberg, AFB.

DIAC Hears Top Officials On Defense, Asia 'Outlooks'

Secretary of Defense Robert S. McNamara, Deputy Secretary of Defense Cyrus R. Vance and General Earle G. Wheeler, Chairman of the Joint Chiefs of Staff, addressed the Defense Industry Advisory Council, Feb. 18-19, in Washington, D.C.

Mr. McNamara and Mr. Vance discussed the "Defense Outlook" and Mr. Vance joined with General Wheeler in presenting "Southeast Asian Outlook."

Additional top-level speakers included: Assistant Secretary of Defense (Installations and Logistics) Paul R. Ignatius, "Defense Profit Policy Considerations"; Assistant Secretary of the Navy (Installations and Logistics) Graeme C. Bannerman and Assistant Secretary of the Air Force (I&L) Robert H. Charles, "Total Package Procurement Concept"; Special Assistant for Assets Management Systems, ASD (Comptroller) George W. Bergquist, "Selected Acquisitions Information and Management Systems"; Barry J. Shillito, president, Logistics Management Institute, "Life Cycle Costing"; Thomas V. Jones, chairman, Northrup Corp., "Status of Export Committee Activities."

The Council also received status reports on: Aluminum Usage; Contractor Independent Technical Effort; Contractor Weighted Average Share; Indemnification and DoD-NASA Advanced Planning Briefings.

The Council was established in 1962 as an important forum for discussions by the Secretary of Defense and his principal assistants with leaders selected from the private sector of the U.S. economy. The 22 nongovernmental Council members include many of the Nation's top industrial leaders.

Cyrus Vance is chairman of the Council and Paul R. Ignatius is alternate chairman. Dr. Ruben F. Mettler, of Thompson-Ramo-Wooldridge is industry vice chairman.

Six new members joined the Council at the recent 12th meeting: Fred J. Gorch, president, General Electric Co., New York, N.Y.; Kermit Gordon, vice president, Brookings Institution, Washington, D.C.; Daniel J. Haughton, president, Lockheed Aircraft Corp., Burbank, Calif.; Donald A. Holden, president, Newport News Shipbuilding and Dry Dock Co., Newport News, Va.; Roger Lewis, president, General Dynamics Corp., New York, N.Y.; and Noel B. McLean, chairman of the board, EDO Corp., College Point, N.Y.

FY 1967 RDTE Budget Goes to Congress

(*Continued from page 5*)

ployment Study" considered several deployment alternatives, and further studies are in progress. Both the system configuration and proposed deployments provide for further growth.

It is planned to continue the test program to obtain data on reentry phenomena and improve reentry vehicle discrimination techniques This program will also support the Navy and Air Force penetration aids program.

Sprint tests will continue at White Sands to include propulsion test flights and missile development firings. A 2-stage, unguided version of Sprint, successfully fired at White Sands in March 1965, closely matched the critical specifications set for acceleration and propellant burning rates. The first successful guided flight occurred in November 1965.

Another major component of the system, the Multifunction Array Radar (MAR), provides for simultaneous detection, discrimination and tracking of many targets and interceptor missiles. By varying the electronic components in the MAR, a tactical MAR (TACMAR) may be tailored to specific requirements. The design prototype MAR at White Sands has contributed significantly to the design of TACMAR and the Missile Site Radar being fabricated for installation at Kwajalein.

Much of the test and evaluation work to be done on the Nike-X will be accomplished at the Army-operated National Ranges—White Sands Missile Range and Kwajalein Test Site (KTS).

With modernization of control equipment, communications and instrumentation at these ranges, the Army plans to continue to support missile and space vehicle tests of all Government agencies and military departments. Both ranges will support reentry measurement requirements for space and missile programs, as well as tests of Nike-X and other DoD missile systems.

Another major program in the Missiles Activity is SAM-D, which will be an advanced air-defense system to be fielded as a replacement for Hercules and Hawk. This system is designed specifically for field army use, and will be more effective than the two systems replaced.

Hercules can engage one target at a time and Hawk is able to engage two targets simultaneously. A more effective defense can be provided with fewer SAM-D batteries than required with Hercules and Hawk. In SAM-D, the Army is taking advantage of advances in technology since the inception of Hercules and Hawk to develop a replacement air defense system of increased effectiveness, flexibility and less operational cost.

Military Astronautics. This program provides for development, test and evaluation of the ground communications complex of the Defense Communications Satellite Program and R&D activities leading to the use of satellite communications to meet Army tactical needs.

With respect to the Defense program, the major effort in FY 1967 will be the conduct of system tests and evaluations to determine operational capabilities and compatability with the Defense Communications System. In the Defense System Ground Environment role, a new-type transportable communications terminal is being deployed worldwide. Units are scheduled to be available in early FY 67.

During FY 1967, plans call for continued development leading to lighter weight, more easily transported terminals for use in contingency situations.

Ships and Small Craft. This program includes the development, test and evaluation of marine craft for logistical support operations. The primary effort is the design for an improved beach-discharge lighter. The lighter will be able to couple directly to U.S. ships for rapid loading and discharge.

The design contract is monitored by the Bureau of Ships, U.S. Navy, and prototype procurement is presently scheduled for FY 67. Other projects within this element include the investigation of new propulsion techniques and initial designs for harbor craft.

Ordnance and Combat Vehicles. To improve munitions, weapons and vehicles critical to maintaining a superior edge in combat, this activity finances work on ground firepower delivery systems, other than missiles, including Field Artillery, Infantry and Armor weapon systems, nuclear and nonnuclear munitions, antitank weapon systems, chemical and biological munitions, and combat and combat support vehicles.

Engineering Development. Work on Heavy Antitank Assault Weapon System (TOW) is nearing completion. The TOW is an Infantry weapon which will be able to defeat all known armor vehicles, both stationary and moving, at required ranges.

The TOW is designed to replace the 106mm recoilless rifle and the ENTAC wire-guided missile and is not in engineering development.

The MAW missile, a Medium Antitank Assault Weapon, will be carried by our frontline Infantrymen in place of the M67—90 mm recoilless rifle. The MAW provides an increase in effectiveness when compared to the M67. Feasibility has been demonstrated and engineering development will begin in FY 1967.

The US/FRG Main Battle Tank has entered engineering development within this program. Design characteristics have been agreed upon by ourselves and the Federal Republic of Germany, with whom we have embarked on this joint effort. FY 67 funds will be used primarily for a contract with the U.S. systems prime contractor.

Work will continue on the development of an improved 155mm howitzer, power systems and convertors, various munitions, a mechanized Infantry Combat Vehicle and other vehicles.

Other Equipment. This activity finances R&D of materiel and equipment which cannot be associated with the previously discussed activities. It includes the areas of communications and electronics, communications security, electronic warfare, surveillance and target acquisition, night vision, command and control, mapping and geodesy, and combat feeding, clothing and equipment. The operation of the Limited War Laboratory, the Army Electronic Proving Ground and Army-wide engineering and service testing is also included.

One major effort deals with the threat of malaria in Southeast Asia, all of which is malarious. U.S. Army troops receive the standard weekly chloroquine-primaquine tablet, which is effective throughout much of the area. However, in certain specific locations a form of falciparum malaria occurs that is resistant to present methods of treatment.

The Army recognized the potentially serious threat of this disease and reprogramed $2 million in FY 65 and additionally obtained $3.8 mililon in emergency funds for malaria research. The current FY 66 program includes $10.1 million to accelerate R&D efforts.

The program is conducted in Army in-house research laboratories as well as in civilian medical research institutions and private industry. It is on

schedule and significant accomplishments have resulted.

Compounds with chemical structures not previously known to possess antimalarial potential have been uncovered. Intensive studies currently in progress and planned during FY 67 will determine if these agents are suitable for use in man against drug-resistant malaria.

Work in support of all types of Communications and Electronics is also included in this program. Substantial improvement in Tactical Communications will be realized upon the completion of several radio system projects presently in the development and test cycle.

The AN/TRC–112 is a long-haul, point-to-point troposcatter terminal which will provide from 1 to 120 reliable high-quality voice channels. The lightweight Radio Relay, AN/GRC–103, a Canadian Development Sharing Program item, will offer substantial reduction in size, weight and power requirement, over the AN/TRC–24 which it will replace.

Under development is a family of single-sideband radios to provide reliable long-range tactical communications. These sets will replace older AM sets and supplement the FM family of radios used for shorter-range tactical communications.

A back-pack set is under development and the basic vehicular set, AN/GRC–106, is in production. Components of the latter provide the basic radios for several vehicular, tactical, radio teletypewriters under development or recently standardized.

One of the programs which is being expedited is the night-vision program. First-generation devices are already under production contract. These are the small Starlight scope, the crew-served weapons, and the night-observation devices. Current emphasis is on second-generation devices.

One of the continuing major problems is that of identifying and directing accurate fire on targets of opportunity, particularly during the hours of darkness. The Army has under development a combination of proven components using the Laser principle which will add tremendously to target acquisition and designation. It is called the Remote Target Designator.

Most of the U.S. Army Limited War Laboratory's work falls in the quick-reaction development of limited war items. The laboratory has developed and delivered items for field deployment within six months after receiving a requirement and rarely does a development project extend beyond eighteen months.

Since May 1964, the Limited War Laboratory has shipped items from 22 different projects to Viet Nam. Presently, 85 projects are underway.

Much of the Limited War Laboratory effort consists of taking existing hardware, modifying it and tailoring it to the solution of an immediate problem. Among items being worked on are counter ambush weapons, detection of hidden enemy troops, an acoustic bullet directional detector for helicopters, leech repellants, water filtration devices, reliable voice and continuous wave communications, and many others.

A major R&D effort which is well advanced is the MUST—Medical Unit Self-Contained Transportable. Up to now most of the Army field hospitals have been housed in tents. Although better than no shelter, tents have a number of serious disadvantages. They are bulky, difficult to erect, and offer poor living and working conditions.

Because of these shortcomings, the Army has been seeking ways of acquiring a lightweight, transportable, mission-oriented hospital.

The MUST system uses three basic elements. The first is the utility unit which supplies electric power, air conditioning, heat and compressed air. Power is provided by a small gas-turbine engine with multi-fuel capability.

Second is an expandable shelter used to house the surgery room, sterile supplies, a clinical laboratory, X-ray machine and other facilities. Expanded, this unit is 12-feet wide, 18-feet long and 8-feet high. Retracted, it forms is own equipment shipping container and can be transported on a 2½-ton truck.

The third element is an inflatable hospital ward for 20 patients that provides a temperature—and humidity-controlled shelter which can be readied to treat patients in 30 minutes.

Development emphasis has been placed thus far on reliability of components and early provision of the elements for medical care and treatment of combat casualties. Progress anticipated in FY 67 should provide Viet Nam with the MUST late this calendar year.

Program-Wide Management. This activity provides for the expenses of running RDTE facilities. It includes the costs of such management levels as the Army Research Office, the R&D Directorates of Mid-Management Commands, and Standardization Groups.

General and administrative expenses of RDTE facilities at selected installations also are paid from this account. A significant item included is the purchase of special purpose equipment for use on more than one RDTE project.

As is readily apparent, the FY 1967 budget covers a multitude of projects and efforts. While it does not provide for everything the Army would like to have, it does provide for the most important items and for support of Viet Nam needs. It will require prudence and careful selection of work to insure that only the highest priority projects are pursued at the least possible cost.

Army Asks $47 Million For FY 67 Construction

In the $1.044 billion Military Construction Bill for FY 1967 submitted to Congress by the Department of Defense, the Army has requested about $47 million for nine research, development and test facilities.

New construction proposals total $522,754,000 to meet new and expanded missions of the Armed Forces throughout the world. The balance of $521,900,000 provides for continuing support for existing and previously authorized family housing. No new family housing is included in the Construction Bill.

The Bill provides for new construction at 188 installations in the U.S. and in the Caribbean, Europe, the Pacific Islands, Japan and the Philippines.

Exclusive of family housing, the Army's total is $161.2 million, divided almost equally between installations in the Continental United States and overseas. The U.S. Air Force headed the list in total amount requested with $211.6 million. The Navy was third with $126.8 million. The balance was requested for military Reserve components and other Defense agencies.

Authorization of funds for Army research, development and testing has been requested as follows:

Redstone (Ala.) Arsenal, $600,000; Rock Island (Ill.) Arsenal, $3,246,000; Edgewood (Md.) Arsenal (including utilities), $3,293,000; Natick (Mass.) Laboratories, $109,000; Picatinny (N. J.) Arsenal, $620,000; White Sands (N. Mex.) Missile Range, $2,336,000; Watervliet (N.Y.) Arsenal, $955,000; Fort Bliss (Tex.), (including training, maintenance and production), $4,936,000; and Kwajalein Atoll (Nike-X Test Site), $31,333,000.

These figures are exclusive of Defense agencies with which the Army is involved in research and development.

APG May Start Reactor Research Early

Research activities in the new $1.78 million "fast pulse" nuclear reactor at Aberdeen (Md.) Proving Ground may begin late this year, instead of in 1967 as originally scheduled.

Construction is progressing well ahead of schedule, Col Charles D. Y. Ostrom, Jr., commanding officer of the Army Ballistic Research Laboratories at Aberdeen, has announced. Work on the main reactor building is expected to begin this month and the entire complex should be completed by late October, the Security Construction Co., Inc., Richmond, Va., has indicated.

Patterned after the Oak Ridge National Laboratory for health physics research, it will be operated by the BRL under the direction of Dr. Hubert P. Yockey, a veteran of more than 20 years in the nuclear physics field.

The reactor complex consists of a laboratory building, a control building and the reactor. The secondary laboratory, located at the edge of the required exclusion area, approximately one mile from the reactor, is a rectangular structure of steel and masonry with 6,500 square feet of administrative floor space.

The primary laboratory or control building, a concrete, steel and aluminum structure, is completely underground and 60 percent complete. It will provide approximately 10,200 square feet of floor space for administrative and control operations and 12,500 square feet for test operations.

Being built by United Nuclear Corporation under a contract with the Atomic Energy Commission, the reactor will be a small, self-contained unit approximately three cubic feet in size.

Designed to provide a limited radiation potential, the facility will be available to military organizations and industrial contractors for research studies. The radiative environment that can be produced under controlled laboratory conditions will minimize the need for high-cost nuclear effects field testing and logistics support.

Army Offers ISF Winners In-House Lab Experience

Army award winners in the 17th International Science Fair (formerly National Science Fair-International) in Dallas, Tex., May 11-14, will be offered one-week all-expense-paid visits to or summer jobs in Army in-house laboratories.

Dr. J. Fred Oesterling, deputy scientific director for Research, Natick (Mass.) Laboratories, will serve for the third year as chairman of the Army panel of judges, which had not been selected at press time.

Army participation in the ISF is administered and sponsored by the Office of the Chief of Research and Development. Dr. John C. Hayes, chief of the Programs and Concepts Branch, Scientific and Technical Information Division of the Army Research Office, is the OCRD project officer.

Judges will select leading teenage scientists to receive certificates of achievement signed by the Assistant Secretary of the Army (R&D) and the Chief of Research and Development.

The Army, Navy and Air Force will each select a representative to send to the Japan Student Science Awards in Tokyo this fall. Last year, Barbara Ann Bennett of Terre Haute, Ind., was the Army's choice for the Tokyo fair.

International Science Fair winners will be announced in the June edition of this publication.

5 Scientific Teenagers Win $25,500 in Scholarships

Careers in science opened up for five top winners of a total of $25,500 in college scholarships in the recent 25th annual Westinghouse Science Talent Search, in which more than 2,800 high school seniors competed.

Sixteen-year-old Henry Wagner, Jr., of Grasshopper Lane, Gwyedd Valley, Pa., won the $7,500 first award for original research in the molecular structure of a protein. He determined the exact arrangement of amino acids in bovine chymotrypsin, a protein whose structure has produced considerable disagreement among scientists.

The youth confirmed the amino-acid sequence suggested by the British investigator, B. S. Hartley, and reported his work in a joint paper with Dr. Stanley C. Clauser, associate professor of pharmacology, Temple University School of Medicine, where he is a research Fellow.

Second-place award of $6,000 was earned by Barry J. Klyde, 17, Flushing, N.Y., who found he could modify, by controlled breeding, the appearance of an inherited fatal defect in mice. He raised more than 1,000 mice in tracing this characteristic through three generations over a period of three years.

David R. Jefferson, 17, Beltsville, Md., received a $5,000 scholarship for his development of a trigonometry based on functions related to the isosceles triangle instead of the right triangle. Over a period of two years, he proved his technique in more than 140 theorems in abstract algebra.

Fourth-place award of $4,000 went to Kevin R. Binns, 18, Des Moines, Iowa, for research on the source of Christian crosses he discovered in graves of Indians in a burial ground at West Des Moines. The Indians had become extinct long before the first Caucasion-Christians entered the area.

Linda Sue Powers, 17, Beckley, W. Va., fifth-place winner of $3,000, was recognized for work in demonstrating and amending a tentative theory on why certain organic chemical compounds change color when exposed to light, heat and pressure.

McGinnis Succeeds Mohlere as Redstone Staff Chief

Col Eugene J. McGinnis has succeeded Col Edward D. Mohlere as chief of staff, U.S. Army Missile Command, Redstone Arsenal, Ala. Col Mohlere retired recently, ending more than 30 years of military service.

Col McGinnis served at Redstone with the Ordnance Guided Missile School from 1958 to 1962 and returned in 1964 as deputy to the commanding general, Land Combat Systems. Prior to the latter assignment, he was Assistant Chief of Staff for Force Development, Department of the Army, Washington, D.C.

Col E. J. McGinnis

During 25 years of military service, he took part in the New Guinea and Philippine campaigns of World War II and was in the Occupation Forces in Japan. He also served with the Military Assistance Advisory Group in Viet Nam.

Col McGinnis is a graduate of the Command and General Staff College and also attended the Universities of Maryland and Alabama. He holds the Arrowhead and two battle stars for action in New Guinea, and the Commendation Medal and the Bronze Star Medal for Viet Nam duty.

USAPRO Publishes 2 Studies on Assignment of Enlisted Personnel

Decision-making accuracy and effective assignment of enlisted personnel are the subjects of two recent technical reports published by the U.S. Army Personnel Research Office (USAPRO), Washington, D.C.

The reports are on a task directed by Seymour Ringel, "Timeliness and Accuracy in a Sequential Decision Making Task," authored by Charles H. Hammer, Support Systems Research Laboratory; and "Optical Allocation of Enlisted Men—Full Regression Equations vs. Aptitude Area Scores," by Richard C. Sorenson, Statistical Research and Analysis Laboratory.

A foreword to Hammer's paper, by Dr. J. E. Uhlaner, director of Laboratories, USAPRO, stated:

"Technological advancements have led to increased speed, mobility and destructive power of military operations. To permit commanders to make tactical decisions consistent with rapid change and succession of events, information on military operations must be processed and used more effectively than ever before.

"To meet this need, the Army is developing automated systems for receipt, processing, storage, retrieval and display of different types and vast amounts of military data. There is a concomitant requirement for research to determine how human abilities can be utilized to enable the command information processing systems to function with maximum effectiveness.

"One objective of the Command Systems Task is to provide research information by which decision making and information assimilation from displays may be facilitated."

The publication "Timeliness and Accuracy in a Sequential Decision-Making Task," reports on a portion of one of the subtasks of the Command System Task.

The requirement was to "investigate the amount of intelligence information which decision makers judge sufficient for action and to relate these judgments to the accuracy and timeliness of the decisions made. The experiment stemmed from indications noted in previous research that decision makers are capable of accurate decision on the basis of less information than they usually judge sufficient."

Sixty enlisted men participated in a series of simulated military problems requiring decisions based on varying amounts of information. Maps showing four, six or eight successive enemy moves toward friendly units were displayed.

At completion of each problem, subjects had to make a final decision as to which of three friendly units the enemy intended to attack. Data were also collected for interim stages. Accuracy of decision, confidence in decision and judgment as to sufficiency of the information presented were analyzed in relation to the number of successive enemy moves shown.

Tendency to judge the information not sufficient for taking action was significantly greater when lesser amounts of information were provided. At each stage, however, some men judged the information not sufficient and yet made accurate decisions. Information was judged not sufficient for 60 percent of the correct final decisions made with the least amount of information, for 37 percent of correct decisions made at 6 moves, and for 21 percent of those made at 8 moves.

Findings strongly suggested that lack of confidence in their ability to make accurate decisions may cause some decision-makers to delay taking action even when they are able to make an accurate decision on the basis of the information available.

Along with techniques to enhance the accuracy of decisions, then, it was concluded, techniques are needed to enhance confidence in those decisions. Effective techniques of this nature could increase the timeliness with which accurate decisions are reached.

A second avenue to improved performance, Hammer concluded, would be to develop means of identifying individuals who can make decisions which are both accurate and timely.

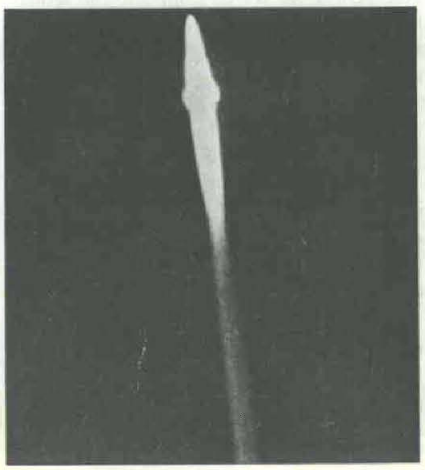
Dr. Sorenson's paper reports results of a USAPRO study on allocation of enlisted personnel to military occupational specialties. It was found that all 11 of the tests in the Army Classification Battery can be utilized in aptitude determination by using computerized techniques.

Because of the excessive hand computation involved without computerization, the present system has been to use the two tests that would best predict performance.

The simulation study was conducted to estimate the amount of gain in quality of performance which would result from use of regression estimates for all 11 of the ACB tests rather than the 2-test aptitude area composites.

Samples of varying size were generated from a simulated manpower pool. Allocation sums over samples averaged 107 using regression estimates for all ACB tests and 103 using aptitude area scores. It was found that in an optimal allocation procedure, performance of enlisted men could be substantially increased by using the regression estimates rather than the 2-test composites.

Estimates of validity in the generated samples, however, were based on school or training performance rather than on post-training evaluations. The researchers recommended that further studies should be undertaken to estimate more precisely the gain in actual on-job performance that would accrue from the suggested operational change.



SPRINT SPRINTS like a "hot rod" missile in this extraordinary photograph, recently released for the first time by the Army at Redstone Arsenal, Ala. The antimissile missile streaked through the air with a comet-like wake and the second stage heated to incandescense by air friction during a flight test at White Sands (N. Mex.) Missile Range. Because of its hypersonic speeds in the relatively dense portions of the atmosphere, the missile's skin reaches temperatures hotter than inside the rocket motor. The bulges are created by the guidance fins on the rear of the stage. Sprint is being developed under direction of the Redstone Project Office.

Mountain Research

By Andrew D. Hastings

ANDREW D. HASTINGS, Jr., physical geographer, Earth Sciences Division, U.S. Army Natick (Mass.) Laboratories, since 1955; former chief, Cartographic Section . . . BS and MS, University of New Hampshire . . . predoctoral Fellow in geography, Clark University . . . technologist, Quartermaster Climatic Research Laboratories, 1950-53 . . . 14 months field service in Arctic, QM test teams and Army Arctic Indoctrination School . . . combat veteran and ski training supervisor, 10th Mountain Division, World War II . . . adviser for military ski training, Exercises Quartrex I and II . . . member 10 professional societies . . . author 18 scientific publications and papers . . . best known for geographical studies on Greenland for U.S. Army.

Throughout history, man has held strong feelings about mountains. They have both lured and repelled him, but inevitably have directed much of the course and timetable of his land movement.

The importance of mountains in the thinking of man has stemmed from their useful resources of timber, minerals and water; their challenge to the adventurous; their beauty to the spiritual; and their protection against storm and invasion.

The unyielding permanence and defensibility of mountain crests have led naturally to political boundary placement and the focusing of international disputes and military actions upon them. Considerations of national security have placed so high a value on the maintenance of protective walls that some of man's most prodigious efforts have gone into the building of great cross-country fortifications in the absence of effective terrain barriers.

Man's walls have yielded, but the mountain ranges remain and the ever-increasing sophistication of ground and air military techniques has not appreciably reduced the tactical advantage of commanding high ground.

Of the few mountain defense sites along the national boundaries of the continental United States, none has been significantly involved with military action. Consequently little attention was devoted to mountain warfare before the last quarter century.

Mountain warfare and research done in Army R&D establishments since World War II, as reviewed in this article, is not intended to be all-inclusive. Rather, my purpose is to show some of the causal effects which have stimulated mountain environmental research within the Army as well as some of the end results of research and development programs.

Emphasis in this article is placed on contemporary studies. Persons desiring a more detailed chronology of geographich research in mountain environments should contact the Earth Sciences Devision, U.S. Army Natick Laboratories.

During World War II, the distinguished combat achievements of the 10th Mountain Division in Italy firmly established the value, if not the continued existence, of specially trained and equipped "alpine" troops in our Army.

In addition, three noteworthy contributions were made to U.S. military literature on mountains—the Army-inspired *Manual of Ski Mountaineering*, National Ski Association; Frank Harper's *Military Ski Manual—A Handbook for Ski and Mountain Troops;* and FM 70-10, *Mountain Operations.*

Shortly after the deactivation of the 10th Mountain Division, the Mountain and Cold Weather Training Command, staffed with veteran assault climbers and over-snow experts, began its training mission at Camp Carson, Colo. Groups from many line outfits received valuable training there during the ensuing 11 years.

In 1957 the Cold Weather Training Command was transferred to Fort Greely, Alaska, and eventually became the Northern Warfare Training Center. Since World War II, however, only two sizeable organizations, the 38th and 14th Regimental Combat Teams, have even approached the state of mountain-combat readiness of the 10th Mountain Division in 1944.

The dispute between India and Pakistan over the mountainous province of Kashmir which again flared into war in 1965 erupted in 1948. Early in that year, the U.S. Army Office of the Quartermaster General requested its geographers to investigate requirements for a mountain research project.

The resultant report was titled "Analysis of Need for a Mountain Project." It surveyed the available literature and concluded that there was, in fact, a substantial area of scientific neglect in mountain geography, one which the U.S. Army could ill afford to ignore.

Soon after the United Nations Kashmir Cease-Fire in 1949, a Mountain Project Committee of prominent experts, both military and civilian, was formed. Recommendations they made led to the establishment of Technical Project 7-83-03-004, Mountain Environments, in March 1950.

Objectives of the research under this project were to define and classify mountainous areas according to their relationship to Army logistical problems; investigate significant factors of mountain environments affecting Army activities; interpret and present information and data in suitable form for determining the best means of dealing with the environmental stresses.

When the Republic of Korea was invaded, American troops were committed, with the United Nations forces, to mountain fighting. Less than four months later, the Communist Chinese marched into Tibet. For the second time in a decade, World attention focused on major warfare in mountains.

Although the Korean Armistice eased the Asian situation somewhat, the mountainous terrain along the 38th Parallel demarcation line remained (and still is) alertly manned and well-armed. At this time, the Red Chinese Army launched an intensive road-building project to bolster its border positions in the Tibetan Himalayas from Punjab to Assam. Such were the disquieting beginnings of a surprising respite from serious mountain conflict which was to hold until the early 1960s.

Military geographers are found in several Department of Defense agencies. Most of those earliest concerned with environmental studies of mountain areas, however, were associated with the Quartermaster R&D Command Laboratories. In the 1962 Army-wide reorganization these became the Army Materiel Command's Natick (Mass.) Laboratories.

Within a year of the outbreak of hostilities in Korea, Quartermaster Corps geographers initiated five pilot studies of selected mountain environments. Considerable groundwork was laid for the determination of a systematic classification of mountain types which

could be used for military purposes. Logistical problems were recognized in four main categories: topography, climatology, transportation and medical geography.

Studies of mountain geography continued at Natick through the 1950s, averaging two a year and covering a broad range of regional and systematic interests. A notable cartographic achievement in 1958 was the publication of the *Environmental Handbook for the Camp Hale and Pikes Peak Areas of Colorado.* This introduced the world's first planimetrically accurate physiographic diagrams.

Another valuable contribution to the field of geography and glaciology was the American Geographical Society's report on a contract study, *A Geographical Study of Mountain Glaciation in the Northern Hemisphere.* A companion study report on mountain glaciers of the Southern Hemisphere by the American Geographical Society will be published this spring.

When the United States became militarily involved in Viet Nam in December 1961, high ground again figured decisively in the action. Hilltop enclaves within Viet Cong-controlled territory managed to resist stubbornly, and numerous battles took place along the Laotian frontier.

A few years later, other elements of the Army began increasing their high-altitude research. The Army Research Institute of Environmental Medicine (ARIEM), also located at Natick, initiated selective site studies for high-elevation physiological tests in the United States.

In collaboration with the Indian Armed Forces Medical Service, a small team of ARIEM scientists conducted a clinical study of acute mountain sickness in Ladakh. ARIEM collaborated with the U.S. Army Medical Research and Nutrition Laboratories, Denver, Colo., on studies at Climax, Colo. (11,400 feet), on "Physiological and Nutritional Effects of High Altitude."

The U.S. Army Cold Regions Research and Engineering Laboratories (CRREL) at Hanover, N.H., have initiated studies in recent years on the physical characteristics of snow at high elevations in Montana. CRREL and Natick Laboratories scientists have conducted additional high-elevation studies in the St. Elias Mountains of Yukon and Alaska.

Studies such as these have been conducted within the overall framework of the Icefield Ranges Research Project, currently a summertime operation of the Arctic Institute of North America. The Army has also been indirectly involved in the establishment of the University of Alaska research station on the top of Mt. Wrangell, Alaska (14,500 feet).

A contract just completed for Natick has analyzed the spectralwave radiation data collected by the Army on Mauna Loa, Hawaii (11,150 feet). Mauna Loa is considered one of the best high-elevation sites in the world for measuring radiation data and it is anticipated that this program will be reactivated.

Under the sponsorship of the National Science Foundation, Natick Laboratories researchers are engaged in an extensive high-elevation radiation climatology program at a newly established station (Plateau) in East Antarctica.

Another study in progress will produce a report on the extremely high solar radiation measurements made in the Himalayas by the American Mount Everest Expedition of 1963. This was supported to a limited extent through the Army expeditions support program.

Programs requested by the Army Research Office the past two years for evaluating stresses created by the total physical environment of high mountain areas. These studies are limited to conditions above 2,000 meters, with greatest emphasis on those above 3,000 meters elevation.

The first such environmental study was made on Central Asia, by far the largest, highest and least-known of the high mountain areas of the world. This study includes contributions in geomorphology, pedology, climatology, hydrology, glaciology, ecology and physiology.

Environmental stresses disclosed in these studies are presented as they affect man and military materiel. Over 30 maps and figures have been prepared for a report which will be published this spring. A tremendous amount of research has gone into the compilation of the small-scale regional maps, particularly in the determination of the contour isopleths. These maps represent a real contribution to the field of Central Asian cartography. It is expected that this study will be followed by additional studies on other mountain systems.

U.S. military interest in high elevations of the world was stimulated greatly by the outbreak of border skirmishes in India. The nature of the geographical investigations has changed in the past 10 years from one of pure description of high mountain areas to one where environment is interpreted in meaningful terms for the soldier.

Only in recent years have earth scientists in Army research and development attempted to study both man and his environment in one treatise. Now it is well recognized that the unique hazards and operational stresses of high mountain environments must be applicably related to the soldier and his equipment. Army geographers believe that their studies, although still in their infancy, can assist physiologists in their attempt to understand the environmental basis of physiological stresses at high elevations.

A DRY-RUN DEMONSTRATION of the Delta Reconnaissance Experimental Test Vehicle was given to about 60 members and guests of the U.S. Army Scientific Advisory Panel during a recent visit to the Army Limited War Laboratory at Aberdeen Proving Ground, Md. Especially suited for the swampy delta regions of Southeast Asia, the vehicle is capable of traveling on water, mud, rice paddies and dry turf. It is powered by a gas turbine engine that produces over 1,600 pounds of thrust.

Army Sponsors First Tri-Service, Industry Medical Meeting

More than 75 recognized specialists on head and neck injuries convened Mar. 2-4 to probe into causes and methods of prevention at an Army-sponsored conference.

Held under auspices of the Life Sciences Division of the Army Research Office, Office of the Chief of Research and Development, the meeting attracted twice the anticipated number of conferees.

Dr. Edward J. Baldes of ARO's Life Sciences Division, the project officer, said similar conferences by individual military services and by private industry had been held in the past, but this was the first to combine Army, Navy, Air Force and industrial representation.

Dr. Wendell H. Griffith, director of the Life Sciences Research Office of the Federation of American Societies for Experimental Biology (ARO-FASEB), chaired the conference.

Dr. J. F. A. McManus, FASEB executive director, Col Tyron E. Huber, chief of the ARO Life Sciences Division, and Dr. Baldes, were among opening session speakers.

AIR FORCE Col John Stapp is center of this tri-service conference break. From left are Maj Harry L. Kukes, Jr., OCRD; Dr. Wendell H. Griffith, chairman; Col Stapp; Dr. Baldes; and Capt Richard Luehrs, MC, U.S. Navy.

Conferees included representatives of the National Aeronautics and Space Administration (NASA), Federal Aviation Agency (FAA), the National Conferences on Medical Aspects of Sports, and American Association for Automotive Medicine.

Among top conferees in this field of research was Col John P. Stapp, USAF, known in 1954 as "the fastest man alive." A 421-m.p.h. rocket-powered sled ride at Holloman Air Force Base, N. Mex., ending in a "water break" with a tremendous 1-second deceleration, earned him that claim to fame.

Assigned to the Armed Forces Institute of Pathology, Washington, D.C., he has conducted nine "Stapp Automotive Crash Conferences" throughout the country. Regular Stapp conferees also attend the ARO-FASEB meeting.

The experts reviewed the general nature of head, brain and neck injuries, mechanical and physical factors, current experimental research, inadequacies of present protective devices, and desirable characteristics of improved protective gear.

Dr. Ayub Ommaya of NIH (center) chats with Dr. Stephen J. Kennedy of Natick (Mass.) Lab and Col Sven A. Bach of the U.S. Army Research Office.

NEUROLOGISTS of note are Drs. William F. Caveness, NIH; E. S. Gurdjian, Wayne State U. professor and Derek Denny-Brown, professor at Harvard University Medical School.

Discussion covered 34 detailed elements relative to injuries in military service — aviation in particular — as well as those continually being experienced in athletic events and automobile racing.

Participants included: Capt Roland A. Bosee, Navy Bureau of Medicine and Surgery; Dr. Jelleff C. Carr, ARO; Dr. Derek Denny-Brown, Harvard University Medical School; Dr. E. S. Gurdjian, Wayne State University School of Medicine, Detroit, Mich.; Dr. Carl M. Herget, Edgewood Arsenal, Md.; Arthur E. Hirsch, David Taylor Model Basin, Washington, D.C.; Lt Col John J. Kovaric, OTSG, U.S. Army Medical R&D Command, Washington; Col Sidney L. Marvin, Office of The Surgeon General; Frank P. McCourt, Army Aviation Materiel Laboratories, Fort Eustis, Va.; Dr. Ayub K. Ommaya, National Institutes of Health, Washington; and Lawrence M. Patrick, Biomechanics Research Center, Wayne State University.

DR. EDWARD J. BALDES, ARO conference project officer, confers with Dr. Caveness and Dr. Denny-Brown at head and neck injury discussions. More than 75 specialists, civilian and military, studied preventive means and gear.