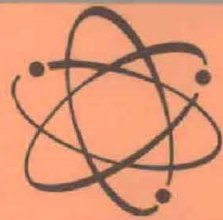




ARMY RESEARCH AND DEVELOPMENT



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TARC Study Puts Emphasis On Applied Research Effort Linked to Military Materiel

In-depth study of research and exploratory development programing, realistically applied to the Army mission, will be reflected in the report The Army Research Council (TARC) submits shortly to Director of Army Research Col Robert E. Kimball.

TARC convened for its first session following reorganization in June 1966. Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research, took over as chairman from Dr. Ralph G. H. Siu, U.S. Army Materiel Command Deputy Director of Developments.

Intensive sessions over the past year have been devoted to the study that will provide the basis for a revised 5-year Army Research Plan. The first study under Dr. Siu concentrated on basic research, programed in the 6.1 category for Department of Defense budgeting.

While the current study has explored deeply into problems of updating the original TARC report on 6.1 category research, much of the empha-

(Continued on page 3)

SARS Fellowships Recognize 3 Career Scientists

Secretary of the Army Research and Study (SARS) Fellowship Awards will enable three outstanding career scientists at Army in-house laboratories to devote one year to investigations designed to increase their potential for future valuable service to the Army.

Secretary of the Army Stanley R. Resor has approved the nominations

AMC Marks 4th Anniversary With Changes

Entering its fifth year Aug. 1 with a solid record of achievements commended by Army Chief of Staff General Harold K. Johnson in an anniversary message, the U.S. Army Materiel Command announced changes affecting four subordinate commands.

Approved by Secretary of the Army Stanley R. Resor, the reorganization follows the July 1, 1966, merging of the Supply and Maintenance Command with Army Materiel Command Headquarters in Washington, D.C.

Headquarters of the U.S. Army Mobility Command at Warren, Mich., will be phased out by January 1967. Its three operating commands will become separate elements reporting directly to the Army Materiel Command in Washington, D.C.

The Mobility Command elements are the Army Tank-Automotive Center at Warren and the Army Aviation Materiel Command and Army Mobility Equipment Center, both in St. Louis, Mo.

Effective Aug. 1, the Army Aviation Materiel Command, headed by Brig Gen Howard F. Schiltz, and the Mobility Equipment Command, under Brig Gen Thomas B. Simpson, became major commands of the Army Materiel Command.

In January, the Tank-Automotive Command will be established under Maj Gen W. W. Lapsley, current CG of the Mobility Command. His deputy will be Brig Gen W. J. Durrenberger,

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McNickle Succeeds Ely In Top DoD Assignment

(See story on page 6)



Lt Gen M. L. McNickle

of Dr. S. David Bailey and Frank J. Rizzo, both of the Army Natick (Mass.) Laboratories, and Oscar L. Bowie of the Army Materiel Research Agency, Watertown, Mass. They were nominated by their respective commands on the basis of exceptional achievements.

Dr. Bailey is director of the

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Dr. S. David Bailey



Frank J. Rizzo



Oscar L. Bowie

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

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AMC Marks 4th Anniversary With Changes

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present CG of the Army Tank-Automotive Center.

All except about 10 of the Army Mobility Command's Headquarters civilian employees will be absorbed by the Army Tank-Automotive Center. The remainder will be offered positions with the Army Aviation Materiel Command, Army Mobility Equipment Command or subordinate elements.

General Frank S. Besson, Jr., noted the Army Materiel Command's fourth anniversary by commenting that it is an organization dedicated to providing the fighting man with the best possible equipment, as quickly as possible and at the least cost to the taxpayer. He has served as commanding general since the AMC was created.

Army Chief of Staff General Johnson's message said, in part:

"Your record of achievement, in providing the Army with fighting tools and materiel of highest quality, is one in which each member of the Command can take pride, for you have applied the latest developments in science and technology to give today's American soldier the equipment he needs for superiority on the battlefield.

"The dedication of the military and civilian members of the Army Materiel Command team in using their professional skills for the good of the country has been instrumental in assuring the readiness of today's Army to perform its many missions."

One of the achievements attributed to the Supply and Maintenance Command during nearly four years of operation was establishment of "a new, unified, efficient supply and maintenance organization." The number of personnel was reduced by about 23,000 and the number of Army depots from 34 to 20.

From an original total of 278 local and regional facilities taken over from the Army's seven Technical Services in 1962, the Army Materiel Command has reduced its network of installations and activities to 186, including a net reduction of five in FY 1966.

To increase the effectiveness of AMC's support in the research and development area, in January 1966 General Besson established a new position, Director of Research and Laboratories (DORL). Dr. Jay Tol Thomas, the first director, also is assigned as Deputy for Research and Laboratories.

Dr. Thomas exercises direct and complete line authority over the nine

AMC central laboratories and has staff responsibility for the technical quality and effective conduct of the AMC in-house research and development program. He also represents the commanding general, AMC, in direct communication with the office of the Chief, Research and Development and with the Office of the Assistant Secretary of the Army (R&D) on all matters relating to the in-house programs conducted in AMC.

Other actions taken over the past 12 months to make AMC more responsive to Army requirements include the establishment of the Northwest and Southwest Procurement Agencies and Procurement Detachments at Chicago, Cincinnati and New York. Customer Assistance Offices were established at Orleans, France; Honolulu, Hawaii; and Saigon, Viet Nam.

The Army/Industry Materiel Information Program was established in FY 1965 and has now been placed on a permanent basis. Detailed data on Army-planned procurements for over 400 items were furnished to industry this past year, resulting in 29,000 industry inquiries.

In the coming year, AMC plans to release information on a total of 1,200 items and expects to furnish approximately 42,000 responses to inquiries related to these items. The data released to industry includes pertinent historical and descriptive facts about individual end items to be procured in the current fiscal year and in the ensuing six years. Included also are statistics pertaining to quantities, monthly production rates and anticipated methods of procurement.

Additionally, AMC's program of classified advanced planning briefings for industry was expanded during FY 1966 to total seven separate briefings covering future research and development requirements. Current plans call for continuing the series with each major commodity command presenting a minimum of one briefing per year in major areas of responsibility.

International logistics programs during the past year received increased emphasis as AMC provided support to more than 80 nations and international organizations. Grant Aid and Military Sales programs during FY 1966 totaled nearly \$1 billion. Items included in the shipments were helicopters, missile systems, tanks, personnel carriers, weapons, ammunition and radios.

The Automatic Data Field Systems

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TARC Study Emphasizes Research Related to Materiel Needs

(Continued from page 1)

sis has been on applied research aspects of 6.2 category exploratory development in support of two or more end items of development.

The objective, Dr. Weiss explained, is a balanced program that will adequately support research to insure a broad flow of new scientific knowledge, but which will be geared to specific military requirements. More than half of the total Army exploratory development program (6.2 category in the budget) is covered in the new study.

TARC's emphasis on exploratory development programing problems is explained partially by the keen interest evidenced by Congress in the relevance of basic research to the Army mission. The theme of the panel discussion that featured the 1966 Army Science Conference was "Basic Research and Practical Relevancy."

In that discussion, noted industrial, academic institutions and Department of Defense research leaders joined with representatives of the public view in considering how much should be spent on basic research, and in what manner, to accomplish a more rapid and adequate flow of basic research findings into practical applications for defense and the Nation's economic growth.

Present TARC consideration of this problem has been described "as seeking to provide clear-cut definitions of the work to be done, current status and its relevance to Army needs—present and future."

"The word," as Dr. Weiss put it, "has to be good. It must provide for all levels of management a clear and comprehensive picture of the Army's research program as we know it today."

Comprised of 10 of the Army's senior scientists in addition to the chairman, TARC was established in January 1964. The Assistant Secretary of the Army for Research and Development, at that time Willis M. Hawkins, directed the action in cooperation with the Chief of Research and Development, then Lt Gen William W. Dick, Jr. The Director of Army Research is the TARC coordinator.

Representative of Army in-house laboratories as well as the Army General Staff, TARC is designed to present the viewpoints and detailed work experience of both in discussions of the research management structure.

TARC's charter authorizes it to guide and review the preparation of



ACTING ASSISTANT SECRETARY OF THE ARMY (Research and Development) Charles L. Poor (right) presents Certificates of Achievement for exceptional performance of duty to Dr. Richard A. Weiss, chairman of The Army Research Council (TARC) and other members (counterclockwise from top) Col Tyron E. Huber, U.S. Army Research Office; Dr. Maurice Apstein, Harry Diamond Laboratories; Col William D. Tigertt, Walter Reed Army Institute of Research; Dr. Hoyt Lemons, U.S. Army Research Office; Dr. W. W. Carter, U.S. Army Missile Command; Dr. J. V. R. Kaufman, U.S. Army Munitions Command; Kenneth M. Barnett, Fort Monmouth, N.J.; Dr. John D. Weisz, Aberdeen Proving Ground, Md.; Col William Hausman, Walter Reed Army Institute of Research. TARC member Dr. Gilford G. Quarles, Office of the Chief of Engineers, was ill when pictures were taken but later received a Certificate of Achievement.

an Army Research Plan which:

- Designates those scientific areas of research effort which show promise for providing technology that will enable the Army to accomplish its mission, as stated in approved Army strategic plans.
- Projects the allocation of Army research fiscal resources among scientific fields for a period of five years.
- Provides a balanced plan among scientific areas of interest to the Army to attain a reduction of critical unsolved problems in Army materiel requirements as well as conducting selective exploration into promising areas of science and technology.

TARC members are authorized to visit any Army or other research and development establishment, upon the approval of the coordinator and chairman, to make observations pertinent to problems under consideration.

TARC members also provide the Army representation on the Joint Advisory Forums, created in January 1964 by the Director of Defense Research and Engineering to supplant the Joint Advisory Council on Science. The Army and Air Force also provide representation.

Usually these Joint Advisory Forums convene for about a month each year to present for review the input from their departments for the Department of Defense allocation of funds. The current review was completed recently.

TARC members are:

Life Sciences: Col Tyron Huber, chief, Life Sciences Division, U.S. Army Research Office; Col William D. Tigertt, director, Walter Reed Army Institute of Research, Washington, D.C.

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Army Materiel Command Marks 4th Anniversary With Changes

(Continued from page 2)

Command (ADFS) was organized on a worldwide basis during the past year. ADFS now has under developmental study three major systems: The Tactical Fire Direction System, the Tactical Operations System and the Combat Service Support System.

The first Initial Defense Communications Satellite Program (IDCSP) satellites were launched on June 16, 1966, inaugurating a worldwide military satellite communications system with terminals located around the globe in New Jersey, California,

TARC Study Puts Emphasis On Applied Research Efforts

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Physical and Mathematical Sciences: Dr. J. V. R. Kaufman, chief scientist, Munitions Command, Army Materiel Command; Dr. W. W. Carter, chief scientist, Army Missile Command, AMC.

Engineering Sciences: Dr. Gilford G. Quarles, chief scientific adviser, Office of the Chief of Engineers; Dr. Maurice Apstein, associate technical director, Harry Diamond Laboratories, Washington, D.C.

Environmental Sciences: Dr. Hoyt Lemons, chief, Geophysical Sciences Branch, Environmental Sciences Division, U.S. Army Research Office; Kenneth M. Barnett, deputy director, Atmospheric Laboratory, Electronics Command, Fort Monmouth, N.J.

Behavioral and Social Sciences: Col William Hausman, deputy director, Department of Neuropsychiatry, Walter Reed Army Institute of Research; Dr. John D. Weisz, director, Human Engineering Laboratories, Aberdeen Proving Ground, Md.

Col Van Wert Returns to MICOM To Serve in Air Defense System

Col Robert W. Van Wert, who served from 1960-64 as director of the Army Missile Command's Supply and Maintenance Directorate, recently returned to Redstone Arsenal, Ala., as deputy to the deputy commanding general, Air Defense Systems.

For the past two years he commanded the U.S. Army Depot, Okinawa. Previous assignments include service in Europe, Turkey and the Pacific. A 1958 graduate of the Command and General Staff College, he holds the Bronze Star with Oak Leaf Cluster for World War II service and the Army Commendation Ribbon for service at Redstone Arsenal.

Hawaii, Philippines, Ethiopia and West Germany.

During FY 1966, the U.S. Army Satellite Communications (SATCOM) Agency selected and prepared the earth station sites, developed and deployed the transportable terminals, modified the existing fixed terminals, developed and installed a satellite communications control facility, coordinated personnel training and designed an integrated R&D test program to evaluate system capabilities.

To fill a need for electrical power in Viet Nam, the AMC launched a program to convert 11 T-2 petroleum cargo ships into fixed power generating stations. The tankers' main turbines will be used to transmit power ashore to provide for troop welfare needs and to operate administrative and logistical installations, communications and other equipment in support of military operations.

With a cargo tank capacity of over 150,000 barrels of fuel, these power plants will operate seven days a week, 24 hours a day, and can produce power for approximately two years without refueling.

A unique tank development program between the United States and the Federal Republic of Germany reached another major milestone. The Joint Engineering Agency and the Joint Design Team moved from Augsburg,

Germany, after two years there, to the General Motors Technical Center, Warren, Mich., marking entry into the pilot build phase.

The military and civilian experts in these agencies have successfully completed the present design phase for the Main Battle Tank (MBT-70).

American and German experts have reached agreement on a one-tank concept and remaining development workloads have been defined and assigned to the nation responsible for execution. The United States program manager has provided briefings to interested NATO governments who may desire to participate in this program.

The first production unit of the Redeye weapon was delivered to the Army in FY 1966. The Redeye weapon system was developed jointly by AMC's U.S. Army Missile Command and the U.S. Marine Corps to provide frontline combat troops and support units protection against low altitude enemy aircraft.

The Project Manager Concept was expanded to 46 projects during AMC's fourth year. Several new systems were introduced including SAM-D (surface to air missile-development), Vulcan/Chaparral (a gun/missile air defense system), STAAS (surveillance and target acquisition aircraft system), the 2.75" Rocket System (an air-to-ground missile which can be

ECOM Physicist Selected to Chair UN Working Group

Dr. Reinhold M. Marchgraber, a physicist with the Army Electronics Command (ECOM), has been selected to serve the next four years as a working group chairman in the United Nations World Meteorological Organization.

Dr. Marchgraber will head the group on Special Radiation Instruments and Observation, on which he has served four years as U.S. Army member. The group includes representatives of the United States, Soviet Union, Belgium, West Germany, Japan and India, and is part of the UN Commission for Instruments and Methods of Observation.

Overall purposes of the World Meteorological Organization include the exchange of information among UN member countries, the resolving of international standards, and determination of areas in which more research is needed for a better understanding of weather, climate and other aspects of the atmosphere.

The group headed by Dr. Marchgraber will seek to define requirements for standard instruments to measure solar radiation, evaluation of measurement procedures, and prepare a report suggesting ways to ensure the greatest possible accuracies.

Dr. Marchgraber, who has been at Fort Monmouth 13 years, was educated at the University of Technology in Vienna. He is well known in scientific circles for his work in advanced methods of probing the atmosphere.



Dr. R. M. Marchgraber

fired from rotary or fixed-wing aircraft), Flying Cranes (CH-54A), bombs and related components and POL (petroleum, oils and lubricants) Distribution Systems.

Perhaps the most significant news to come out of the Nike-X Project in FY 1966 was the May 1966 announcement that new developments in the system would enable it to provide a measure of protection for the entire geographic area of the United States. Previously, Nike-X has been described as an urban defense weapon.

Two new hardware development programs also announced during the year had a significant bearing on the area defense capability of Nike-X. One of these was development of an improved version of the Zeus interceptor missile which would have longer range, greater maneuvering capability and a greater kill radius than the present Zeus missile.

The second was an announcement that the Nike-X project has asked for contractor proposals on a new radar, the third phased-array radar in the system, which would give the system increased capabilities. A milestone event in the Nike-X development program during the year was the successful first guided flight of a Sprint missile launched from its cell at White Sands, N. Mex.

The first production line roll-off of the Sheridan Weapon System took place on June 29, 1966. The Sheridan is armed with the Shillelagh Missile System which has completed a successful development program.

During March and April 1966, the Army's new Light Observation Helicopter (LOH), the OH-6A, established 23 world helicopter records—more than any other helicopter in the world. Twelve of the records set for rotary-wing aircraft were for speed; five for distance; and three each for climbing, and sustained altitude.

Among the aviation logistical actions was the conversion of a Navy seaplane tender into a floating aircraft maintenance facility. The ship, designated the *USNS Corpus Christi Bay*, became operational in Viet Nam Apr. 2, 1966, and is being used to repair and overhaul aircraft components and assemblies. Its aviation shops are manned by an Army Transportation Corps battalion with a strength of 310 enlisted men and officers.

In August 1965, four AMC project-managed CH-54 heavy lift helicopters were deployed with the 1st Cavalry Division (Air Mobile) to Viet Nam. As of June 30, 1966, CH-54s had retrieved 94 downed aircraft valued at

\$39,462,601, greatly offsetting the cost of the four "Flying Cranes."

Development of a team of tactical air defense weapons to protect forward area combat elements against attack by low-flying aircraft was initiated during the past year. The weapons used are the rapid-firing Vulcan gun and the Chaparral, the ground-to-air adaption of the Navy's Sidewinder 1C missile.

Other significant actions during AMC's fourth year of operation include:

- Development of a 300-watt hydrazine-air fuel cell weighing 30 pounds to permit silent and continued operation of vehicular radio sets while the vehicle is not in motion.

- Providing within 90 days a new type of plastic structure 16 feet wide and 60 feet long, including lighting and air conditioning, for use in a hospital complex as a post-operative recovery room.

- Accelerating the development of new expedient surfacings for the rapid construction of airfields, roads, depot storage areas, and other facilities. As a result, three new surfacing materials have been introduced or are in the process of being introduced into the inventory.

- Providing bullet-defeating armor in the form of pilot seats, body armor and component protection armor for protection of air crewmen and aircraft.

- Responding to increased demands for ammunition by reactivating eight Government-owned, contractor-operated plants.

- Completion of development and testing of a lightweight radio set for use by combat soldiers. The receiver, mounted on an Army helmet, weighs one-half pound and the transmitter one pound.

- Completion of the Armed and Armored Chinook helicopter (CH-47) program, including its cycle of design, fabrication and developmental test. The program was conducted from June through December 1965.

- Production by the Aircraft Weaponization Program of new and improved armament subsystems for the UH-1B/D Huey, CH-47A Chinook and the OH-6A LOH (Light Observation Helicopter) aircraft.

- Training over 9,000 students in management techniques, logistics and military packaging at AMC's various schools.

- Accomplishing approximately 30,000 purchasing actions (over \$10,000 each) in FY 66 compared to 21,500 for FY 1965.

In his birthday message to AMC personnel General Besson said:

"Our challenges in a world of crisis have hastened our maturity. Our response to these challenges has established the AMC reputation as an experienced and highly respected member of the Army team. . . .

"We must all maintain the highest sense of urgency in the months ahead. The best birthday present at our Fifth Anniversary, a year from now, will be the Nation's continued gratitude for meeting our obligations in an hour of need."

Col Watkins Designated 1st Brigade Commander

Col George W. Watkins, a veteran of 32 years Army service, recently took command of the newly established 1st Brigade, Combat Support Training, at Fort Huachuaca, Ariz. Until reassigned he was director, Department of Gunnery, Artillery School, Fort Sill, Okla.

Combat support training is conducted also at Fort Leonard Wood, Mo., Fort Ord, Calif., Fort Dix, N.J., Fort Jackson, S.C., Fort Knox, Ky. and Fort Polk, La.



Col George W. Watkins

Maintaining a training capacity of 3,500 personnel, the 1st Brigade is organized to train personnel in clerical, mechanical, food service, vehicular operations and other combat support activities. Military and civilian operational personnel of the brigade will eventually total about 1,400.

Following seven years with the National Guard, Col Watkins served in World War II as an Artillery officer and earned the Bronze Star Medal.

He is a former University of Arkansas student and has completed the Amphibious Staff School, Coronado, Calif.; the Field Artillery School Advanced Course, Fort Sill; and the Command and General Staff College at Fort Leavenworth, Kans.

McNickle Succeeds Ely in Top DoD Assignment

Vice President Hubert Humphrey pinned the third star signifying Lt Gen Marvin L. McNickle's new rank when he succeeded Lt Gen William J. Ely upon his retirement Aug. 1. General McNickle, U.S. Air Force, has an expanded title—Deputy Director of Defense Research and Engineering for Administration, Evaluation and Management.

General Ely terminated a 33-year military career, following graduation from the U.S. Military Academy in 1933, to accept appointment as vice president of Sverdrup and Parcel and Associates, Inc., a St. Louis, Mo., engineering and architectural firm. He received the Army Distinguished Service Medal at formal retirement ceremonies.

After serving as the second Director of Army Research from March 1959, General Ely became Deputy CG of the U.S. Army Materiel Command when it was activated in 1962. He remained in that capacity until reassigned as DDDRE (Administra-

tion and Management).

Into his new duties he takes an MS degree from Cornell University, as well as his Military Academy BS degree in engineering. He has done graduate work at Carnegie Institute of Technology.

Until that third star was pinned on, everyone in General McNickle's office might have been excused for thinking he was seeing double. His twin brother, Maj Gen Melvin F. McNickle, commander of the Oklahoma City Air Materiel Area at Tinker AFB, Okla., was in Washington for the occasion and even the secretary was confused.

General McNickle's duties in addition to those assigned to General Ely charge him with supervisory control over the operational test and evaluation of new weapons systems. Dr. John S. Foster, Jr., Director of Defense Research and Engineering, assigned this new function to the job.

Born in Doland, S.D., Jan. 30, 1914. General McNickle earned a BS degree

in business administration from the University of South Dakota and a Reserve commission in the Air Force. During World War II, he served at Headquarters, U.S. Air Force, and on the staff of the Joint Chiefs of Staff.

From June until October 1942, he was a fighter pilot with units in England and then served until April 1944 with combat fliers in North Africa, Sicily and Corsica. After two years at HQ USAF in Washington, he was assigned to Wright-Patterson AFB as chief of Plans (Engineering Division) and then assistant chief of staff from January 1946 until 1951.

Following a 2-year assignment at HQ U.S. Air Forces Europe in Wiesbaden, Germany, he attended the USAF Air War College at Maxwell AFB, Ala., and the Manpower Management Course at George Washington University, Washington, D.C.

For five years (1956-61), he was Deputy for Materiel, Tactical Air Command, Langley AFB, Va., and then was Director of Supply, HQ Air Force Logistics Command for two years until he became commander of the 9th Air Force, at HQ TAC.

General McNickle's awards include the Legion of Merit, Distinguished Flying Cross, British Distinguished Flying Cross and the Air Force Outstanding Unit Award.

Gen Betts Delivers Keynote At Mobility R&D Seminar

Chief of Research and Development Lt Gen A. W. Betts gave the keynote address at the 2-week Mobility Research and Development Seminar held at Wayne State University, Detroit, Mich., under sponsorship of the 5001st U.S. Army Reserve R&D Unit.

General Betts emphasized current mobility problems in Southeast Asia during an overview of U.S. Army research and development activities to improve ground and air mobility.

Other major speakers included Brig Gen William Durrenberger, who reported on R&D activities of the U.S. Army Tank-Automotive Center, Warren, Mich.; Brig Gen John K. Boles, Deputy CG, U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md.; and Brig Gen John R. Guthrie, Director of Developments, Office of the Chief of R&D.

Presentations by industrial and university speakers were headed by Dr. P. W. Lett, Chrysler Corp., who discussed ground mobility vehicles.

Eighty-five participants represented both Army Reserve and Active Army ranks. The 5001st USAR R&D Unit is composed of officers employed in industry, academic institutions or other professions in the Detroit area.

GIMRADA Institute Hires Two Research Consultants

The U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA) has employed Dr. Ivan Mueller and Dr. Heinrich Eichhorn von Wurmb as consultants for three months.

Dr. Mueller, professor of geodesy at Ohio State University, will conduct two workshops in the GIMRADA Research Institute for Geodetic Sciences. He also will assist in planning and developing an effective Army satellite geodesy research program.

Dr. Eichhorn von Wurmb, head of the Department of Astronomy at the University of South Florida, will advise the Institute in celestial mechanics and star catalog use and updating as these relate to satellite geodesy. He will review and analyze the GEOPS (Geodetic Estimates from Orbital Perturbations of Satellites) computer program, and determine the influence of star catalog errors in the southern hemisphere on a global network adjustment.

The Research Institute for Geodetic Sciences was formed under a recent GIMRADA reorganization. Although it serves primarily as a research group in mapping and geodesy, it has an important advisory function. B. J. Bodnar is acting director.

Dr. Mueller was educated at the Technical University of Budapest and earned a PhD degree at Ohio State University. He has served as a research scientist and in a consultant

capacity with the National Aeronautics and Space Administration, the Air Force and private concerns.

Dr. Eichhorn von Wurmb studied mathematics, physics and astronomy at the University of Vienna, Austria, where he received his doctorate. A fellowship grant by the Scientists Research Project brought him to the United States and he joined the McCormick Observatory staff at the University of Virginia. Later, he served as assistant professor of astronomy at Georgetown University.



SATELLITE geodesy and astronomy professors, Dr. Heinrich Eichhorn von Wurmb (left) and Dr. Ivan Mueller (right), confer with B. J. Bodnar, acting director of GIMRADA Research Institute for Geodetic Sciences, upon their arrival at Fort Belvoir, Va.

SARS Fellowships Recognize Research of 3 Career Scientists

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Pioneering Research Division, a position he has held at the Natick Laboratories since 1954, and is internationally recognized as an expert in photographic and radiation chemistry, as well as in food flavor research. He is responsible for supervising a staff of 118 civilians, 40 of whom have PhD degrees.

The Pioneering Research Division has provided research support to development projects in the fields of microbiological deterioration, food research, and new materials through basic studies in high-energy radiation physics; also, organic synthesis, natural product chemistry, spectroscopy, flash photolysis, biophysics, spore physiology, polymer chemistry, radiation chemistry, sensory physiology and human capabilities.

During a year of study in Europe, Dr. Bailey will engage in research and study in theoretical chemistry, with special emphasis on conformation theory and analysis, quantum chemistry and photo and radiation chemistry, including methods of analysis and biochemistry of volatile food flavors.

The tentative schedule calls for Dr. Bailey to reside at Nottingham University in England for about eight months. There his efforts will be associated with Prof. F. S. Dainton, FRS, vice chancellor of the University, head of the Department of Chemistry, one of the world's leading radiation chemists, and immediate past president of the celebrated Faraday Society.

Prof. Dainton also has been appointed by the Council for Scientific Policy of the Royal Institute for Chemistry to undertake an inquiry into the supply of candidates for the universities in science and technology, including research planning and management. Dr. Bailey is also interested in this study and hopes to discuss the overall problem with British scientific leaders.

Other points in Dr. Bailey's study and research itinerary will include The Netherlands Central Institute for Nutrition and Food Research, the largest laboratory of its kind in Europe. He expects to spend about one month in close association with the director, Dr. C. Engel, on research management and planning and the study of volatile components in foods.

In France, Dr. Bailey will spend one month at the Institute for Biological Physical Chemistry under the direction of Prof. Bernard Pullman

who, with his wife, is the author of a recent treatise on Quantum Biochemistry. Dr. Bailey also plans to visit other French laboratories and academic institutions, including the French Atomic Energy Laboratory at Saclay and the Centre National de la Recherche Scientifique.

In Germany, he will study with Prof. George Kortum, director of the Institute of Physical Chemistry at the University of Tubingen. Prof. Kortum studied with Dr. Bailey at the Natick Laboratories for three months in 1962.

Dr. Bailey also plans to visit a number of additional laboratories and research institutes in Germany and in Switzerland, including the Federal Research Institute for Food Preservation at Karlsruhe, Germany, and the Max Planck Institute for Physical Chemistry and Spectroscopy at Göttingen.

Among benefits Dr. Bailey expects to derive from his SARS Fellowship is substantially broadened knowledge of chemical theory that will have potential application in new compounds for protection of military personnel against atomic weapons flash blindness.

Author of 11 publications reporting on his work, Dr. Bailey started his military/civilian career in 1951 at the Philadelphia Quartermaster Laboratories as chief, Analytical Chemistry Section. A year later he became a physical sciences administrator with Dr. Ralph G. H. Siu, now Deputy Director of Developments, U.S. Army Materiel Command, as his immediate supervisor.

Graduated from State College of Iowa in 1937 with a BA degree in chemistry, he received an MS in physical chemistry from Iowa State University in 1938. He continued his education there to earn a PhD in 1942, studying under research fellowships.

OSCAR L. BOWIE is a 44-year-old GS-15 research team leader at the Army Materiel Research Laboratory at Watertown, Mass., where he has been employed since May 23, 1944. He is credited in his nomination for a SARS Fellowship with research studies that "have provided accurate determinations for the stress intensity factors for technologically important specimens employed in evaluation of materials behavior."

After graduating from American International College with a BA degree in mathematics, he received a Rockefeller Foundation Fellowship at Brown University (1942-44) and did graduate work at Massachusetts In-

stitute of Technology (1946-50). He has authored or presented 18 technical papers on results of his research and has prepared 42 Government reports.

Backed by his long-established relations at MIT, Bowie has outlined a SARS plan that provides for continued studies with Prof. F. McClintock, MIT Department of Mechanical Engineering, on mechanics aspects of materials behavior related to most contemporary problems in materiel design.

Bowie is primarily concerned with problems of materials related to the Army's need for improved mobility through lighter weight of vehicles without sacrificing reliability and economy. The proposed research plan will concentrate effort in plasticity, viscoelasticity, the dislocation theory, and other materials fracture problems.

Results of his work have gained recognition in the form of invitations to present papers at several major conferences, including the 8th International Congress on Theoretical and Applied Mechanics at Istanbul, Turkey.

FRANK J. RIZZO is acclaimed in his SARS Fellowship nomination as "the Department of the Army's principal authority in the field of dyes and their application to textile materials."

"Within DoD his outstanding qualifications and competence are attested by frequent requests from the Navy and Air Force for assistance on problems involving textile colorants. He is recognized throughout the industry as one of the leading dyestuff chemists in the United States in the field of dyestuff application. . . . In addition, he is held in high esteem in Canada and Great Britain for his work in dyestuffs and colorants."

"During the past 20 years, Mr. Rizzo has pioneered in the application of new dyes and dyeing systems on military textiles, including the application of reactive and premetalized and new dyeing systems on natural and synthetic fibers. . . ."

The SARS plan Rizzo has outlined is directly related to the Army's research program on the achievement of improved camouflage in combat clothing and equipment. One of the objectives is the achievement of a camouflage system with the potential for providing thermal and possibly chemical warfare protection as part of the colorant system through selection of appropriate dye structures.

(Continued on page 8)

STRATCOM Expands DoD Net in Europe

Activation of a major segment of the U.S. Department of Defense communications network in Europe was announced recently by the U.S. Army Strategic Communications Command (STRATCOM) European operations.

The new system is part of the European Tropo-Army (ET-A) network of stations in Western Europe. Adding more than 1,200 channel-miles to the complex, it ties in communications from Leghorn, Italy to Bremerhaven, Germany, and from Heidelberg, Germany, to within a few miles of Paris.

The announcement of the system expansion said it is "equivalent to 100 telephone circuits from Boston to San Francisco, with extensions into 20 major cities en route."

Ultimately, through further expansion, the system will have a capacity to handle a large volume of voice and

data traffic between far-flung points while providing users with "instant access" for priority calls.

Employing the latest high-speed automatic-switching techniques, the ET-A network permits any designated control center to establish rapidly voice communications with

Bess Succeeds Kelsey as Deputy CG of STRATCOM

Brig Gen Walter B. Bess is now deputy CG at STRATCOM Headquarters in Washington, a position Brig Gen Kelsey relinquished to succeed him as STRATCOM-Europe commander and deputy chief of staff, Communications-Electronics, United States Army in Europe.

A 1936 graduate from the United States Military Academy, General Bess has served there as an instructor and also has taught electrical engineering at Massachusetts Institute of Technology following graduation from MIT.

General Bess has had key Signal Corps assignments at European Command Headquarters in Germany, and U.S. Army Pacific Headquarters in Hawaii. He also served as chief of the Personnel and Training Division, Office of the Chief Signal Officer.

BRIG GEN JOHN E. KELSEY served from 1960 to 1964 as assistant chief of staff, Communications, with the Allied Land Forces Central Europe, Fontainebleau, France, and commander of the STRATCOM Joint Support Command at Fort Ritchie,

any or all stations throughout the system.

Under contract with the U.S. Army Electronics Command, Fort Monmouth, N.J., the International Telephone and Telegraph Federal Laboratories at Nutley, N.J., has been involved in the development of the system over a 4-year period.

SARS Fellowship Awards Recognize Army Scientists

(Continued from page 7)

During a year of study and research in Europe, he will establish close relations with Prof. I. D. Ratte and members of the Department of Colour Chemistry at Leeds University in England. He also will work with Dr. R. H. Peters at the University of Manchester and Dr. R. S. Asquith at the Bradford Institute of Technology, as well as with top scientists at Imperial Chemical Industries, Blakeley, Manchester and Harrogate.

In Switzerland, he will work with Dr. H. Zollinger of the Swiss Federal Institute of Technology at Zurich. Dr. Zollinger has long been recognized as a leading scientist in the study of photostability of dyes.

In Germany, Rizzo will work with a trio of well-known scientists at the Technische Hochschule at Munich, Drs. F. Doerr, G. Scheibe and J. Heiss, and also with Dr. H. Rath at Technische Hochschule in Stuttgart. The itinerary calls for visits to Marberg University to study with Dr. H. Kuhn and to the Textil Forschungsanstalt at Krefeld.

Rizzo was a 1961 Army Research and Development Achievement Award winner. His nomination for a SARS Fellowship concludes with:

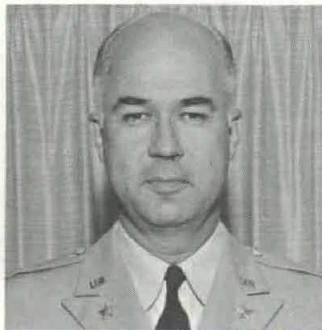
"These visits with scientists probing different aspects of the general problem of photodegradation of colored textiles are intended to provide a basis for critical analysis at a point in time during the candidate's active research which may help to focus effectively on significant factors."

JCS R&D Official Takes MICOM Intelligence Assignment

Fresh from a tour of duty in the Research and Development Division, Joint Chiefs of Staff, Washington, D.C., Col Thomas A. Rodgers recently assumed duties as director, Missile Intelligence, Army Missile Command, Redstone Arsenal, Ala.

From 1958 to 1961, he was chief, Missiles and Space Division, Office of the Chief of Research and Development, Department of the Army. A graduate of the Army Guided Missile School, Fort Bliss, Tex., he has spent much of the past 16 years in Army missile development assignments.

Col Rodgers has served on the Guided Missile Committee of the Research and Development Board, Department of Defense, and is a former commanding officer of the 31st Brigade of the Army Air Defense Command.



Col Thomas A. Rodgers

Before entering active Army service in 1941, he was an assistant professor of physics at Mississippi State University. Following World War II, he was acting head of the physics department for a year.

He received bachelor's and master's degrees in mathematics and physics from the University of Alabama, later did graduate work at the University of Michigan, and received a master's degree in international affairs from George Washington University.

The colonel is also a graduate of the National War College, the Command and General Staff College and the Armed Forces Staff College.

ADFSC Marks First Full Year in Data Processing

Aug. 1 marked the first anniversary of the Army Automatic Data Field Systems Command (ADFSC) headquartered at Fort Belvoir, Va.

Commanded by Brig Gen Roger M. Lilly, ADFSC began with the merger of the Command and Control Information Systems Group of the Combat Developments Command (CDC) and the Command and Control Information Systems 1970 Project of the Army Materiel Command (AMC).

Subordinate to the AMC and the CDC, the ADFSC has a mission "to significantly improve the Army's command, control, and combat effectiveness by the application of automatic data processing techniques in selected tactical and combat service functions within the Army in the field."

Three major systems under development by ADFSC are the Tactical Fire Direction System (TACFIRE), Tactical Operations System (TOS) and the Combat Service Support System (CS₂).

TACFIRE will increase the effectiveness of fire support through improved accuracy and more rapid use of target information. It is designed to automate selected artillery functions such as ammunition and fire unit status, fire planning, target intelligence, tactical and technical fire control, artillery survey and meteorological data.

The TOS will assist in certain functions of operations, intelligence and fire support coordination. Areas include friendly unit status, task, organization, road networks, tactical troop movement, barrier planning, radio frequency allocation and engineer tactical operations.

TOS aims to provide the field commander with current, accurate information and intelligence for consideration in making operational decisions. A major field experiment of this system unit is being conducted in the Seventh Army, in Germany.

The CS₂ is designed to automate selected personnel, administrative and logistical functions. Included in these are unit readiness reporting, stock control, materiel readiness reporting, ammunition service, transportation service, personnel management, strength accounting, military pay, medical services, casualty reporting, graves registration, military police services, maintenance services and logistical administration. This system will be tested at Fort Hood, Tex.

The ADFSC is responsible for the Field Artillery Digital Automatic Computer (FADAC), the Tactical Imagery Interpretation Facility (TIIF),



Brig Gen Roger M. Lilly

and the Direct Support Unit/General Support Unit (DSU/GSU) Project.

The command has established a

number of field agencies, principally the Automatic Data Field Systems Design Agency (ADFSDA) at Fort Huachuca, Ariz., which is designing and testing the CS₂; the Resident Study Group (RSG) in Germany, which will operate the TOS experiment there; and the Combat Service Support System Assistance Group (CS₂AG), which is helping the Seventh Army introduce a replacement system for the MOBIDIC computer in the Seventh Inventory Control Center, Germany.

At Wright-Patterson Air Force Base, Ohio, ADFSC has a detachment in the Air Force Systems Program Office participating in the development of improved intelligence interpretation and processing facilities for use by all the services. In Europe and Southeast Asia, ADFSC has stationed new equipment introduction teams.

AMC Classifies Shillelagh Missile System Standard A

The Army's Shillelagh gun-launched guided missile system being developed for armored vehicles recently was classified Standard "A" by the Army Materiel Command Technical Committee.

The classification means that a newly developed item of materiel is considered the most advanced and satisfactory for a specific requirement. Shillelagh is in full production at the Army Missile Plant, Lawndale, Calif.

Adopted as the main armament for the General Sheridan vehicle, the Shillelagh is planned for use in a version of the current M60 main battle tank and the U.S.-Federal Republic of Germany Main Battle Tank for the 1970s. Shillelagh's 152mm gun-launcher can fire either missiles or conventional rounds of ammunition.

The missile is guided to its target by a command system mounted on the launching vehicle and is capable of maneuvering in flight to attack a moving target. Used for frontline attack and infantry support, Shillelagh will give increased firepower against armor, troops and field fortifications.

Multiple-Target Area Radar Delivery Scheduled for 1967

Delivery of the portable AN/PPS-5 combat area radar, designed to detect and track personnel and vehicles at distances of more than six miles, is scheduled to start in February and be completed by June 1967.

Under technical direction of the U.S. Army Electronics Command, the AN/PPS-5 was developed by Airborne Instruments Laboratory (AIL) as a second-generation field radar to keep constant watch over areas containing multiple targets.

The battery-powered solid-state circuit radar displays target information visually and aurally, and is capable of tracking moving targets in azimuth, or direction, as well as range.

Designed to give greater resolution than earlier similar-type radars, the AN/PPS-5 incorporated an automatic sector scan capability. Visual display of targets shows position and azimuth in exact relation to radar position.

All targets in the sector surveyed are visible at one time and can be distinguished by the operator through the audio output or by the radar "signature" of the display.



AN/PPS-5 Combat Area Radar

4-Nation Technical Cooperation Program Group Slates Meet in Australia

Scientists representing the four nations in The Technical Cooperation Program (TTCP) will convene for the first time in Australia in 1967 at the ninth session of the research and development organization.

TTCP Nonatomic Military R&D Subcommittee (NAMRAD) has accepted an invitation extended by Australia through Sir Leslie Martin, Australia's Scientific Adviser to the Department of Defence, to meet in March in Canberra.

When Australia joined the alliance in July 1965, TTCP became a quadripartite body cooperating in science and technology as a matter of national defense, similar in purpose and identical in membership to the ABCA (America, Britain, Canada, Australia) Army Standardization Program.

TTCP meetings have been held in Washington, London, Quebec, Singapore and at governmental installations throughout the United States and abroad.

Dr. Finn J. Larsen, Principal Deputy Director of Defense Research and Engineering, chaired a recent TTCP meeting at the Pentagon. In addition to Sir Leslie Martin, representatives of other nations included Sir Solly Zuckerman, the United Kingdom's Chief Scientific Adviser to the Secretary of State for Defence, and Dr. A. Hartley Zimmerman, chairman of Canada's Defence Research Board.

Since the program began as a tripartite effort in 1958, interests of the TTCP have expanded to embrace a dozen major subjects and two specialties. At the Washington meeting, the NAMRAD group concentrated on counterinsurgency, one of the new fields, with specific emphasis on environmental data, behavioral sciences, systems analysis and material research and development.

Heads of the four national defense R&D organizations comprise the NAMRAD subcommittee while matters in the atomic field are studied by another subcommittee under TTCP Combined Policy Committee (CPC).

The CPC consists of foreign and defense ministers of the United Kingdom and Canada, Secretaries of State and Defense of the United States and the heads of the four nations' atomic energy agencies.

Basically an aggregate of activities by subgroups and working panels, TTCP began eight years ago as a result of a Declaration of Common Purpose by the President of the

United States and the Prime Minister of Great Britain.

The Declaration stated, in part: "The countries of the Free World are interdependent and only in genuine partnership, by combining their resources and sharing tasks in many fields, can progress and safety be found." Shortly after, Canada joined the program.

Today, TTCP is responsible for considering the entire field of defense research and development, including the R&D programs of each of the armed services of member nations. Particular attention is directed to areas of interest to more than one of the services and to interdisciplinary problems.

Aims and activities of TTCP bring the organization into contact with several existing service organizations

whose interests are related: the Naval Tripartite Standardization Program, the ABCA Armies and the Air Standardization Coordinating Committee.

To provide maximum coverage in all areas of defense activities, active subgroups are headed by a national leader of each participating country. Subgroups are: Guided Missiles; Defense Against Ballistic Missiles; Undersea Warfare; Aircraft and Aero Engines; Electronic Devices; Infrared, Radar Techniques; Military Space Research; Nuclear Weapons Effects; Ordnance; Material; Electronic Warfare; Counterinsurgency Warfare Research; and Communication Techniques.

The U.S. Secretary of Defense and defense ministers of the other participating countries have strongly endorsed TTCP as "an important source of encouragement of technology in selected areas, as a means of providing the extensive technical interchange necessary for broad cooperation, and as a means of identifying potential cooperative R&D programs."

Bantam Burner Packs Heat



A lightweight multifueled burner, designed as a heat source for backpack 100-watt thermoelectric generator, is demonstrated by Harvey Hunter (left) and Herbert Hazard at Battelle Memorial Institute. Stringent weight and power-consumption requirements of the U.S. Army Electronics Command, sponsor of the development at Battelle, were met by using an ultrasonic atomizer and transistorized driver powered by a small rechargeable battery. Designed for 20,000 B.t.u. per hour input, the 2.5-pound unit operates equally well with fuels ranging from gasoline to No. 2 heating oil, and requires only 9 watts of electrical power at 12 volts. The wire-screen mantle, normally placed above the burner, nearly fills cavity within the thermoelectric generator for which burner is designed. Radiation from mantle heats generator's thermocouple junctions to a uniform temperature of 1650 F. The base of the unit is 10 inches long.

Special Instruments Ordered For Rigid-Rotor Helicopter

Extensive instrumentation of a rigid-rotor helicopter to measure unsteady aerodynamic loads and accompanying stresses has been ordered by the Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va.

Flight test data will be recorded in compound and helicopter configurations for normal and extreme flight regimes. Loads will be measured by miniature pressure transducers on the rotor blades at 46 stations. Blades will also be "strain gauged" to measure the detailed history of moments of vibration.

The helicopter will contain instruments to measure usual flight parameters such as airspeed, altitude, control position and center-of-gravity acceleration.

Data obtained will be used to validate methods for predicting unsteady loads and moments encountered in flight, to be used in future aircraft design. The instrumented flight-test plan will cover the complete operational spectrum of the helicopter, including hover, steady forward flight to maximum velocity, flare to landing, pull-ups, steady turns and transition.

The test program is expected to take 12 months. A contract for \$375,000 has been awarded to the Lockheed-California Co. to install the instruments and conduct measurements.

Col Jean Heads Support Command at Redstone Arsenal

Leadership of the U.S. Army Missile Support Command, Redstone (Ala.) Arsenal was assumed by Col J. N. Jean when Col Thomas W. Cook retired from Army service in July.

Col Jean served at Redstone in 1956 with the Army Ballistic Missile Agency, which developed the Army's Redstone and Jupiter missiles and launched Explorer I, the Free World's first satellite. He recently concluded a 3-year tour as chief, Plans Division, Supply and Maintenance Agency, HQ Communications Zone, Europe, at Orleans, France.

In 1958 when the Army Ordnance Missile Command was activated he became secretary of the General Staff and served until July 1961. He then served a year at Picatinny Arsenal, Dover, N.J., before attending the National War College, Washington, D.C.

Upon graduation he was assigned to Germany and served successively as deputy Ordnance officer, U.S. Army, Europe and commander, 57th Ordnance Group, which became the 57th Ordnance Brigade.

Col Jean graduated with honors from Indiana University and accepted a Distinguished Military Graduate's commission in the Regular Army in September 1939. He served in the European Theater during World War II, then returned to the United States and took graduate work in physics and optics at the University of Rochester, N.Y., receiving his MS de-

AIAA Slates April Symposium On Space Thermal Problems

Thermophysicists and space scientists will exchange current information at a conference of the American Institute of Aeronautics and Astronautics (AIAA), Apr. 17-19, 1967, in New Orleans, La.

Sponsored by the National Bureau of Standards and the U.S. Air Force, the AIAA meeting will be concerned primarily with spacecraft thermal problems and possible solutions.

Dr. Y. S. Touloukian, director of the Thermophysical Properties Research Center, Purdue University, said that for the first time planetary radiative properties, which contribute significantly to the space radiation environment, will be a discussion topic.

Since 1959, five thermophysics symposia have been held to bring physicists studying thermal properties of solids together with space scientists who need current data on these properties. The most recent symposium was held in September 1965.

gree in August 1949.

Subsequent assignments included the Armed Forces Special Weapons Project at Sandia Base, N. Mex.; Special Weapons Group, Killeen Base, Tex.; and Armored Officers Advanced Course, Fort Knox, Ky.

In Korea, Col Jean served as battalion commander, 3rd Battalion, 32nd Infantry Regiment; senior adviser to the 29th ROK Division; and senior adviser to the G-2, First ROK Army. In 1956 he attended the Command and General Staff College.

He holds the Bronze Star Medal with "V" device and Oak Leaf Cluster; Army Commendation Medal; Order of Chung-Mu from the Republic of Korea; and various campaign and service medals.



COL J. N. JEAN looks over display of documentary photography during get-acquainted tour of activities at the U.S. Army Missile Support Command.

NAS-NRC Invites Dr. Watson to Serve Second Term

Dr. Robert B. Watson of the U.S. Army Research Office, Arlington, Va., has been appointed to a second term as Army liaison physicist for the National Academy of Sciences-National Research Council.

Representing the Chief of Research and Development, Dr. Watson will serve with the NAS-NRC Division of Physical Sciences. He is chief of the Physics, Electronics and Mechanics Branch, Physical and Engineering Sciences Division, Army Research Office.

Dr. Frederick Seitz, president of NAS-NRC, and Dr. Gerald M. Clemence, chairman of the Division of Physical Sciences, extended the invitation.

Leech Named Chief, AMC Combat Surveillance Office

Assignment of Col Lloyd L. Leech, Jr., to succeed Brig Gen Thomas M. Rienzi as chief of the Combat Surveillance Office, U.S. Army Materiel Command Headquarters, Washington, D.C., has been announced.

General Rienzi is now commanding general of the U.S. Army Signal School at Fort Monmouth, N.J. He was the first chief of the Combat Surveillance Office when it was established in March 1965.

Col Leech took over responsibility for directing and coordinating AMC activities and interests in combat surveillance, target acquisition and night vision technology, including requirements, capabilities, materiel development, procurement, support and related matters. He will retain his designation as the project manager for the Surveillance and Target Acquisition Aircraft System (STAAS).

Col Leech is the son of a Marine Corps officer and was graduated from the Virginia Military Institute in 1942 with a bachelor's degree in electrical engineering. He was commissioned in the field artillery of the Regular Army.

During World War II, he served in a signal battalion in the European Theater. Under the Army graduate school program, he received a master's degree in electrical engineering in 1948 from the University of Illinois, and was assigned to Army Field Forces Board Number 1 at Fort Bragg, N.C.

Graduated from the Artillery Advanced Course in 1952, he served with the Second Infantry Division in Korea as executive officer, 37th Field Artillery Battalion, and commander, 38th Field Artillery Battalion.

From 1958 to 1961, he was assigned to the Joint Staff of North American Air Defense Command, Ent Air Force Base, Colo. Then he was commander of the 94th Artillery Group in Germany until January 1964 and deputy artillery officer, Seventh U.S. Army, until he became STAAS project manager in July 1965.

Col Leech is a graduate of the Artillery School, both field and air defense courses, the Command and General Staff College, and the National War College.



Col Lloyd L. Leech, Jr.

Tests of Antimalaria Drug Indicate 50 Percent Improvement

Fifty percent reduction in the number of U.S. troops who will be stricken by falciparum malaria in Southeast Asia is indicated by Army field tests of diaminodiphenylsulfone.

The Army Surgeon General's Office recently authorized the use of diaminodiphenylsulfone (DDS), a drug long used to treat leprosy. Soldiers are being given daily doses of 25-milligram pills and will continue to take the drug for one month after leaving the combat area.

A team from Walter Reed Army Institute of Research (WRAIR), Washington, D.C., conducted tests with DDS in the infested areas from December 1965 until May 1966.

Reports on the study show that soldiers taking the drug who still may be stricken with malaria will be able to return to duty in two or three weeks, instead of six to eight weeks. Chance of relapse, according to WRAIR scientists, is cut from 40 to four percent.

Last year, 1,801 soldiers in Viet Nam contracted malaria and lost 63,035 man-days from duty. More than

Army Mohawk Claims Records In New FAI Weight Category

Five world records have been claimed recently by the Army's Mohawk turboprop surveillance aircraft.

- Lt Col John Collins flew 2,422 miles from Fort Lewis, Wash., to Sherbrooke, Quebec, Canada, in 9 hours 34 minutes, averaging 255 m.p.h.

- Col Edward L. Nielsen, project manager for the Mohawk Surveillance System, flew a 100-kilometer closed-circuit course at 5,000 feet in 12 minutes 48.8 seconds, averaging 292 m.p.h.

- Jim Peters, pilot for the Grumman Aircraft Engineering Corp., set three records: climbing to 9,842 feet in 3 minutes 46 seconds; climbing to 19,685 feet in 9 minutes 9 seconds; and sustained altitude of 32,000 feet in horizontal flight.

The records have been filed with the Federation Aeronautique Internationale under a new category for Mohawk-type aircraft weighing between 13,227 and 17,636 pounds.

The OV-1 Mohawk, used in Southeast Asia since 1962, is the standard Army Aerial Surveillance and Target Acquisition Aircraft System. It is equipped with cameras, side-looking radar and infrared devices.

a dozen deaths from malaria have occurred since January 1965.

Discovery of the antimalarial qualities of DDS is considered a major breakthrough in the Army Medical Service Malaria Research Program. In the continuing research, more than 100 university teams, private firms and military research units are working together at WRAIR and in the field.

DDS is aimed specifically at the drug-resistant strain of falciparum malaria first reported in South America in 1960 and confirmed among U.S. troops in Viet Nam in mid-1964. A less serious malaria, vivax, is under control in Viet Nam with chloroquine-primaquine drugs.

The falciparum type of malaria is found in highlands of Viet Nam and the rate of infections began to rise last fall as military operations spread out from base camps. The disease-carrying mosquito normally flies only a mile, researchers discovered, and bites only at night.

Incidence of the disease can be kept low at base camps with sprays and protective netting, but the rate of infection rises as troops move into the jungle. Malaria has the potential of incapacitating entire military units by evacuation, prolonged hospitalization and death.

When U.S. and Allied Forces in Viet Nam, Thailand and Malaysia began experiencing the previously unrecognized falciparum malaria, the malaria research program was stepped up to find a prophylaxis or thera-

peutic measure to battle the drug-resistant disease.

Of the four types of malaria, only benign tertian malaria (vivax) and malignant tertian malaria (falciparum) are important from a military standpoint. Vivax, the most common, is rarely fatal; falciparum malaria is often fatal if not treated quickly and effectively.

During the Korean War, some 39,000 cases of malaria were reported among U.S. Army personnel, despite continuous improvement in control methods. During World War II, the ratio of vivax to falciparum was seven to one, but falciparum malaria killed almost twice as many troops. Approximately half a million U.S. troops developed malaria and 302 died. In the South Pacific area, malaria caused more than five times as many casualties as combat.

In 1943 Sicilian campaign, 21,482 American soldiers were hospitalized with malaria and 17,375 casualties were reported.

Malaria has played a key role in the evolution of civilization, and was detrimental to the development of the United States until the 20th century. Even as recently as 1933, some counties in the southern part of this country reported infection of more than 80 percent of their school children.

It is estimated that more than one billion persons live in malarial areas of the tropics. Despite concentrated control programs, some 100 million people have malaria and, of these, one million die each year.

25-Year Veteran Selected 'Enlisted Chief of Staff'

From 4,700 senior noncommissioned officers, Army Chief of Staff General Harold K. Johnson has chosen an incumbent for the newly created position of Sergeant Major of the Army—the "enlisted chief of staff."

Sergeant Major William O. Wooldridge, 43-year-old decorated veteran of 25 years service, was sworn in by General Johnson at a Pentagon ceremony, Washington, D.C.

The top enlisted man of the Army was serving with the 1st Infantry Division in Viet Nam when the appointment was made. He had recently volunteered for an additional six months in Southeast Asia and was not scheduled to return to the U.S. until March 1967. Wooldridge also served with the 1st Infantry in World War II.

He serves now on General Johnson's personal staff in Washington, D.C., and is senior enlisted adviser and consultant on enlisted morale, pay, promotion and other enlisted personnel matters.

S/Maj Wooldridge has been awarded the Silver Star with Oak Leaf Cluster, Legion of Merit with Oak Leaf Cluster, Bronze Star Medal, Air Medal with five Oak Leaf Clusters, Army Commendation Ribbon and Combat Infantryman Badge with star.



S/Maj W. O. Wooldridge

Army, University Join in Nurses Training Program

Ninety-seven Army Reserve student nurses have been enrolled by the University of Maryland for a 2-year clinical course at Walter Reed Army Medical Center leading to BS degrees and Nurse Corps commissions.

This is the first increment of a 2-year-old Department of Defense-approved nationwide program to alleviate the shortage of Army nurses.

Currently enrolled at 110 colleges and universities throughout the country are 228 women and seven men who have enlisted in the U.S. Army Reserve for four years in pay grade E-3. Upon completion of two years study in general education and pre-professional subjects they will be reassigned to the Walter Reed Army Institute of Nursing (WRAIN).

The initial WRAIN Program students were welcomed at Walter Reed last June by The Surgeon General of the Army Lt Gen Leonard D. Heaton and University of Maryland President Wilson H. Elkins.

Inaugural day for the Army-University nursing program included ribbon-cutting at the WRAIN Delano Hall, whose facilities were enhanced for the new program by Congressional appropriation.

Nursing and clinical courses at WRAIN are being taught by a faculty appointed by the University. Upon graduating, the nurses will be commissioned second lieutenants in the Army Nurse Corps to serve an additional three years on active duty as Reserve officers.

In 1963, The Surgeon General's Committee reported that the supply of nurses is one of the Nation's critical health problems. The American Nurses' Association reported to a House Interstate Subcommittee that there would be a national need for 130,000 more nurses by 1970 and declared the current capacity of nursing schools "woefully inadequate" to meet this requirement.

Also documented is the fact that many young women turn to other pro-

fessions because of the limited facilities of collegiate schools of nursing. It was reported that in 1962 a total of 92 collegiate schools had rejected 1,499 students for lack of nurse-training facilities, faculty or both.

President Johnson Extends Surgeon General's Tenure

Army Surgeon General (Lt Gen) Leonard D. Heaton has been appointed to continue in that office until Dec. 1, 1968, under a 2-year extension announced by President Johnson.

General Heaton was appointed The Surgeon General by President Eisenhower in 1959 for a statutory 4-year term. The late President Kennedy extended the appointment for two years in May 1963 and President Johnson approved a second extension to December 1966.

When General Heaton reaches the mandatory retirement age of 64 in November 1966, he will be advanced to 3-star rank on the retired list and called to active duty on Dec. 1.

Completion of a 9-year tenure in 1968, however, will not give him the distinction of having served longer than any man in that office. Maj Gen Merritte W. Ireland served from 1918 to 1931 and Brig Gen Joseph Barnes from 1864 to 1882. Tom Lawson (no rank listed in the records) served from 1836 to 1861.

The 4-year statutory limitation did not apply in those days. General Heaton is the first Surgeon General to receive an extension in more than 30 years and is also the first to be appointed by three different Chief Executives of the United States.

Because of his international renown as a surgeon, General Heaton has performed major and extremely deli-

The WRAIN Program each year will provide approximately 100 fully qualified nurses trained in an Army environment. Availability of the Army's vast clinical resources to prepare qualified nurses is considered an important contribution to the military and national nursing needs.

cate operations on many distinguished leaders, including Dwight D. Eisenhower, John Foster Dulles when he was Secretary of State and the late General of the Army, Douglas MacArthur.

Two Presidents honored him with the Distinguished Service Medal, and he received the Legion of Merit for his contribution to the sick and wounded at Pearl Harbor in December 1941. Two Oak Leaf Clusters were added to the latter award for his wartime service as commander of the 160th General Hospital and the 802nd Hospital Center in Europe.

General Heaton attended Denison University and received his M.D. degree from the University of Louisville, Ky. He holds honorary degrees from those universities as well as from the University of West Virginia and Brandeis University.

He is a Diplomate of the American Board of Surgery and a Fellow of the American Surgical Association, the Southern Surgical Association and Pacific Coast Surgical Association.

ERDL Tests Equipment For Clearing Roadsides

Rapid clearing of areas ideal for ambush along roads in Viet Nam is envisioned through use of new equipment being tested at the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Two clearing blades commercially manufactured by the Rome Plow Co., Cedartown, Ga., feature a "stinger," a sharp projection used to split large trees so they can be sheared at ground level.

The same blades can be used to pile cut material in windrows and also to construct drainage ditches. A heavy duty cab guard protects the operator and tractor, and a guide bar above the blade controls the direction of falling trees.

Using the large, 4600-pound, blade on an Allis Chalmers HD-16M tractor, ERDL engineers have been able to clear an acre in an hour. Half an acre an hour can be cleared with the smaller 2800-pound blade mounted on a Caterpillar D-6B tractor.



Lt Gen Leonard D. Heaton

OCMH Releases SigC History

The Signal Corps: The Outcome (Mid-1943 through 1945), a new official history by Dr. George Raynor Thompson and Dixie R. Harris, has been released by the Office of the Army Chief of Military History.

The 65th volume in the series "United States Army in World War II" is the third and final Signal Corps volume in the Army's "big green" series. It is for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20401.

Army Airborne Radar Probes Depth of Greenland Icecap to 10,600 Feet

Greenland's icecap was sounded recently to a depth of 10,600 feet, believed the full depth of the mantle, by an Army team using airborne radar techniques developed by the Army in 1961 for testing in Canada.

Measurements recorded recently were made as part of Project Icecap, being conducted by the U.S. Army in cooperation with the Danish Government to gain new knowledge of the depth and nature of the ice mantle. The 10,600-foot sounding was made in the North Dome region.

Army Electronics Command (ECOM) scientists in a C-121 Constellation flying laboratory made spot readings. They are being assisted by personnel of the Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H., and the Army Research Support Group.

Senior scientist on Project Icecap is John W. Walker, geophysicist of the ECOM Institute for Exploratory Research. The photographic record of the measurements will become permanent exhibits of the project.

The techniques used in taking the soundings were developed originally by a team headed by Amory H. (Bud) Waite, noted Army polar explorer, who retired this year to end a career that brought him many honors. He was awarded an Army R&D Achievement Award for his role in developing the airborne radar sounding method.

Modified radar equipment has been used experimentally over the past several years by ECOM to sound the



ECOM senior project scientist John Walker checks specially designed antenna, mounted in belly radome of C-121 Constellation flying laboratory. The antenna was used for signal transmission and reception during polar ice measurements to a depth of 10,600 feet.



PROJECT ICECAP participants, silhouetted by rocky outcroppings that dot the rugged terrain of Greenland, are (standing, from left) Charles Olsen, U.S. Army Electronics Command (ECOM); Victor Belmont, Lockheed Aircraft Services; Edmund F. Pawlowicz, Institute for Polar Studies, Ohio State University; Air Force Lt Edward Taylor; Albert V. Timer, Lockheed; John W. Walker, ECOM; Charles Konecko, Lockheed. Kneeling from left: Albert H. Zanella, ECOM; Arthur Klaus, Lockheed; Eugene Hryckowian, George Swistak, R. A. Fariello, ECOM.

depth of ice in the north and south polar regions.

The latest expedition is the first in which such measurements have been made during unbroken traverses by an aircraft moving at comparatively high speed. The 4-motor propeller-driven Constellation flies more than 200 miles an hour at 2,000 feet above the ice during actual operations.

Most of the earlier radar soundings were made from the surface with largely improvised equipment mounted on weasels and sleds. Some soundings were made from helicopters.

A frequently used way to measure polar ice has been to set off dynamite blasts on the surface and then derive depth readings from the complex shock-wave patterns that are picked up by a string of geophones. Although accurate, this seismic method is slow, costly and has not provided sufficient data.

Dr. S. Benedict Levin, director of the ECOM Institute for Exploratory Research, explained how the new system works:

The specially designed ice-measuring radar transmits at 30 megacycles. The radio waves on this frequency penetrate the ice, reflect from the soil or rock beneath, and send signals back to the receiver in the aircraft. These waves also reflect a signal from

the surface to give the aircraft's height above the ice.

Ultraprecise timing equipment makes a continuous record of the time it takes for the signals to travel to the surface and back and for the radar to obtain echoes from the ice-covered subsurface.

Depth of the polar cap is determined from the net time it takes for the sounding signals to make the round trip through the ice itself. Navigational data match the depth readings with geographic location.

Allowance is made in the depth measurements for the speed of radio waves which travel through the atmosphere at a rate of about 900 feet every millionth of a second. They move through ice at a little more than half that rate—about 500 feet per millionth of a second.

The ice-sounding radar sends out 20,000 pulses a second, each of which lasts a half-millionth of a second. The velocity of the waves is so rapid that the plane moves forward only a few inches while the signals make the round trip through the deep ice.

One of the Army's major interests in the ice sounding is to find out more about the behavior of electromagnetic waves, or radio signals, as they travel through solid substances.

As scientists point out, the amount

of data on polar ice that can be obtained by the airborne measuring system also is of great interest to geologists, geographers, climatologists, glaciologists and scientists working in other fields. The Greenland icecap alone amounts to more than a million cubic miles. The icy layer in the Antarctic is even more massive.

The effect these huge frigid areas have on the rest of the earth is by no means fully known.

Scientists, for example, would like to know more about the history of the icecaps themselves; the buildup and retreat of glaciers which have periodically covered large parts of southern Canada, the United States, Europe, and other regions; the rise and fall of the oceans and the overall distribution of water; and the influence which the distribution of the earth's "heat budget" has on global weather patterns and long-range climate.

Results of the recent expedition demonstrate the capabilities of the Waite airborne technique. Project Icecap scientists are hopeful that these results will provide the basis on which agencies concerned with glaciological and other research aspects can exploit the technique in more extensive measurement of the polar icecaps and mountain glaciers.

Members of the expedition include Richard A. Fariello, physicist; Albert H. Zanella, electronic technician who made a number of trips to the Arctic and Antarctic with explorer Waite; Edmund F. Pawlowicz, graduate student from the Institute of Polar Studies, Ohio State University; and George Swistak, the expedition's photographer.

Walker, Zanella and Fariello are from the Electronics Command re-

search institute's Division "S," headed by Dr. Gernot Winkler, a seasoned polar researcher who was with Waite on the original sounding expedition in 1961.

Flight crew members were Albert Timer, the pilot; Arthur Claus, co-pilot; Air Force Lt Edward Taylor, navigator; Charles Konecko, flight engineer, and Victor Belmont, an electronics engineer and radio operator.

After leaving New York's Kennedy International Airport on June 28, the expedition members halted at Goose Bay, Labrador, and then flew on to the U.S. Air Force Base at Thule in northwestern Greenland near the head of Baffin Bay.

Operating out of Thule several days while making flights across the

width of Greenland, the group then made another ice-measuring traverse to Sondrestrom, in western Greenland, about 700 miles north of Cape Farewell.

They were joined for the last series of sounding flights by Dr. Levin, Dr. Borge Fristrup of the University of Copenhagen, and Dr. Colin Bull, Director of Ohio State's Institute for Polar Studies.

The Constellation aircraft was leased by the Army from the Navy's mothball air fleet and fitted out for the expedition under the Lockheed contract.

The ice-measuring radar was designed by the Institute for Exploratory Research and built by Airborne Instruments Laboratory.

Chaparral Missile Downs Firebee in Test Firing

Chaparral, the Army's newest air defense guided missile, successfully intercepted a Firebee target missile in a recent advanced developmental test at White Sands (N. Mex.) Missile Range.

The supersonic missile, a Sidewinder 1C modified for ground-to-air use, is reported to have met all test objectives. Earlier firings were conducted at the U.S. Naval Ordnance Test Station (NOTS), China Lake, Calif. Chaparral uses the target missile's heat source to locate and destroy it.

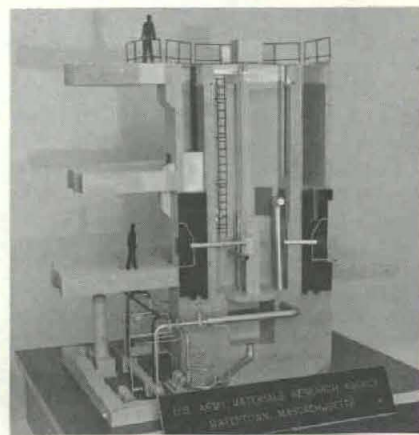
The test firing was conducted by a crew from the U.S. Army Air Defense Board, project personnel from the Aeronutronic Division of Philco Corp. and NOTS specialists.

Self-contained Chaparral system missiles can be aimed and fired against hostile aircraft from turret mounts either ground-emplaced or in-

stalled on vehicles such as the self-propelled M730 tracked carrier, railroad flat cars, flat-bed trucks and trailers.

Chaparral will be used by air defense battalions being organized by the Army to give field commanders low-altitude protection in forward areas. It will be complemented by the Vulcan Gun, the self-propelled Hawk and the Redeye missile.

AMRA Reactor Adds Power



The Army Materials Research Agency (AMRA), Watertown, Mass., recently increased the thermal power level of its research reactor from one to two megawatts to meet growing demands of experimental programs. The reactor is a "pool" type, water-moderated and -cooled, and has an open tank completely above ground to provide beams of neutrons for use in experiments in solid state physics. In addition to AMRA programs, research is done by Picatinny Arsenal, Frankford Arsenal and Fort Detrick scientists who are stationed at Watertown. Planned is increased power level to five megawatts.

Death Claims Frankford Arsenal Senior Scientist

Dr. William J. Kroeger, 60, Senior Scientist at Frankford Arsenal, died July 23 at Temple University Hospital in Philadelphia, Pa.

Among his contributions to engineering are the "scientific rationale" for interior ballistics design of the recoilless rifle, first used in World War II. With C. Walter Musser, he invented the recoilless rifle and worked on development of the 57mm, 75mm and 105mm models which became mainstays among infantry support weapons.

A pioneer in the development of escape systems for military aircraft, specifically the pilot ejection seat, Dr. Kroeger also founded the Institute for Research at Frankford Arsenal, the first such activity in the Ordnance Corps. He held 18 patents on inventions and was author of 35 articles in technical journals.

Born in Duquesne, Pa., Dr. Kroeger received degrees in electrical engineering from Carnegie Institute of Technology and the University of Pittsburgh. He had been with Frankford Arsenal since 1940.



Dr. William J. Kroeger

Army Awards \$868,374,516 in RDT&E Procurement Contracts

Army contracts totaling \$868,374,516 for research, development, testing and evaluation, and for procurement of materiel and equipment, were awarded to 125 firms since the previous edition of this publication went to press.

Contracts totaling \$49,000,598 were awarded to Sperry Rand Corp., followed by \$40,242,226 to Harvey Aluminum, Inc., and \$38,440,327 to Honeywell, Inc. Research, development, testing and installation of a wideband communication system for Viet Nam are the basis of a \$37,679,900 contract to Page Communications Engineers, Inc.

Olin Mathieson Chemical Corp. received contracts and modifications totaling \$36,967,403 for rifle barrels and ammunition. Radio Corp. of America received \$33,559,428 in electronic R&D contracts. Raytheon Co. won nine contracts totaling \$33,163,249 for Hawk missile components and ammunition. Allison Division of General Motors Corp. will get \$18,596,938 in 10 contracts for radio receivers, 20mm aircraft guns, and vehicle and hardware components.

AVCO Corp. received a \$2,934,035 modification contract and \$22,107,483 for engines for the Army's UH-1 helicopter. Day & Zimmerman, Inc., was issued a \$22,627,983 contract modification for ammunition and components.

General Time Corp. contracts for fuzes totaled \$18,497,213 and Hughes Aircraft Co. gained \$14,934,028 for development work on the TOW missile system and \$2,003,257 modification for radio sets.

Five FMC Corp. contracts totaling \$16,577,557 are for antipersonnel projectiles and loader-transporters. American Machine & Foundry Co. received a \$16,043,916 contract for demolition bombs.

Vinnell Corp. received \$15,619,673 for T-2 tankers and projects in Viet Nam. Collins Radio Co. was awarded \$14,440,458 for radio sets and \$1,000,000 for insulation provisioning kits for the UH-1.

Atlas Chemical Industries, Inc. was issued a \$14,713,613 modification for TNT and for operations and maintenance activities. Bell Helicopter Co. was awarded contracts and modifications totaling \$14,577,582 for helicopter components.

Hupp Corp. gained a \$13,838,175 modification for multifuel engines and A. O. Smith Corp., \$13,348,265 for demolition bombs.

Bowen McLaughlin-York Corp. re-

ceived contracts totaling \$11,400,594 for self-propelled guns and \$1,531,000 for utility truck platforms. R. G. Le Tourneau won two contracts totaling \$12,565,601 for demolition bombs.

Holston Defense Corp., a subsidiary of Eastman Kodak Co., will be paid \$12,274,590 for explosives, Federal Cartridge Corp., \$12,032,200 for 5.56mm ammunition.

Zenith Radio Corp. \$10,529,442 for bomb fuzes, and Atlas Corp. and H. C. Smith Construction Co. (doing business as Global Associates, Oakland, Calif.), a \$10,000,000 increment for logistical support of the Kwajalein Test Site for the Nike Zeus in the Pacific.

General Electric Co. contracts totaling \$9,679,207 are for power plant generators, machinegun components, communications equipment and R&D. Chrysler Motor Corp. will get \$9,574,299 for cargo trucks and United Aircraft Corp. \$9,500,000 for CH-54A helicopters.

Philco Corp. received \$9,406,890 for the Shillelagh missile system, and General Dynamics Corp., \$8,712,577 for a range measurement system, teletypewriter sets, maintenance equipment and HF/SSB simulators, and Northrop Corp. \$8,194,719 for 105 and 106mm antipersonnel missiles.

Red River Army Depot, will be paid \$7,800,000 for conversion of M103A1 tanks to M103A2, REDM Corp. \$7,720,448 for fuzes, and Harvard In-

dustries, Inc., \$6,374,615 for AN/GRC-50 radio sets.

S. S. Mullen, Inc., and Dravo Corp., Seattle, Wash., were issued a \$6,347,567 order for a multiproduct pipeline from Whittier to Anchorage, Alaska, and Boeing Co. will receive \$6,230,169 for helicopter work.

The Institute for Defense Analysis, Arlington, Va., will be paid \$6,220,551 for research and analysis on scientific capabilities, and Chamberlain Corp., Waterloo, Iowa, \$6,207,082 for projectiles.

Goodyear Tire & Rubber Co. will receive \$5,630,243 for shoe assemblies for M41 and M42 vehicles, Motorola, Inc., \$5,446,287 for bomb fuzes, and Ingraham Corp., \$5,214,804 for artillery components.

Contracts under \$5 million include: Continental Motors Corp., \$4,947,093 for tank components; Rand Corp., \$4,731,719 for research studies; ACF Industries, \$4,614,774 for fuzes; Hamilton Watch Co., \$4,606,511 for fuzes; Pettibone-Mulliken Corp., \$4,603,209 for trucks; Kaiser Jeep Corp., \$4,473,823 for 5-ton wreckers; Illinois University, \$4,201,000 for research; HRB Singer, Inc. (State College, Pa.), \$4,199,988 for AN/AAS-14A infrared detecting sets; Silas Mason Co., Inc., \$4,196,175 for projectiles; IT&T Corp., \$4,009,300 for communication components.

Contracts under \$4 million are: Southwest Truck Body Co., \$3,945,073

Natick Laboratories Appoint First Visiting Research Professor

Initiation of a program to establish closer working relations between scientific and engineering personnel of academic institutions and Army in-house laboratories has been announced by the U.S. Army Natick (Mass.) Laboratories.

Dr. Paul A. Buck, associate professor of food science at Cornell University, has accepted appointment as the first visiting research professor at the Natick Laboratories. Granted a one-year sabbatical leave from his faculty duties, he will investigate edible coatings of food preservatives for use by the Armed Forces and astronauts.



Dr. Paul A. Buck

Recognized as an authoritative food technologist, Dr. Buck is the author of numerous publications on food preservation, including frozen and freeze-dried foods, and has made extensive studies on flavor chemistry, enzymology and rheology.

A member of the Institute of Food Technologists, American Association of Cereal Chemists, the American Chemical Society and other professional groups, he has been on the Cornell faculty since 1959.

Graduated from the University of British Columbia, Canada, in 1944, with a BS degree, he earned an MS in 1948 and a PhD in 1954 from the University of California at Berkeley. From 1952 to 1954, he was head of the quality control program at H. J. Heinz Co. at Berkeley, covering the firm's West Coast operations in 11 states.

for semitrailers; J. H. Pomeroy and Co., Inc., and M-B Contracting Co., Inc., \$3,900,000 for runway improvements at Kadena AFB, Okinawa; Jordan Co. and Crown Construction Co., \$3,788,990 for expansion of facilities at Fort Benning, Ga.; International Harvester Co., \$3,766,759 for truck tractors and auxiliary parts for helicopters; Presto-lite Co., \$3,725,221 for batteries;

Norris Thermador Corp., \$3,411,107 for projectiles; Stevens Manufacturing Co. (Ebensburg, Pa.), \$3,105,247 for cargo trailers and chassis; LTV Electro System, Inc., \$3,071,102 increment for modification of U-8D and U-6A aircraft.

Contracts under \$3 million are: Bulova Watch Co., Inc., \$2,945,504 for head assemblies; Farmers Chemical Association, Inc., Tyner, Tenn., \$2,727,950 for TNT; Case-Master Body, Inc., Rose City, Mich., \$2,699,371 for water-tank trucks; Johnson Corp., Belleville, Ohio, \$2,690,565 for M105A2 trailers;

Amron Corp., \$2,677,201 for cart-ridges; Sylvania Electric Products, Inc., \$2,664,630 for fuzes and electronic equipment; Martin-Marietta Corp., \$2,634,964 for demolition kits; University of Pennsylvania, \$2,500,000 for materials research;

Cornell University, \$2,291,000 for materials research; Canadian Commercial Corp., Ottawa, \$2,289,194 for TNT; Holt Brothers, Stockton, Calif., \$2,273,926 for generator sets; Atlantic Research Corp., \$2,257,200 for canisters and mines; Massachusetts Institute of Technology, \$2,200,000 for materials research; Eureka Williams Co., \$2,091,889 for bomb fuzes; Control Data Corp., Rockville, Md., \$2,000,000 for electronic equipment.

Contracts under \$2 million are: Western Electric Co., Inc., \$1,893,260 for Nike Hercules modification kits; Bendix Corp., \$1,816,423 for development of a portable alarm system; De-Long Corp., N.Y.C., \$1,800,000 for trestles and auxiliary equipment; University of Michigan, \$1,749,985 for Mount Haleakala Observatory in Maui, Hawaii; Aerojet General Corp., \$1,746,428 for UH-1 aircraft shell armor seats;

Garwood Industries, Inc., \$1,710,580 for truck assemblies; Mack Truck Co., \$1,676,962 for 10-ton truck axle sets; Northwestern University, \$1,664,390 for materials research; I. D. Precision Components, Inc., Jamaica, N.Y., \$1,658,525 for rocket boosters;

Brown University, \$1,646,250 for materials research; Garrett Corp., \$1,623,421 for inflatable shelters for the Army's Medical Unit Self-contained, Transportable (MUST); Haliburton Enterprises, Inc., \$1,606,968

for Mono-pak Containers for the Red-eye missile system; Ford Motor Co., \$1,588,450 for M151A1 trucks; TRW, Inc., \$1,582,000 for an integrated management system in support of the Army's Advanced Aerial Fire Support System; Marvel Manufacturing Co., \$1,511,266 for aircraft propeller and rotor wing balancing equipment;

White Motor Corp., \$1,510,629 for M600 vehicles; Capital Radio Engineering Institute, \$1,500,000 for classified services; Mansfield (Ohio) Tire & Rubber Co., \$1,484,102 for tires; Strong Electric Co., Toledo, Ohio, \$1,451,195 for searchlights; American Hoist & Derrick Co., \$1,411,920 for truck-mounted crane shovels;

Eagle Engineering Corp., Louisville, Ky., \$1,381,944 for engine generator sets; Tridea Electronics Corp., South Pasadena, Calif., \$1,356,365 for radio beacons; H. K. Ferguson Co., \$1,341,700 for rehabilitation of the Cleveland Army Tank-Automotive Plant; North American Aviation, Inc., \$1,331,660 for automatic data processing facility;

Alcan Aluminum Corp., Riverside, Calif., \$1,319,827 for M54 rocket motors; Burgess Battery Co., Freeport, Ill., \$1,283,360 for AN/PRC-6 radio batteries; Stanford University, \$1,276,000 for materials research; MIT Division of Sponsored Research, \$1,275,000 for basic and applied research; Grumman Air Engineering Corp., L. I., N.Y., \$1,246,000 for 16 OV-1 Mohawk aircraft;

E. I. duPont de Nemours & Co., \$1,-

239,106 for TNT; Stolte and Santa Fe Engineers, \$1,243,000 for electric power, floodlights, and other security facilities; Southeast Drilling, Denver, Colo., \$1,231,622 for classified work; Emerson Electric Co., \$1,230,381 for services and components for Honest John missile; Brezina Construction Co., Salt Lake City, Utah, \$1,211,000 for tower grid modernization;

Chamberlain Corp., Waterloo, Iowa, \$1,206,765 for rocket warheads; R&D Construction, Inc., Chicago, Ill., \$1,176,000 for an aircraft facility and maintenance dock; University of Chicago, \$1,165,000 for materials research; Firestone Tire & Rubber Co., \$1,132,047 for combat tanks; Logistics Management Institute, Washington, D.C., \$1,120,000 for analytical studies; Pace Corp., Memphis, Tenn., \$1,118,132 for surface trip flare, M49A1;

Electronics Assistance Corp., Red Bank, N.J., \$1,096,122 for radio receivers; L. E. Mason Co., Hyde Park, Mass., \$1,085,728 for fuzes; Astro Communication Labs, Inc., Gaithersburg, Md., \$1,072,300 for electronic equipment; N. H. Spinks, Sr., Enterprises, Inc., Fort Worth, Tex., \$1,064,336 for UH-1 helicopter seats; Technical Operations, Inc., Burlington, Mass., \$1,050,000 for automatic data processing system support; VARO, Inc., \$1,000,000 for Starlight scopes; and Washington University, St. Louis, Mo., \$1,000,000 for research in macro-modular computer systems.

ATAC Sees \$4.5 Million Saving on Tank Retreading

Retreadable tracks developed for the M60A1 tank by the Army Tank-Automotive Center (ATAC), Warren, Mich., are expected to save the Government as much as \$4.5 million annually.

An experimental track shoe assembly, the T142, makes it possible for the first time on a heavy tracked vehicle to rotate the track shoes to equalize wear or to replace individual rubber pads when excessively worn. The standard T97E2 tank track must be replaced as a unit.

Five months of intensive testing at Yuma (Ariz.) and Aberdeen (Md.) Proving Grounds and at the Armor and Engineer Board, Fort Knox, Ky., shows that the new track shoe assembly has more than twice the life expectancy—5,000 miles—of the unit currently in use.

The estimated multimillion-dollar saving is based on reduction in parts-replacement cost, maintenance, manufacturing, shipping and warehouse storage. The development program, completed in 13 months, cost \$600,000.

ATAC engineers cited an additional advantage in removable rubber

pads that would bare the track's steel grousers for tractability on soft ground or ice.

Eight pilot models of the new track have been tested. Six of these, operated on a 2-shift 16-hour day, recorded a total of 38,000 test miles. The one-piece track design now used requires replacement after approximately 2,200 miles.



T142 RETREADABLE tracks are shown on the tank at left. The entire standard T97E2 track (right) must be replaced when excessively worn.



Col T. F. Bristol



Col R. K. Moore



Lt Col H. A. Buzzett



Lt Col J. G. Mears

Assignments of 20 OCRD Staff Members Announced

Staff officer reassignments within the Office of the Chief of Research and Development produced an unusually heavy personnel turnover recently. Newcomers include:

COL BRISTOL (Thomas F.), the new Deputy Chief of the Environmental Sciences Division, Army Research Office, received his BS degree in business administration from the University of Alabama. Graduated in 1960 from the United Kingdom equivalent of the U.S. Armed Forces Staff College and the Army War College in 1964, he has completed the Advanced Artillery Course at Fort Sill and the Associate Command and General Staff Course at Fort Leavenworth.

Until assigned to his new post he was commanding officer of the 18th Artillery Group, Pittsburgh, Pa. Since entering active duty in 1940, he has served overseas in Africa, Germany, Korea and Okinawa. His citations include the Bronze Star, 10 Battle Stars and the Bronze Arrowhead.

COL MOORE (Robert Kenneth) came from HQ Seventh Army Support Command, where he was assistant chief of staff, Personnel, to replace Col Edward B. Kitchens as chief of the Air Mobility Division. He received a degree in safety engineering from New York University in 1949, and studied international relations at the University of Mary-

land (1957, 60, 61) and at George Washington University (1962, 63).

His military training has been extensive, including the regular course and the senior officers counter-insurgency training course at the U.S. Army War College. His citations include the Air Medal with nine Oak Leaf Clusters, the EAME Campaign Medal with three Campaign Stars and the Army Commendation Medal with Oak Leaf Cluster.

LT COL BRYANT (Robert Lee) is assigned to the Nike-X Branch of the Nike-X and Space Division. After receiving his MS degree in engineering science from Purdue University in 1956, he served tours in Germany and Korea. In February 1961, he reported to Redstone Arsenal to work on the Nike-X project.

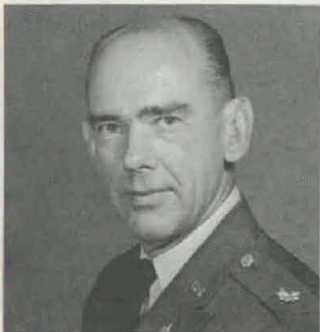
LT COL BUZZETT (Harry Archer) is replacing Lt Col Richard A. Smith as chief, Electronics Branch, Communications-Electronics Division. After receiving his BS degree in military engineering from the United States Military Academy in 1944, he served in the European Theater, including Berlin. In 1958, he received an MS degree in electrical engineering from Georgia Institute of Technology and in 1966 earned an MA in international affairs from George Washington University. He graduated from the Command and General Staff College in 1959 and Army War College in 1966.

LT COL MEARS (Joe Glenn), assigned to the Human Factors and Operations Research Division, Army Research Office, is fresh from Tulane University, where he received an MBA degree in business administration. He joined the service after receiving his BS degree from Texas A&M in agronomy (1949). He served in Korea (1951-52), earning the Purple Heart with Oak Leaf Cluster, and returned in 1963.

LT COL MOONEY (George Perry) is new in the Programs and Budget Division. After graduation with a BS degree in industrial management from Auburn University, he enlisted in the Army and attended the basic finance officers course. While in the service, he completed his MBA in management at Indiana University (1955) and attended the Command and General Staff College (1963).

LT COL RACHMELER (Louis), graduated recently from the Army War College, is a staff officer in the Special Warfare Division. He was stationed in the European Theater immediately following graduation from the United States Military Academy in 1947, returned to the States in 1952 and received an MS degree in electrical engineering from Stanford University in 1953.

LT COL RAFERT (Walter E.), a 1966 graduate of the Army War College, is the new chief of the Combat Arms Branch, Combat Materiel Division. He holds BSME degrees from Purdue and Stanford Universi-



Lt Col W. E. Rafert



Lt Col R. M. Reuter



Lt Col W. G. Skelton



Lt Col R. T. Wagner



Maj H. H. Berke



Maj F. K. Mahaffey



Maj W. D. Miller



Maj R. A. Purple

ties, has served in London, England and Taiwan, and was an instructor at the Army Ordnance School and the United States Military Academy.

LT COL REUTER (Robert M.) is the new military adviser to the United States Army Research and Development Operations Research Advisory Group, Research Analysis Corp., McLean, Va. Combat in Korea and Viet Nam earned him the Legion of Merit, the Distinguished Flying Cross (with Oak Leaf Cluster) and the Air Medal with Oak Leaf Clusters, among other decorations. Graduated with a BS degree from New Mexico Military Institute in 1950, he has attended the Army Command and General Staff College, the Armor School and the Aviation and Airborne Schools.

LT COL SKELTON (Winfred G., Jr.) is coming from Europe to take over as chief, Air Movement Branch, Air Mobility Division. He has a BS degree from the United States Military Academy, has attended the British Staff College and various U.S. Army schools, and has received the Bronze Star Medal.

LT COL SMITH (Chester R.) returns to the Plans Division, Long Range Plans Branch, following graduation from the Industrial College of the Armed Forces. After receiving his PhD degree in economics from the University of Virginia, he was stationed in Japan, Korea and as an adviser to the Greek Army.

LT COL WAGNER (Robert T.), newly assigned to the Nike-X and Space Division, is a 1946 graduate of the United States Military Academy and holds a PhD Degree in physics from the University of Virginia. He has attended the Industrial College of the Armed Forces (1961) and the Command and General Staff College (1964). Previous to his current assignment, he was a physicist at the Los Alamos Scientific Laboratories in New Mexico.

MAJ HOLMES (Frederick S.) has returned from Viet Nam to serve as staff officer, Electronics Branch, Communications Electronics Division. A 1956 graduate of the United States



Maj E. M. Simonson



Maj D. D. Wingfield



Homer E. Hart

Military Academy, he received an MS degree in physics from Massachusetts Institute of Technology in 1962. He returned to the Academy as an assistant professor in 1962 and served until assigned to Viet Nam.

MAJ BERKE (Henry H., Jr.) ended a 3-year tour in Alaska with assignment to the Review and Analysis Division. After receiving his BS degree in chemistry from Virginia Military Institute, he attended the Basic Infantry, the Advanced Infantry and Airborne Schools. He attended the Command and General Staff College in 1963 and has been awarded the Bronze Star.

MAJ MAHAFFEY (Fred K.) is assigned to the Review and Analysis Division. He was a battalion adviser in Viet Nam prior to attending the U.S. Army Command and General Staff College. He has attended the Infantry Officer's Career Course and the Army Special Warfare School. He holds the Legion of Merit, the Bronze Star and the Air Medal, among other decorations.

MAJ MILLER (Wayne D.) is the new action officer for the Low Altitude Systems Branch, Air Defense and Missiles Division. A 1951 graduate of the United States Military Academy, he recently received an MS degree in mechanical engineering from the University of Southern California. He has attended the U.S. Army Command and General Staff College and the Armed Forces Staff College.

MAJ PURPLE (Robert A.) reported recently to serve as staff officer with the Range Branch, Nike-X and Space Division. A recent graduate from the Command and General Staff College, he has two master's degrees (nuclear engineering and civil engineering) from MIT.

MAJ SIMONSON (Eugene Michael), newly graduated from the Command and General Staff College course, is assigned to the Chemical-Biological Branch of the Nuclear, Chemical and Biological Division. He holds a BS degree in chemistry from Henderson State Teachers College and an MS degree in industrial management from Georgia Institute of Technology.

MAJ WINGFIELD (Damon D.) has reported for duty as staff officer in the Medical and Biological Sciences Branch, Life Sciences Division, Army Research Office. A graduate in bacteriology from the University of Oklahoma, he earned an MS degree in microbiology at Oklahoma State University in 1964. He was until recently a bacteriologist at the United States Army Biological Warfare Laboratory, Fort Detrick, Md.

HOMER E. HART came from the Office of Personnel Operations, HQ Department of the Army, to serve in the Review and Analysis Division, OCRD. He holds a BS degree in pharmacology from the University of Montana and credit towards an MA degree in business administration from the University of Minnesota.

Conference Called on Science 'Coupling Problem'

One of the critical areas of scientific progress—the “coupling problem” concerned with the rapid application of basic research findings to production engineering design—will be discussed at a national metallurgical symposium, Oct. 5-7.

Sponsored by the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME), in cooperation with the Materials Advisory Board of the National Academy of Sciences, the symposium at Los Angeles will be attended by Army representatives. About 750 scientists and engineers are expected to attend.

Lt Col Louis G. Klinker of the Physical and Engineering Sciences Division, Army Research Office, Arlington, Va., will present a paper on “Some Research to Engineering Coupling Techniques Pioneered by the U.S. Army.” He will represent the Office of the Chief of Research and Development.

Col Klinker's presentation will use some data from an article published in June in the trade journal, *Foundry*, which he coauthored with Henry Handler, technical adviser to the commanding general, Army Materiel Command, and Leonard Croan, AMC program manager for the Army Metals and Armor Research Activity.

The article reported on the Army's continuing Basic Research Metallurgical Program, the Army 5-year cast-metal exploratory development activities and the close working relationship established between the Army and the Steel Founders' Society of America (SFSA) as an example of a “practical and efficient way to bridge the gap between research and practice.”

Attaining that goal requires rapid exchange of information and a strong desire by all concerned to work together, the article stated.

“When these research efforts are translated into practice, the vastly improved properties attainable in castings will have a significant effect on mobility, effectiveness and air-transportability of Army equipment. Benefits will accrue to the Army and to the foundry industry.”

Casting techniques developed at Massachusetts Institute of Technology under Army contract were cited as a case in point. At MIT the SFSA is using its own research funds for application studies to be conducted in commercial foundries with the cooperation and help of the Army. This insures that improvements are reflected in Army materiel.

The cast-metal techniques were reported also in *Transactions*, pub-

lished by the American Foundrymen's Society (AFS). This trade organization subsequently expressed interest in cooperating with the Army and the SFSA in pursuing the application efforts.

During this calendar year, the authors wrote, the Army is planning critical application studies in commercial foundries to explore the feasibility of applying research results for the improvement of cast-steel armor, in furtherance of the Army-industry cooperative effort.

Chaired by Augustus Kinzel, president of the Salk Institute, San Diego, the symposium will consist of sessions devoted to educational aspects, the coupling problem in Federal agencies and the Department of Defense, general industry and case histories.

Principal speakers will include authorities from the National Academy of Sciences, the Science Center of North American Aviation, Inc., National Aeronautics and Space Administration, U.S. Air Force and the U.S. Navy.

Chairmen of symposium sessions will be M. E. Tanenbaum, director of research, Western Electric Co., R. M. Thomson, director, Materials Sciences Advanced Research Project Agency (ARPA); M. A. Steinberg, deputy chief scientist, Lockheed Aircraft Corp.; J. J. Harwood, metallurgy department manager, Ford Motor Co.; and G. V. Bennett, metals and ceramics research branch chief for Douglas Aircraft.

Col Clowes Succeeds Grubbs as APG Commander

After serving as deputy commander at Aberdeen Proving Ground, Md., for the past year, Col George E. Clowes succeeded Col Elmer W. Grubbs as commander when he retired Aug. 1 to end 30 years military service.

Prior to assignment to Aberdeen, Col Clowes was stationed at Headquarters U.S. European Command, Paris, following a 1958-1961 tour at Department of the Army Headquarters in Washington, D.C.

The colonel entered the Army in 1941, served in the European Theater during World War II and returned to the U.S. in 1945 with the 30th Infantry Division. He was with the Fifth Corps at Fort Jackson, S.C., served four years in Tokyo, Japan, and then was assigned to Headquarters, U.S. Army Pacific, Hawaii. He also served with the Eighth Army Korea and was commanding officer, 31st Infantry Regiment, 7th Infantry Division.



Col George E. Clowes

A graduate of the Army War College, Command and General Staff College and Armed Forces Staff College, he has attended the Infantry School, Fort Benning, Ga., and Air University, Maxwell AFB, Ala.

He received a BS degree from the University of Oregon and has studied at the University of Hawaii and New York University. He holds the Legion of Merit, Bronze Star Medal and Combat Infantryman Badge.

HDL Scientists Author Book On Fluid Amplifier Systems

What is claimed to be the first complete textbook published on *Fluid Amplifiers*, a new type of control system finding increasingly wide application in industry and military use, is the work of scientists at the Harry Diamond Laboratories.

Joseph M. Kirshner, chief of the HDL Fluid Systems Branch, is the principal author and coordinator of the textbook. Silas Katz, one of his supervisors, authored several chapters and coauthored others. John M. Goto, supervisory research mechanical engineer, also authored several chapters.

Others who wrote chapters or collaborated in the writing of chapters are Sanford D. Weinger, Raymond W. Warren and Kenneth E. Scudder.

Fluid amplification controls—sometimes called “fluid dynamics” and rather widely known as “fleurics”—were invented in 1959 by Billy M. Horton, now technical director of HDL.

Following a nationwide announcement of the discovery, worldwide interest was generated. Industry has since invested millions of dollars in developing various applications of the system.

Fluid controls using gases or liquids are finding application in guidance systems for missiles, in the Army Artificial Heart Pump, in oxygenators, face masks and artificial cardiac chest depressors.

Generally no moving parts are involved in the control systems. An exception is the heart pump, which uses artificial ventricles and valves.

Defense Cost Reduction Exceeds Goal

Department of Defense Cost Reduction Program savings in FY 1966 totaled \$4.5 billion, exceeding earlier estimates by \$400 million, Secretary of Defense Robert S. McNamara has reported to President Lyndon Johnson.

The Program seeks to achieve a saving of \$6.1 billion a year by FY 1969 and each year thereafter. Secretary McNamara reported that cumulative 5-year savings exceed \$14 billion and that actual cost reduction accomplishments each year have far exceeded goals announced in July 1962.

President Johnson, in a memorandum covering distribution of Secretary McNamara's report, stated: "This (report) confirms my belief that we can have both combat readiness and economy in Defense."

The Secretary of Defense stated that FY 1966 savings "were achieved at the same time we were building up a military force of about 350,000 men in Southeast Asia, some 10,000 miles from our shores, and providing the facilities, weapons, ammunition, equipment and supplies required to support them in combat."

Gains of 70 to 480 percent in such areas as military personnel deployed, number of combat maneuver battalions, helicopters, land-based attack aircraft and tonnage delivered by aircraft were reported.

During the year, production was increased from 15 percent for fixed-wing aircraft to 6,700 percent for tropical uniforms, including 60 percent in helicopters and huge percentages in air- and ground-delivered munitions and in airfield matting.

All of this has been accomplished, Secretary McNamara said, "Without imposing the usual wartime controls on wages, prices and civilian production and consumption . . . without calling up the Reserve Forces . . . without imposing wartime tax burdens, and while holding Defense expenditures in FY 1966 (as a percent of GNP) at a level lower than that of four of the past five years."

In conjunction with Secretary McNamara's report, July 11-15 was designated Cost Reduction Week to honor the thousands of military and civilian personnel of the Department of Defense whose ideas and efforts produced the multibillion-dollar savings.

President Johnson presented Certificates of Merit to 17 Department of Defense employees at a special Pentagon ceremony, rewarding them for

significant contributions to the Cost Reduction Program.

Three of those honored are Department of the Army employees. Credited with the largest achievement was Donald McCullough, project engineer, U.S. Army Tank-Automotive Center, Warren, Mich. His citation reads:

"His initiative and ingenuity resulted in redesign of the Fuel Tank, Semi-Trailer, use of better materials, and an improved manufacturing process which enabled the Department of the Army to save \$894,152 in FY 1966."

The saving was \$689.40 on each of 1,297 units purchased.

Top Leaders Attend Army Nuclear Science Seminar

Participation of high-ranking civilian and military leaders made the sixth annual Army Nuclear Science Seminar, sponsored by the 3252nd Reserve R&D Unit, Oak Ridge, Tenn., "responsive to an important need."

Army Chief of Research and Development Lt Gen A. W. Betts joined with Dr. A. M. Weinberg, director, Oak Ridge National Laboratory, and Dr. W. G. Pollard, executive director, Oak Ridge Associated Universities, as major speakers.

Other top-ranking speakers included Dr. C. E. Larson, president of the Nuclear Division of Union Carbide Corp.; Maj Gen George T. Duncan, deputy commander of the Third U.S. Army; and S. R. Sapirie, manager of the Oak Ridge Operations

Frederick J. Meineker, industrial specialist at Watervliet (N.Y.) Arsenal, was cited as follows: "His initiative and resourcefulness enabled the Department of the Army to obtain excess interchangeable spare parts from Navy MK I and MK II 40mm guns in lieu of procurement of needed spare parts for the Army's 40mm Dual Automatic Gun M2A1, thereby saving over \$352,000 in FY 1966."

Sherman M. King, production controller (aircraft) at New Cumberland (Pa.) Army Depot, was cited: "His noteworthy alertness to cost improvement opportunities coupled with his outstanding technical competence enabled the Army to save \$13,104 during FY 1966 in the procurement of bolts for installation of helicopter armor."

for the U.S. Atomic Energy Commission.

Presentations were made by the Defense Atomic Support Agency team, headed by Lt Col John L. Davis, III, on nuclear weapons; the CBR team, headed by Lt Col R. G. Harris, on chemical and biological weapons; and by Maj J. J. Skaff and W. A. Miotke of the U.S. Army Combat Developments Command Nuclear Studies Group on Nuclear Weapons Effects.

The 2-week seminar included 10 hours of basic physical science presentations, 11 hours of purely military technical presentations, 14 hours of reactor design, operations and economics; 12 hours of biology and biological applications; three hours devoted to civil defense; and various tours of AEC facilities.

Contract Calls for Research on XH-51A Helicopter

Further flight research on the XH-51A compound helicopter, clocked in June 1965 at 272 m.p.h., has been



XH-51A Compound Helicopter

ordered by the Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va.

A contract for \$675,000 awarded to the Lockheed-California Co. in July 1966 is for investigation of maneuverability, vibration effects and structural loads over the entire speed range. Lockheed also will attempt to increase the level-flight maximum airspeed of the experimental helicopter.

Flight testing in turbulence and in nap-of-the-earth operations will be performed by Army and National Aeronautics and Space Administration (NASA) pilots who will evaluate the aircraft for the U.S. Government.

The XH-51A is equipped with an auxiliary jet engine on the left side for increased horizontal thrust. A pod on the right wing tip contains instrumentation and offsets the unbalance of the extra engine.

U.S. Army Medical Unit Developing Biological Warfare Defense

Biological agents have never been employed as a major weapons system. Still it must be recognized that it would be entirely feasible for an enemy of this country to employ such a weapon against civilian and military personnel within the continental United States or against our troops operating anywhere in the world.

Requirements exist for achieving a defensive capability against this method of warfare and the mission of the U.S. Army Medical Unit, Fort Detrick, Md., is to develop medical measures to protect military personnel against such an attack.

The responsibility of this research unit is limited to the medical aspects of the problem and does not include studies on shelters, masks, protective clothing and alarms.

Operating as a Class II facility funded and supported by the Army Medical Research and Development Command, the Medical Unit is administratively an element of Walter Reed Army Medical Center. Located at Fort Detrick about 45 miles northwest of Washington, D.C., on the outskirts of Frederick, Md., the unit is funded and supported by the Army Materiel Command. Technical direction is a responsibility of the Surgeon General.

The research program is divided into three major areas. The first involves studies of the basic mechanisms of disease processes and how the human being (the host) responds to disease-producing microorganisms or their products. Included are studies to determine the susceptibility of man to infectious agents disseminated by



Col Dan Crozier, CO
U.S. Army Medical Unit
Fort Detrick, Md.

means other than those generally encountered in nature.

The second category is prophylaxis and therapy of diseases considered to be of importance from the standpoint of defense against a biological agent attack.

The third aspect of the program relates to means for establishing a diagnosis within the shortest possible time, or even for detecting the presence of infection prior to the onset of clinical illness.

Most of the organisms being studied by the Medical Unit cause diseases that are not encountered normally in this country or which occur so rarely that they do not constitute a significant problem. For this reason, knowledge of these organisms and the diseases they produce is limited and the research being conducted in this country is minimal.

Lack of intensive investigative effort does not mean, however, that these diseases are not important in other areas of the world. Certain of the diseases for which a biological warfare defense capability is considered essential are important public health problems in other countries, particularly in tropical areas.

Quite frequently the countries in which these diseases are most important do not have the microbiological research capability to study properly the intricate problems of pathogenesis, prophylaxis or treatment. In a number of cases, the diseases produced by these so-called "exotic" microorganisms have received little attention.

The knowledge being developed in the U.S. Army biological warfare medical defense program is of particular value to those countries which

do not have the capability themselves. This information can also be of significant value if our military forces should be required to operate in areas of the world where these particular diseases are endemic.

Study of most of the microorganisms important to this program requires special facilities which are both complicated and expensive. Such facilities are necessary for protection of individuals working within the laboratory as well as the population in the surrounding area. Vaccines of varying degrees of effectiveness have been developed to protect laboratory personnel against certain of the organisms and in some cases effective therapy is available.

Numerous disease-producing agents still exist, however, against which neither vaccines nor effective methods of treatment are available. Work with this latter category of organisms requires facilities equipped for complete containment of the infectious material within a gas-tight safety-cabinet system.

Suitable research facilities are available only in a limited number of laboratories in this country. Numerous other special features must be incorporated into laboratories studying highly pathogenic organisms.

The Medical Unit, in addition to its research mission, administers and operates a limited medical treatment facility, including care of soldier volunteers participating in infectious disease studies. Medical care is provided military and civilian personnel becoming ill with or suspected of having an occupationally acquired illness.



SEALED MICROTOME unit coupled to a biological safety cabinet is employed at the U.S. Army Medical Unit to provide safety for personnel preparing frozen sections of infected tissues for microscopic examination.



AEROSOL GENERATING equipment at Army Medical Unit at Fort Detrick, Md., can be adapted easily for exposure of humans or animals to precisely measured quantities of biological products for research experiments.



ONE-MILLION VOLT X-ray machine is employed at Army Medical Unit, Fort Detrick, Md., in studying the effects of ionizing radiation on the immune response of experimentally infected or vaccinated animals.

In addition to these two special categories of patients, limited medical care is available for military personnel, dependents of military personnel, and others for whom treatment in a uniformed services medical facility is authorized.

Treatment is limited to medical problems although a small operating room is available for use in case a patient requiring surgery cannot be moved. Obstetrical, orthopedic and other categories of surgical care are not provided routinely.

Many scientific disciplines are included within the unit organization. Extensive capabilities have been established in virology, bacteriology, biochemistry, biophysics, pathology and veterinary medicine. Special facilities permit quantitative exposure of animals and humans to aerosols of pathogenic and nonpathogenic microorganisms; also, study of the effects of x-irradiation on the infectious process in animals.

Other special capabilities include electronmicroscopy, ultracentrifugation, various radioisotope procedures, provision for automated analytical chemistry determinations, fluorescent antibody studies, and other highly technical biochemical, biophysical and serological procedures. The unit is well equipped to study all aspects of the infectious process.

The research program of the Medical Unit is closely coordinated with that of the U.S. Army Biological Center at Fort Detrick. Their missions are closely allied and many specific projects are conducted jointly, but they are administratively independent of each other. Interchange of scientific information is continuous and mutual use of equipment and

facilities is the rule rather than the exception.

Studies in humans are essential to the accomplishment of the Medical Unit's mission. Persons naturally infected with organisms of interest to the unit rarely are available for study and extrapolation from animal data is always open to question.

To fulfill the need for such human data, the Medical Unit conducts an extensive volunteer program. All ethical, moral, legal and medical guides for volunteer studies are meticulously observed. Prior to initiation of a new study, approval must be obtained from the Secretary of the Army.

A civilian group, the Commission on Epidemiological Survey, a component of the Armed Forces Epidemiological Board (AFEB), composed of outstanding physicians in the field of infectious disease and related subjects, advises the commanding general, U.S. Army Medical Research and Development Command, and The Surgeon General on both the in-house and contract programs of the unit.

All protocols involving volunteer studies must be reviewed by the Commission and by the AFEB before being submitted by The Surgeon General to the Secretary of the Army.

A large proportion of the laboratories of the unit are housed in

converted temporary World War II cantonment-type hospitals or semi-permanent buildings, thus placing a limitation on the type of studies which may be conducted.

Construction of a 126,000-square-foot laboratory, which constitutes Phase I of a 2-phase building program, has been approved but temporarily deferred. This building will consist of facilities for studying highly infectious microorganisms with the necessary supporting services.

Whether biological warfare will ever be used against this country is unpredictable, the U.S. Army Medical Service concedes. No doubt exists, however, that the employment of this weapon system under proper conditions could cause illness in individuals over very large areas. Depending on the types of organisms employed, the decrease in effectiveness of these individuals would vary over wide ranges.

As with any other method of warfare, the Medical Service recognizes that a completely adequate biological defense system is difficult to achieve. The Medical Unit at Fort Detrick strives for knowledge upon which medical aspects of defense measures can be based. All of the questions will not be answered this year, or even in the next 10 years, but researchers believe definite progress is being made.

WSMR Director Authors Book on Computer Program Training

Fundamentals of Digital Machine Computing, published recently as a basic text for training computer users, is a first book for Guenther Hintze of White Sands (N. Mex.) Missile Range (WSMR).

The director of the WSMR Analysis and Computer Directorate is a pioneer in the computer field. His book is partly a product of the computer and was produced by special

equipment, punched tape and programmed instructions.

Once called "Mr. Flight Simulation," the author was prime developer of computer programs in missilery. He is credited with being largely responsible for establishing WSMR's Flight Simulation Laboratory, forerunner of the Analysis and Computer Directorate.

Hintze's book gives beginners a comprehensive introduction to computer fundamentals and provides mathematicians, physicists and engineers a method of solving and interpreting their problems. The book is broad in its approach yet provides sufficient detail for deep computer studies. Explanations of functions and logic are simple and concise.

A native of Breslau, Germany, Hintze has taught an introductory computer course for the past several years at Texas Western College, El Paso, where he realized the need for a computer text. He was one of Dr. Wernher von Braun's group of missile scientists brought to the U.S. in 1945 to lead the missile program.



Guenther Hintze

AVCOM Orders Multipurpose Test Stand Prototypes

Development of two prototypes of a multipurpose Army aircraft turbine test stand that can accommodate present and future engines up to 5,000 hp. has been ordered by the Army Aviation Materiel Command.

AVCOM recently awarded a \$1.26 million contract to Universal Match Co. Industries, Inc., St. Louis, Mo., where AVCOM Headquarters is located.

Col Edward J. Chrysler, chief of the AVCOM Directorate of Research, Development and Engineering, said the new stand is the result of two years of intensive research and development study and refinement.

The stand will be designed to accommodate all models of the T53, T55, T63, T64 and the JFTD12 and has "growth potential" to accommodate future versions of these engines. The T58 and T65 as well as practically any turboshaft or turbo-

prop engines in the 300 to 5,000 hp. range can also be tested and run-in.

The multipurpose stand will have improved mobility over present equipment designed for specific engines, Col Chrysler reported.

Specifications require that the stand be mounted on two 4-wheel trailers. One will consist of an air dynamometer, two gearboxes, lubrication systems for the dynamometer and test engine, engine handling equipment, and mounts and adapters for all the various engine models. A control cab trailer will mount an air-conditioned and sound-proofed control compartment, turbine-powered servicing unit and fuel system.

The significant design feature which allows the development of this lightweight, universal test stand is the air dynamometer, which is designed to absorb a maximum of 5,000 horsepower at 7,000 revolutions per minute. The dynamometer load can be decreased as required for each test engine.

Due to the wide air-flow control range of the dynamometer, only two gearboxes are required to match the various engine horsepower (317 to 4,050 hp.) and speeds (1,700 to 19,500 r.p.m.) with the dynamometer load characteristic.

The test stand will be employed at general support and depot maintenance activities for acceptance testing after major repair or overhaul.

The instrumentation system accuracies will be comparable with those presently used in fixed test cells at depots.

In addition, the instrumentation must be lightweight, compact and adaptable to worldwide environmental extremes to allow deployment with mobile general support units. Display systems will be primarily digital with direct-reading torque and horsepower indicator.

Ease of deployment is facilitated by the on-board power supply. It enables the test stand to operate in remote areas independent of generator sets or electric and hydraulic start carts. Each trailer-mounted unit will be air-mobile as an internal or external sling load in the CH-47A (Chinook) helicopter.

Tentative delivery dates are December 1967 for the prototypes and July 1969 for production models.

The Army presently has six trailer-mounted test stands procured from Lycoming to support T53 engines used in the UH-1 and OV-1 and T55 engines used in the CH-47A. Four more of these units have been ordered for interim use.

Development of the multipurpose test stand is intended to eliminate the necessity of procuring separate test systems for the various types of turbine engines. Army logistic requirements, support system complexity and cost will be decreased and the system will contribute materially to the mobility of units in the field.

TOW Fires Shotgun Shells In New Testing Program

Facetiously termed a "shotgun wedding to a missile launcher," an ingenious cost-reduction training technique for the TOW "tank killer" is being used at Redstone (Ala.) Arsenal, Headquarters of the U.S. Army Missile Command.

TOW is the acronym for the tube-launched, optically-tracked, wire-guided missile system that can knock out a tank more than a mile away or destroy other heavy armored vehicles. TOW is rated one of the newest and hardest hitting of the Army's battleground missiles.

Ordinary shotgun shells, however, are the ammunition being fired by TOW to train operator-gunners. Loaded in a special rig in the launcher, they give the gunner a "feel for firing the weapon" that will prepare him for actual guided missile firings. When engineering/service testing is conducted later, these same military and civilian students will operate the system.

The training includes an introduction to the TOW system, theory of system operation, organizational and field maintenance, and system operational tasks.

Now in advanced production engineering, TOW is being developed for infantryman to use against tanks and field fortifications. TOW is effective against both moving and stationary targets, can be carried by troops and fired from a ground emplacement, or can be mounted on various vehicles.

Foreign Officers Attend Army Electronic Warfare School

Eight officers representing Canada, France, Italy and Turkey are attending the initial 10-week class of the U.S. Army Electronic Warfare School which convened Aug. 1 at Fort Huachuca, Ariz.

Commanded by Lt Col Samuel J. Bistany, the school will train military personnel as electronic warfare officers, repairmen and operators. School officials expect 10 or more foreign students to be enrolled in a 23-week maintenance course scheduled immediately following the initial class.

A continuing program of tours to local and state governmental institutions, industry, agricultural exhibits and cultural facilities will be provided for foreign students assigned to the school to give them an insight into American community life.



Lt Col S. J. Bistany

The tours have been organized through the school with the assistance of the Bisbee and Tucson Chambers of Commerce, the State Adjutant General's office in Phoenix, officials at the University of Arizona and the Sierra Vista Council for International Visitors.

Prior to assignment as commandant of the school, Lt Col Bistany served as director of academy operations at the Army Security Agency Training Center and School, Fort Devens, Mass. He entered intelligence work in 1953 after attending the Strategic Intelligence School in Washington, D.C.

DoD-UCLA Seminar Presents Viet Nam Problems to Scientists

Viet Nam problems of U.S. Forces in guerrilla, counterinsurgency and special warfare received primary attention at the annual Department of Defense-University of California at Los Angeles Science Seminar, Aug. 1-28.

In addition to research and development leaders and key staff officers from the Army, Air Force and Navy, the seminar was attended by 30 invited young scientists serving as assistant or associate professors in physics, chemistry, mathematics and the engineering and life sciences at academic institutions.

Coordination of joint service arrangements and Department of Defense input was handled by the Advanced Research Projects Agency, Office of the Director of Defense Research and Engineering. Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research, was the Army point of contact and planned the Army part of the program.

Initiated in 1964, the DoD-UCLA Science Seminar was arranged to develop young scientists, engineers and research and development ad-

ministrators knowledgeable in Government scientific-technical problems.

Army Chief of Research and Development Lt Gen A. W. Betts spoke on "The Army Ballistic Missile Defense Program". Several staff directors made presentations, namely:

Brig Gen J. R. Guthrie, Director of Developments, "Advanced Weapons and Army Aircraft Developments"; Col Francis J. Pallister, Director of Missiles and Space, "An Overview of Space and Missile Developments"; Lt Col Egbert B. Clark, III, chief, Space Branch, "Army Space Activities";

Col Jack G. Hines, chief, Communications-Electronics Division, "Developments in Communications, Combat Surveillance and Electronic Warfare"; and Lt Col Edwin Stuart Townsley, chief, General Materiel Branch, "Combat Support Developments."

Brig Gen John J. Hayes, commander of Desert Test Center, Salt Lake City, Utah, discussed the Army "Chemical and Biological Weapons Operations as Related to Conventional Warfare."

Counterinsurgency was the theme of one session. Brig Gen R. R. Williams, Director of Army Aviation, Assistant Chief of Staff for Force Development (ACSFOR), opened with a presentation on "Counterinsurgency Operations," with special emphasis on Army aviation. Col Frank J. Nemethy, chief, Special Warfare Division, Office of the Chief of Research and Development, talked on "R&D Problems Associated with Counterinsurgency." Maj Paul Coombs, an instructor at the U.S. Army Infantry School, Fort Benning, Ga., until recently reassigned to Viet Nam, discussed the "U.S. Army Advisory Role."

Conferees made field trips by Air Force aircraft to view new military materiel and equipment and the work in progress related to Viet Nam requirements, including a full day at Picatinny Arsenal, Dover, N.J., where they were welcomed by Maj Gen F. A. Hansen, commanding general. Visits were made to Vandenberg Air Force Base, Calif.; Defense Atomic Supply Agency, Washington, D.C.; North American Air Defense Command, Denver, Colo.; and Naval Ordnance Test Station, China Lake, Calif.

U.S. Army Materiel Command representatives were Dr. Hamed M. El Bisi, an Egyptian-born researcher at the Natick Laboratories; Dr. Geoffrey E. H. Ballard, Cold Regions Research and Engineering Laboratory; Dr. William E. Bennett, Army Biological Laboratories at Fort Detrick, Md., and Maj Robert P. St. Louis, Army Aviation Test Board.

Dean Richard Freitag, a 1961 Secretary of the Army Research and Study Fellowship winner, was named as the representative of the Office of the Chief of Engineers. The Office of The Surgeon General was represented by Maj Martin L. Nusynowitz, a radio-biologist with the R&D Service, William Beaumont General Hospital, El Paso, Tex.

MOCOM Honors 10 Students for Value Engineering

Ten students at universities and technical institutes won honors, topped by awards of \$150, \$100 and \$50, in the recent Army Mobility Command Value Engineering Contest, based on simplicity of design.

Maj Gen William W. Lapsley, MOCOM commander, presented the awards at a dinner in the McGregor Memorial Conference Center at Wayne State University, Detroit, Mich. The cash awards and 10 honorary plaques were provided by the American Academy of Transportation.

Limited to undergraduate engineering students under 25 in institutions east of the Rocky Mountains, the contest involved design of a fuel tank filler cap and mating filler neck. Purpose was to publicize importance of Value Engineering, "achieving required function at lowest overall cost," to Department of Defense activities.

Ferril S. Stillson, Milwaukee, Wis., a student at the University of Wisconsin, won the \$150 first prize and a plaque. Second prize of \$100 went to Anthony P. Baleno, Syracuse (N.Y.) University the \$50 award was to Dennis C. Berry, Rose Polytechnic Institute, Terre Haute, Ind.

Honorable mention winners were: David C. Brenner, Roger E. Johnson and David G. Taylor, North Carolina State University; Byron G. Buck,

Rose Polytechnic Institute; Laurence J. Kernan, Manhattan College, New York City; Robert Venendaal, University of Toledo (Ohio) and Ronald H. Young, Drexel Institute of Technology.

Brig Gen W. J. Durrenberger, CG, U.S. Army Tank-Automotive Center, Warren, Mich., Herbert Norder, president, American Academy of Transportation, and Dr. Hamilton Stillwell, dean, Division of Urban Extension, were among guests of honor at the presentation dinner.

ECOM Atmospheric Sciences Lab Gets New Director

New director of the Army Electronics Command's Atmospheric Sciences Laboratory at Fort Monmouth, N.J., is Col James F. Scoggin, Jr., reassigned from duty as signal officer of the 4th Infantry Division at Fort Lewis, Wash.



Col James F. Scoggin, Jr.

Col Scoggin is a graduate of the U.S. Military Academy and holds a BS degree in mathematics from Mississippi State University, a master's degree in physics from Johns Hopkins University, and a doctorate in physics from the University of Virginia. He also is a graduate of the Industrial College of the Armed Forces.

During World War II, he served with the Signal Company of the 44th Infantry Division in France, Germany and Australia. Subsequently, he served as deputy director at the former Evans Signal Laboratory, then a part of Fort Monmouth, later as commander of a meteorological test station at Yuma, Ariz., and with the U.S. Military Research and Development Center at Bangkok, Thailand.

Return-Fire Targets Developed by HEL Researchers To Test Soldiers' Efficiency Under Stress Conditions

Human engineering researchers at Aberdeen (Md.) Proving Ground have found a way to test the efficiency of riflemen under fire by developing a rifle-range target that shoots back.

Preliminary studies in the return-fire research technique have shown Human Engineering Laboratories (HEL) scientists that stress does affect soldiers' accuracy, rate of fire and time to fire the first round.

More extensive study is planned, using electronic pop-up targets and BB-firing devices, to learn how stress actually affects a rifleman's performance. HEL scientists are interested in determining how realistic are the current estimates of riflemen's performance.

Under study also is the comparative performance of riflemen trained and untrained in the pointing technique—firing without using rifle sights.

The stress applied to riflemen in HEL tests is a semiautomatic, carbon-dioxide gas-powered BB gun with a shortened barrel to reduce muzzle velocity and accuracy.

The BB gun is electrically controlled to fire at the soldier every half second, starting 1.3 seconds after the kneeling silhouette targets are raised. It continues to fire at the marksman until targets either are hit or lowered after a specific time exposure.

In tests, seven targets are arranged in a 60-degree arc at 40 meters. Electronic equipment records raising and lowering of targets, number of shots fired by the riflemen, number of hits and BB-gun fire.

Marksmen are protected by padding over the vital parts of the body; they can be stung by the pellets but not injured. A plywood backstop provides a sounding board so the riflemen can hear the BBs strike.

Two weapons—the M-14 and M-16 rifles—are used to establish more exacting tests for comparing weapons. The tests also seek to find which man-weapon combinations are most effective in terms of combat conditions.

Two groups of riflemen fire. One group is trained in the pointing method, the other untrained. Soldiers use any method they choose and fire with and without the addition of stress. No rifleman encounters the same target deployment or stress condition twice. Targets are raised and lowered at random with no specific pattern.



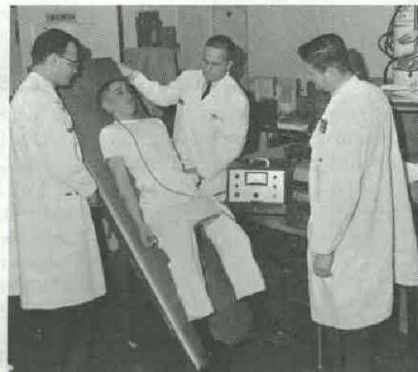
In some tests, the BB gun fires back for only two of the targets in each sequence, but the threat of return fire provides sufficient stress, HEL scientists report. The number of BB hits on the firing soldier can be reduced to decrease the stress for comparative analysis of the degree of stress.

NASA Supports Army 'Superman' Physiological Study

Operation Superman, a special space-age physiological study, is being conducted by the Army on 20 volunteers at William Beaumont General Hospital, Fort Bliss, Tex.

Under a research grant from the National Aeronautics and Space Administration (NASA), medical scientists seek to determine by monthly tests the effects of physical conditioning on normal, well-motivated men. Research includes

PROTECTIVELY PADDED, a soldier fires M-14 rifle prior to HEL tests to measure effects of return fire on the shooter's performance. Wires leading to the rifleman connect with a ventilation fan in the hood and to electrodes used to measure heartbeat. Leaning against shack in background is the pop-up target used on the return-fire course. Approximately the size of a kneeling man, the target is a standard used on most Army rifle ranges. Below is the CO₂-powered BB gun used to supply return fire during the tests. The barrel was cut short to reduce muzzle velocity and accuracy.



MONITORING tilt-table test, as part of "Operation Superman" being conducted at William Beaumont General Hospital, are (from left) Lt Col Robert L. North, Capt Timothy Harris and Lt Col Robert H. Moser. Seated astride saddle at 70-degree angle is S/Sgt Frederic Pamatian.

three age brackets: 30-34, 35-39 and 40-45.

"Effects of Sustained Programmed Exercise in the Cardiovascular, Pulmonary and Renal Systems in Normal Men between the Ages of 30-45" is the official title of the study.

Following base-line physical examinations, the volunteers were given a series of tests to determine basal kidney, pulmonary and cardiac functions. The conditioning program began this past spring when exercises were prescribed.

Twice-daily exercises include a build-up to a minimum of 30 push-ups, 30 deep knee bends and 30 sit-ups. A 2-mile run was attained by gradual conditioning through a combination walk and run.

Tests include the 70-degree tilt table, where individuals' kidney, pulmonary and cardiac functions are recorded. This is the same test series given to astronauts before and after a flight.

Heading Operation Superman is Lt Col Robert H. Moser, chief of Beaumont's Department of Medicine. He is assisted by Maj Martin L. Nusynowitz, chief of Radioisotope and Endocrinology Service; Capt Martin N. Cohen, chief of Cardiology Service; and Capt Timothy Harris, assistant chief of Pulmonary and Communicable Disease Services.

Natick Labs Seek Better Bullet-Proof Vest

One of the serious problems facing American forces in Viet Nam is the vulnerability of helicopter crews to sniper fire. Low-flying, slow-moving aircraft make these men an obvious target for soldiers concealed beneath the jungle canopy.

The extent of the problem is revealed in the exceptionally high rate of casualties caused by small arms fire rather than fragmentation—80 percent rifle-fire casualties as compared with 27 percent in the Korean War—largely during takeoff and landing operations.

Army researchers are intently pursuing the goal of total protection for the combat soldier in Viet Nam—a truly “bullet-proof” vest. Conventional steel or aluminum armor is not the answer because it is too heavy to allow freedom of movement.

An important advance came with the development of a lightweight armor plate at the U.S. Army Natick (Mass.) Laboratories. Consisting of a ceramic facing and a fiberglass backing, it is lighter than steel armor, yet more effective in its bullet-stopping power.

Installed around helicopter cockpit areas, the armor provided substantially improved safety, but Natick researchers continued to develop better protection for individual crewmen. A curved ceramic material which can be mated to the fiberglass backing was developed.

Pieces of this material, being produced under contract with Good-



1966-STYLE ARMOR worn by U.S. helicopter crewmen in Viet Nam consists of front and back torso plates, plus leg and thigh pieces, all designed by Army Natick (Mass.) Labs. Patented by Goodyear Aerospace, armor combines ceramic facing and fiberglass backing. (Goodyear photo)

year Tire and Rubber Co., can be placed in a vest which fits over the crewman's head to provide whole torso protection. Experimental leg and thigh armor is outfitted with straps.

Reports from the frontlines indicate a great deal of effectiveness. (The armor also is being used to protect

gun mounts on small Navy patrol boats and vital areas of Air Force C-130 cargo planes.)

A far cry from the historic “knight in shining armor,” or even the protected soldier of World War I or II, today's fighting man receives ever-increasing armor protection with ever-decreasing weight and inconvenience, due to materials resulting from improved technology.

Student Wins Contest on Creative Ideas for Viet Nam

Last December when the call went out at the Army Missile Command's Redstone (Ala.) Arsenal for suggestions to help the Americans fighting in Viet Nam, more than 100 employees responded, including some of the Nation's top-rated scientists.

When the results of evaluating 185 of the creative ideas from that response were announced recently, 19-year-old Arthur Charles Browning received second place.

His original concept is a modification of an automatic shotgun so that it can be fed by a continuous belt of ammunition. The rapid-firing shotgun opens new fields of power to a soldier fighting in close-in situations. It would operate much like the .50-caliber machinegun now in use, developed by famed U.S. arms inventor John Moser Browning.

A sophomore cooperative student at Mississippi State University, where he majors in aerospace engineering, Arthur spends his summers working in the Ground Support Equipment Laboratory of the R&D Directorate at Redstone Arsenal.

A member of the Air Force ROTC at Mississippi State and the Tau Kappa Epsilon fraternity, Arthur is also an avid outdoorsman and hunter. His idea of the automatic shotgun was born of his knowledge of hunting deer and other game in the deep woods around his Hattiesburg, Miss., home.

Browning designed, built and flew model airplanes for about two years while in high school, and this was where the seed was planted that grew into his college major: aerospace engineering. As to why he designed his own planes, he says: “They always flew better than the models you could buy.”

APG Museum Displays Body Armor From Former Wars

Body armor and helmets designed for U.S. combat pilots in World War I and II were studied recently at the Army Ordnance Center and School Museum, Aberdeen (Md.) Proving Ground, by consultants on a current U.S. Air Force project.

Col H. H. Hunt (USAF, Ret.) and Robert F. Rolsten, employees of the Research Institute of the University of Dayton, Ohio, visited the museum in connection with a project to develop body armor for pilots and air crews for protection against ground fire.

The consultants examined various items contained in the Brashford Dean collection of experimental body armor and helmets, representative of the extensive work done by Dr. Dean as an Ordnance Corps officer in World War I, as well as lighter protective experimental gear developed in World War II.

Many scientists and design engineers, as well as scholars, visit the Army Ordnance School Museum

in research work. The museum houses one of the world's most complete collections of ordnance materiel.



1917-STYLE ARMOR is an example of experimental body armor research conducted during World War I by Maj Brashford Dean. Designed along lines of 15th Century armor, the breastplate shown above is .185 inches thick and weighs 16 pounds. This model was not used in World War I.

150 Expected at DoD Conference on NDT

Nondestructive testing (NDT) problems facing agencies of the Department of Defense will be discussed by experts at the 15th annual Defense Conference on NDT, Oct. 4-6, in Boston, Mass.

The U.S. Army Materials Research Agency (AMRA), Watertown, Mass., is the Army Materiel Command agency spearheading the Army 5-year plan for design, development, application and continual refinement of materials testing techniques to meet Army requirements. Col Dimitri A. Kellogg assumed command July 1, 1966.

Conference chairman Ernest H. Rodgers, chief of AMRA's Non-destructive Testing Branch, said approximately 150 personnel responsible for development or application of NDT methods are expected to attend.

Six specific problems will be presented to technical panels which will report as the conference progresses. They include: Separation of Base Adapter from 81mm Mortar Shell; NDT of Torpedo Welds; NDT

Microcircuits Replace Units in Redeye System

Microcircuits in small silicon chips have virtually replaced the individual guidance package components in the Army Redeye guided missile weapon system.

The discrete component circuitry of transistors, diodes, resistors and capacitors has been converted to linear integrated circuitry, considered a major milestone in analog control systems.

General Dynamics Corp., operating under contract with the Army Missile Command, Redstone Arsenal, Ala., reported the conversion was made at reduced cost and with no loss in performance by the Redeye system. A custom-made Motorola design was used.

Because the heat-seeking Redeye's proportional navigation system requires extreme precision, linear electronic circuits are needed to convert and amplify incoming infrared energy to electrical signals precisely to drive the aerodynamic control surfaces.

The new system went from concept to hardware in one year and initial flight tests demonstrated superior performance. General Dynamics and Motorola engineers evolved circuit designs with minimum system changes and optimum monolithic integrated circuit properties.

Redeye is being produced by the Pomona, Calif., division of General Dynamics.

of 400-Gallon Water Tank; NDT of Welded Integrated Circuit Leads to Printed Circuit Boards; Crack Depth Measurement in Tee-Welded Plate Fatigue Specimens; and Ductility and Elongation Determination of Sintered Iron Rotating Bands for Artillery Shells.

Scheduled technical presentations are: "Eddy-Current Inspection of Turbojet Disks for Loss of Strength"; "Infrared Multiple Scan

STRATCOM Adjusts to General Staff Concept

Realignment of Headquarters, U.S. Army Strategic Communications Command (STRATCOM) has established a general staff to replace a directorate type organizational structure.

Maj Gen Richard J. Meyer, in announcing the changes, explained that they are designed to meet expanding command responsibilities. The Headquarters consists of five general staff and six special staff elements, with three action departments.

General staff elements and the top officers are: Deputy Chief of Staff for Personnel, Col Charles C. Roder; DCS/Intelligence and Security, Col V. E. Johnson; DCS/Operations, Col J. B. James; DCS/Logistics, Col E. L. Weeks and DCS/Comptroller, Col W. G. Skinner.

Special staff elements are: The Inspector General, Col R. H. Folts; The Adjutant General, Col O. R. Rumph; The Staff Judge Advocate, Lt Col D. R. Booth; Civilian Personnel Officer, A. W. West; Information Officer, Wrenne Timberlake and The

Bond Inspection System"; "Use of Industry Standards by the Government"; "Neutron Radiography to Determine Condition of Loads in Explosive Devices"; "NDT Inspection of Adhesive Bonded Metal Helicopter Rotor Blades"; "An Improved Method for Inspecting Solder Connections"; and "Microwave NDT."

In addition, the state-of-the-art in determining incipient failure because of metal fatigue will be explored, primarily in the areas of gun tube and helicopter rotor field failures.

Engineer, (formerly the Facilities Office), Col L. B. Farnum.

Action departments are: Army COMSEC Commodity Manager's Office, Col M. D. Weeks; Communications Engineering Department, Col L. R. Klar; and the Test and Evaluation Department, Robert C. Surina. Functions of STRATCOM's former ET-A (European Troop-Army) Project Control Office are assigned to Col Klar.

To consolidate technical functions, Test and Evaluation (formerly known as the Equipment Applications Directorate) and Communications Engineering have moved from the Command's Arlington, Va., offices to Tempo "E" Building, at 4th and Adams Drive, S.W., Washington.

Another important Headquarters staff action, General Meyer said, was the recent creation of an Office of Command Coordination and Analysis, headed by W. T. Craven. It was established to serve as an extension of the Office, Chief of Staff headed by Col James G. Moak.

The Most Surprising Things Happen . . .

USARO Assignments Reveal Unknown Family Ties

When Lt Col Daniel J. Walsh reported for duty with the U.S. Army Research Office (USARO), Arlington, Va., he was asked if he was related to Lt Col John J. Walsh of USARO. The answer was an unhesitating "No."

Then, to decide on a plan of action to cope with possible "misdirection of the mail," they had an informal chat. John casually mentioned that he had relatives in Lawrence, Mass. Daniel countered by saying that he had an uncle Peter Walsh in Lawrence.

Further conversation revealed that Peter had two brothers, Daniel and Joseph. Daniel, it turned out, was the father of Lt Col Daniel Walsh and Joseph the father of Lt Col John Walsh. Daniel, Sr., had settled his family in the Lawrence, Mass., area while Joseph reared his family at Springfield, without ever giving

Daniel, Jr., and John an opportunity to meet.

Lt Col Daniel Walsh's side of the family shows a line of Marine Corps and Navy personnel. Lt Col John's side has had Air Force affiliations for the most part, although his brother, Lt Mark Walsh, was graduated from the United States Military Academy in June 1965 and is assigned to Santo Domingo, Dominican Republic. Brother Maj Phil Walsh is at Fort Dix, N.J.

Lt Col Daniel Walsh is assigned to the Research Plans Office with extra duty as executive secretary of The Army Research Council (TARC). Lt Col John Walsh is a staff officer in the Scientific and Technical Information Division and was the assistant project officer for the 1966 Army Science Conference at the Military Academy.

XV-5A Modifications Prove Out in Testing

High performance capabilities of the Army XV-5A research V/STOL jet aircraft proved out by 15 test pilots since development began, have been enhanced by modifications to increase the fan-powered conversion-approach speed.

Further flight tests of the 500 m.p.h. vertical-short-takeoff-and-landing aircraft are being conducted at Edwards Air Force Base, Calif., for the Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va.

The XV-5A has completed Phase II testing and was subjected this year to severe environmental tests at rough sites in the Mojave Desert.

Among significant modifications to the XV-5A is the addition of a pitch-or nose-fan diverter valve. This allows the pilot to shut down the fan during the high-speed approach to vertical conversion, thereby reducing drag, and is expected to increase speed from 90 to 100 knots to 110 knots or more.

Another improvement is a mechanical connector which permits conversion of one jet engine at a time. One engine feeds the fan system through the interconnecting ducts and the

second engine's thrust is directed through conventional tailpipes. This permits greater speeds and angles of attack in the fan mode.

A refinement in the mechanical control system of the aircraft is another modification which gives the pilot constant roll control during vertical takeoffs and landings.

Pilot-comfort improvements include an insulated cockpit and installation of an air inlet forward of the cockpit windshield.

The XV-5A is powered by a lift-fan propulsion system. Two J85 turbojet engines provide power for vertical takeoffs and landings and during conventional flight. The lift-fan system nearly triples the basic thrust of the engines and the V/STOL maneuvers and hovering require no more fuel than conventional jet aircraft.

Pilots who have qualified to fly the new V/STOL hover craft are jet and helicopter fliers from the Army, Air Force, Marine Corps, Federal Aviation Agency, National Aeronautics and Space Administration, General Electric Co. and Ryan Aeronautical Co., the designer and builder of the aircraft.



Army XV-5A V/STOL

Joint Bibliography Contains 8,011 Abstracts on Arctic

Volume 13 of *Arctic Bibliography*—being published in Canada (by McGill University Press) for the first time in its 19-year history—is expected to be ready for distribution by the end of 1966.

Previous editions have been published by the U.S. Government Printing Office, Washington, D.C.

The 8,011 abstracts in the new volume raise the total published in the series to 84,727 since the U.S. Army, Navy and Air Force contracted with the Arctic Institute of North America to compile the bibliography in 1947.

Headquarters for the Arctic Institute is in Montreal, Canada, with offices in Washington, D.C. Miss Marie Tremaine of the Institute is bibliography editor.

Dr. Henry B. Collins, senior scientist of the Smithsonian Institution's Office of Anthropology in Washington, is the original and permanent chairman of the committee directing the program to abstract and index scientific literature on the arctic and subarctic.

In the past 10 years, other U.S. and Canadian agencies have swelled the number of supporting organizations to 11. They are in addition to the U.S. Services:

U.S. Atomic Energy Commission, U.S. National Institutes of Health, National Science Foundation, National Geographic Society; and in Canada, the Canada Council, Defence Research Board of Canada, the National Research Council of Canada.

The Canadian Department of Northern Affairs and National Resources, also a 10-year supporter, is assuming a large portion of the cost of printing the current volume. The Environmental Sciences Division of the U.S. Army Research Office, Office of the Chief of Research and Development monitors the Army portion of the production contract.

The United States Library of Congress provides working space for the bibliography staff. Collections of some 100 other large libraries in the U.S., Canada, England, France and Norway also are used for the bibliography's preparation.

Surgeon General Cites AMEDS Viet Nam Role

Rapid buildup capabilities of the U.S. Army Medical Service in responding to an emergency situation such as Viet Nam were stressed by Lt Gen Leonard D. Heaton, The Surgeon General, on the Corps' 191st anniversary, July 27.

During the past year, he said, the Army Medical Service has increased the number of hospital beds available in Viet Nam from 200 to more than 3,100 in a complex medical organization of some 100 units and 5,400 personnel. The number of medical officers has increased tenfold over the previous year.

From the single 100-bed field hospital unit and a few medical detachments in the early days of the Viet Nam conflict, the Army Medical Service has developed capabilities that equal, and in some instance surpass those in Korea during the peak of operations. Modern equipment and air-conditioned buildings now offer relative comfort from the oppressive tropical heat.

The Army's 1st Cavalry Division initiated the first airmobile surgical center in existence for use in forward combat areas where evacuation is hazardous and time-consuming, Gen-

eral Heaton reported. Sling-loaded beneath a CH-54 Flying Crane, the unit is large enough to hold 14 people and support four surgical operations at the same time.

Two helicopter ambulance detachments and a medical air ambulance company have been added to the evacuation support for the Viet Nam war. Some 25,000 wounded men have benefited by aeromedical evacuation. General Heaton paraphrased the late Winston Churchill by noting that "never have so many owed so much to so few."

Intensified research efforts have resulted in an aerial spray device that can effectively distribute minute amounts of highly potent insecticide for the control of mosquito carriers of malaria by Army preventive medicine teams in Viet Nam, it was reported. Currently being field tested, the solution is expected to increase the knockdown of mosquitoes to about 90 percent.

Expansion of research efforts also has resulted in notable progress in coping with treatment and prevention of malaria resistant to established control procedures, General Heaton reported.



LEGION OF MERIT. The Army's coveted Legion of Merit for "exceptionally meritorious conduct" was awarded recently to two STRATCOM personnel. Recipients are the recent CO of the command's continental U.S. operations, Col John N. Medinger, and Lt Col William R. Blake, recently retired secretary of the General Staff.

Col Medinger was cited for "outstanding services" and "superior leadership, initiative and professional competence" as commander of STRATCOM-CONUS during a 19-month period ending May 31.

Col Blake, also a Bronze Star recipient, was praised for "outstanding and versatile ability in organization, administration and communications" as secretary of the Command's General Staff.

Other recent Legion of Merit Award winners are Col Robert C. Crisson, Col Charles S. Skillman and Col George H. Darwin.

Crisson has served successively with the U.S. Army Combat Development Command Experimentation Command as chief of Project Team IV, assistant chief of staff G-3 and chief of staff, CDCEC Headquarters.

Noted in his citation was outstanding ability in planning and executing



NEW ADJUTANT GENERAL of the Army, Maj Gen Kenneth G. Wickham, receives Legion of Merit (Second Oak Leaf Cluster) from Lt Gen Ben Harrell, CG, U.S. Army Combat Development Command (USACDC), Fort Belvoir, Va. Cited for his role in developing COSTAR (Combat Service to the Army) and follow-on concept TASTA (The Administrative Support, Theater Army), General Wickham formerly was CG, USACDC Combat Service Support Group, Fort Lee, Va.

a complex pioneering effort in field experimentation, resulting in "conclusions of significant value in evaluating the role of Army aircraft in tactical operations."

Skillman distinguished himself by "exceptionally meritorious service" as director of logistics for the Army Test and Evaluation Command.

Darwin, who served at the U.S. Army Electronic Proving Ground at Fort Huachuca, Ariz., until his retirement June 30, was cited for "exceptionally meritorious conduct in performance of outstanding services."

MERITORIOUS CIVILIAN SERVICE AWARD. The Army's second highest civilian award was presented to Dr. Marvin S. Peterson and Clarence T. Smith.

Dr. Peterson is a supervisory physical scientist at the U.S. Army Natick (Mass.) Laboratories. He was cited for his "significant contributions, as writer and editor, to scientific and technological literature" and for his accomplishments in the new and still experimental art of technological forecasting of military requirements for the future.

As founder and editor of the *Army Research and Development Newsmagazine*, and chief, Publications Branch, Army Research Office, Office of the Chief of Research and Development, Smith received his second MCSA. Both were in recognition of his selfless efforts and exceptional editorial abilities.

BRONZE MEDAL. Lt Col Thomas W. Sheehy was awarded the 2nd Oak Leaf Cluster to the Bronze Star Medal, and a Certificate of Achievement in recognition of his service in the Republic of Viet Nam as a U.S. Army medical consultant. Since his return he has been serving as assistant chief, Department of Medicine at Walter Reed General Hospital, Washington, D.C.

A citation accompanying the award stated that Col Sheehy's "untiring efforts in applying his extensive knowledge materially contributed to the efforts of our forces in Viet Nam."

AIR MEDAL. Action in Viet Nam has earned the Air Medal for two Army personnel. Col John T. O'Keefe, who was transferred to Viet Nam last year after serving four years at the U.S. Army Missile Command, was awarded the Air Medal for heroism while flying as gunner in a helicopter.

Sustained aerial flight in support of combat ground forces of the Republic of Viet Nam merited the award for Lt Col Edgar R. Fitzgerald, aviation research and development coordinator with the U.S. Army Test and Evaluation Command.

Lt Col Fitzgerald has participated



CONGRATULATIONS from Secretary of the Army Stanley R. Resor go to Army Chief of Staff General Harold K. Johnson at presentation of Distinguished Service Medal. The Army's highest noncombat award—for "eminently meritorious service"—was given to General Johnson as Chief of Staff from July 1964 to July 1966. He was cited for his "key role in the rapid expansion of the Army to meet the Communist threat in Viet Nam while insuring the Army's ability to fulfill its many other commitments throughout the world."

in more than 75 missions over hostile territory in support of counter-insurgency operations. In recognition of his efforts, he also received the first, second and third Oak Leaf Clusters to the Air Medal.

The **JOINT SERVICE COMMENDATION MEDAL** was awarded to Lt Col Thomas G. Provenzano of the Armed Forces Radiobiology Research Institute (AFRRI). Col Provenzano was cited for his "exemplary performance of duty" as head of the Accelerator Division of the Physical Sciences Department of the AFRRI.

ARMY COMMENDATION MEDAL. Lt Col George R. Stockdale was cited for "exceptionally meritorious service" as deputy commander, U.S. Army Mobility Equipment Center Engineer Research and Development Laboratories, Fort Belvoir, Va. The citation reads:

"Although the Laboratories were faced with a severe shortage of manpower, he ingeniously guided the Departments and Staff Offices to meet the increasing number of special projects in support of emergency operations in Southeast Asia in the areas of technology, engineering and procurement."

Lt Col Robert W. Wood was cited for meritorious service as chief of the Armament Section of the command's Aviation Materiel Testing Directorate. Col Wood's Oak Leaf Cluster to the Commendation Medal recognized his "outstanding initiative and exceptional abilities" in testing

a wide variety of armament items and systems for use in Southeast Asia.

Lt Col Forest L. Neal, MSC, consultant to The Army Surgeon General for packaging medical materiel, received the award for the period when he served consecutively as assistant chief, Development Division, U.S. Army Medical Research and Development Command, and then as project officer of the MUST (Medical Unit Self-contained Transportable) Project Office, OTSG.

Other recent Commendation Medal recipients are Lt Col James L. Quinnely, Combat Materiel Division, OCRD; and Maj Henry H. Berke, Jr., Review and Analysis Division, OCRD, who received his first Oak Leaf Cluster.

The ARMY CERTIFICATE OF ACHIEVEMENT was presented to Lt Col John W. Consolvo for "exceptionally meritorious service" as deputy commander and executive officer of the Engineer R&D Laboratories. He was also cited for his success as chairman of the Laboratories' Incentive Awards Committee and as military adviser to the Junior Management Board.

John R. Tedesco, a general electronics engineer with the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency, was similarly honored for his work in advancing the use of satellites for surveying and geodesy.

A third recipient of the award was Guy C. Bevers, Zero Defects coordinator and chief, Special Programs Office of the U.S. Army Electronics Proving Ground, Fort Huachuca, Ariz. He was cited for having "demonstrated exceptional ability . . . in creating an effective and progressive Zero Defects Program."

OUTSTANDING PERFORMANCE AWARD. Mrs. Hilda M. Helmcamp received her ninth certificate for "outstanding" performance of her duties as secretary in the Electrical Department at the U.S. Army Engineer R&D Laboratories.

Turner G. Timberlake, chief of the Engineering Department, received his fifth consecutive award. Other recent OPA recipients at ERDL are Rudolph Messerschmitt, Lemuel L. Osteen, William S. Guerrant, William D. Shipley, Mrs. Betty J. Keys, Mrs. Julia S. Rice, and John L. McDonald, who also received a "Sustained Superior Performance" rating.

DR. E. N. PETRICK, chief scientist, U.S. Army Mobility Command, Warren, Mich., received the title "Distinguished Engineering Alumnus" at a recent Honors Convocation at Purdue University. Ten engineering alumni are chosen annually by the heads of Purdue's en-

gineering schools for outstanding achievement in business, industry, military or public service and education or research.

FRANCIS P. McCOURT, chief of the Safety and Survivability Division of the U.S. Army Aviation Materiel Laboratories, received the Laura Taber Barbour Air Safety Award for 1966 for notable achievement in the field of aviation safety.

THE HOFF MEDAL, awarded annually in the Military Medicine and Allied Sciences Course at Walter Reed Army Institute of Research to the student with the highest class average, was presented to Lt Col Harvey B. Conklin, Medical Corps.

DR. LUDWIG SELIGSBERGER, U.S. Army Natick Laboratories, was the recipient of the Alsop Award for creative research. This is the highest honor of the American Leather Chemists Association.

JAMES McCAHILL, research chemist and acting CBR officer at Picatinny Arsenal, Dover, N.J., was chosen one of the Outstanding Young Men of America in the book bearing that title published by the national Junior Chamber of Commerce (JAYCEES). He is head of the Physics Branch, Feltman Research Laboratories radiation facility, past president of the Dover area JAYCEES and president of the Morris County School Board Association.

New Deputy CG of WECOM



Brig Gen H. G. Davisson assumed duties as Deputy CG of the U.S. Army Weapons Command, headquartered at Rock Island (Ill.) Arsenal, when he returned recently from a 26-month tour as commanding general of the Eighth U.S. Army Support Command in Korea. A 1937 U.S. Military Academy graduate and native of Ruleville, Miss., he served as executive officer for the Chief of Ordnance, European Theater, in World War II. His decorations include the Legion of Merit with OLC, the Army Commendation Medal, and the Order of the British Empire.

HOWARD J. PRATT, chief, Control Office of Eastern Area Military Traffic Management and Terminal Service, has been named "Outstanding Civilian of the Year 1966" by the Federal Business Association of New York.

THE GROVER E. BELL AWARD for 1966 was presented to Paul J. Carpenter, Director of Systems at the U.S. Army Aviation Materiel Laboratories, Fort Eustis, Va., by the American Helicopter Society for the most outstanding contribution to helicopter development. Carpenter, 44, recently received the Army's Exceptional Civilian Service Decoration.

FIVE SPRINGFIELD ARMORY personnel from the Research and Engineering Division recently received individual invention awards for documented new ideas in the military weapons field. They are Anthony J. Lizza, Stanley O. Silsby, Frederick P. Reed, John M. Wallace and John G. Rocha.

MISSILE COMMAND scientists, Dr. William C. McCorkle, Jr., and Robert C. Conrad coauthored a patent application recently approved on a drag-compensated fin-stabilized missile, including a booster, sustainer, accelerometer and control and measurement devices. Dr. McCorkle is director of the Advanced Systems Laboratory, Research and Development Directorate. Conrad is a supervisory physical scientist.

ARMY COMMENDATION Certificates were awarded to five employees of the Office of the Chief of Research and Development—Mrs. Doriene J. Amundson, Plans Division; J. Brian Flesche, Review and Analysis Division; Mrs. Mildred C. Mumane, Review and Analysis Division; L. VanLoan Naisawald and Leslie S. Davis, Technical and Industrial Liaison Office.

Missile Veteran Becomes Chief Of Kwajalein Range Operations

Maj W. H. Griswold, former Nike Ajax missile system project officer at Redstone Arsenal, Ala., and White Sands (N. Mex.) Missile Range, is the new chief of the Range Operations Division at the Army's Kwajalein Test Site in the Pacific.

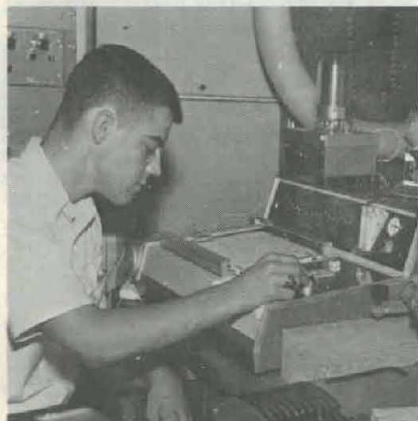
Maj Griswold was involved in Nike Ajax development at Redstone in the early 1950's and attended the Ordnance Guided Missile School, predecessor of the Missile and Munitions Center and School.

The Kwajalein Test Site is operated by the Nike-X Project Office, Redstone Arsenal, as a research and development site for the Nike-X missile defense system and other Department of Defense projects.

ERDL Offers Research Experience to Area Students Through Participation in NSF/AU Summer Program

Five students from three Northern Virginia high schools spent their summer vacation conducting research in a Fort Belvoir laboratory to determine whether they may be interested in career opportunities offered in Army science.

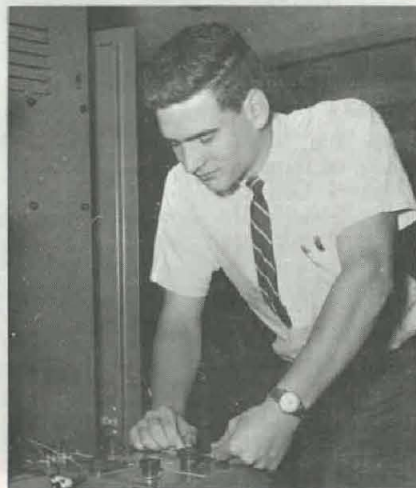
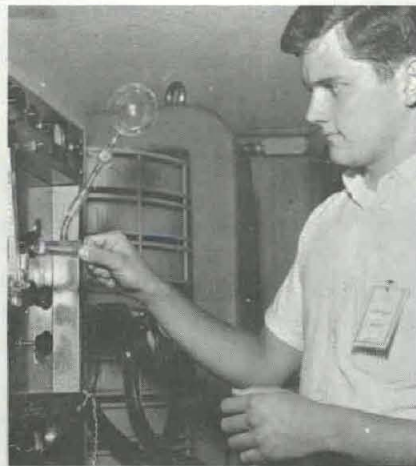
The U.S. Army Mobility Equipment Center's Engineer Research and Development Laboratories (ERDL) enabled Gary L. Oleson, Knox S. Long, Jr., James M. Huggett, William H. Dripps and James J. Kessinger, Jr., to get an insight into some interesting activities in progress.



They participated in a program financed by the National Science Foundation and administered by American University, Washington, D.C., in an effort to stimulate more interest in research careers to meet the Nation's continuing need for scientists. They worked under highly qualified supervisors in ERDL's Basic Research Laboratory.

The young men were among a large group of "high ability" science students chosen from Metropolitan Washington, D.C., schools to work in nearby laboratories of local Govern-

SENIOR HIGH SCHOOL students who participated in a program financed by National Science Foundation at ERDL during summer vacation included (from top left, counterclockwise) Gary Lynn Oleson, W. T. Woodson H.S.; Knox S. Long, Woodson H.S.; James J. Kessinger, Washington-Lee H.S.; William H. Dripps, Fort Hunt H.S.; James M. Huggett, Woodson H.S.



ment agencies and private technical firms.

Oleson hopes to major in physics at Princeton University. At ERDL he worked on infrared spectroscopy. Long hopes to attend either the Massachusetts Institute of Technology or Georgia Tech, and to major in either physics or mathematics. He worked at ERDL under Dr. Edward F. Allard in the Mossbauer physics lab.

Huggett, who hopes to major in physics at Princeton University, worked in the mass spectrometry lab under the supervision of Amos Coleman. Dripps would like to major in physics or chemistry at MIT or Harvard University. His work at ERDL on the thermal sensitivity of explosives was supervised by Richard J. Holland.

Kessinger is interested in Georgetown University and a career in chemistry. His research at ERDL on differential thermal analysis was supervised by O. Fred Kezer.

McNamara Plans Cutback To Prevent War Surplus

Air munitions production will be reduced 30 percent beginning in October to prevent recurrence of such surpluses as the \$12 billion materiel stockpile at the end of the Korean War.

Secretary of Defense Robert S. McNamara announced that "... the new plan (on an annual basis compared with previous estimates) will reduce expenditures by approximately \$1 billion while building to an air ordnance inventory of more than 500,000 tons within a year."

Secretary McNamara said the revised production plans have the support of the Joint Chiefs of Staff, and planned expenditures for air munitions will continue to rise during the coming months. "The new production," he stated, "will insure that requirements in Viet Nam and elsewhere will be met while at the same time inventories will continue to grow."

Mr. McNamara complimented American industry and labor for having done "an outstanding job" in responding to military requirements. As a result, he said, production last June exceeded consumption and "this trend will continue at a rising rate."

First deliveries of the new 750-pound bomb, originally programed for August 1966, were made 60 days earlier, the Secretary reported.

He said that ground munitions requirements also are being reviewed and preliminary data indicate "that planned rates of production for many items will be decreased; for some items there will be increases."

Human Factors R&D Parley Set Oct. 3-4

"Human Factors R&D in Today's World Crises" is the theme of the 12th Annual Army Human Factors Research and Development Conference, Oct. 3-4, at Fort Benning, Ga.

Sponsored by Chief of Research and Development Lt Gen A. W. Betts, the conference will be hosted by Maj Gen Robert H. York, commanding general of the Infantry Center and commandant of the Infantry School.

Battelle Programs Clark For R&D Management Meet

Retired Maj Gen Chester W. Clark, former Director of Army Research, will address a 2-week Research and Development Management Program beginning Oct. 2 at Battelle Memorial Institute, Columbus, Ohio.

Since he retired from the Army in May 1965, General Clark has been vice president for research, Research Triangle Institute, Durham, N.C. He will share speaking honors with Dr. Hudson Hoagland, executive director of the Worcester Foundation for Experimental Biology.

Dr. Clark will compare military and civilian responsibility in research management at the Battelle banquet, Oct. 6. Dr. Hoagland will speak on "Aspects of Human Behavior Control" during the second week of the program when the scene shifts to Ohio University at Athens.

Some 30 scientists, educators, management specialists and industrialists will serve on the faculty for the fourth annual management course on management of scientific personnel, programing of research and development and budgeting.

In addition to specialists from Battelle's Columbus Laboratories and the Ohio University faculty, speakers and lecturers will represent Bell Telephone Laboratories, Harvard University, Indiana University, University of Miami (Fla.), University of Michigan, Ohio State University, Owens-Illinois, Inc. and University of Pennsylvania.

Dr. Clark received BS and MS degrees in chemistry from the University of California and a PhD in physics from the University of Leiden, The Netherlands.

Dr. Hoagland, cofounder of the Worcester Foundation, is a research physiologist and administrator and has taught at Harvard University, University of Cambridge and Clark University. He received BS and MS degrees in chemical engineering from MIT and a PhD from Harvard.

Maj Gen F. T. Unger, deputy chief of staff, Individual Training, U.S. Continental Army Command (CONARC), is keynote speaker. He will discuss "CONARC's Training and Education Mission in the Current Crisis." Army Chief Scientist Dr. Marvin E. Lasser is banquet speaker.

About 250 psychologists, scientists, engineers and top management personnel, representing the Army, industry and nonprofit organizations, are expected to participate.

The Human Factors Engineering Conference was initiated in 1955 at the Pentagon in Washington, D.C., and the present name was adopted in 1963. Subsequent meetings have been held at different Army installations each year. The eleventh was held at Fort Bragg, N.C., the tenth at Fort Rucker, Ala., and the ninth at Walter Reed Army Institute of Research, Washington, D.C.

ERDL Schedules Seminar on Managing Innovators

"Management of Creative Scientists and Engineers" is the subject of a seminar sponsored by the Army Engineer Research and Development Laboratories (ERDL), Oct. 16-21, at Airlie House, Warrenton, Va.

Personnel selected to attend the third seminar of this type sponsored by the Fort Belvoir, Va., laboratories will be selected from all professional categories at the GS-12 level and above. Thirty seminarists will be selected from ERDL and 20 from other Government agencies.

Workshops and discussion periods will dwell on the training of potential supervisory personnel to meet the growing demand for capable managers. Major topics include the individual, the creative environment and the management of creative activities.

SCIENTIFIC CALENDAR

Northeastern America's Branch of the Glaciological Society Meeting, sponsored by AMC, Dartmouth College, Glaciological Society and Research Institute of Cambridge, England, Hanover, N.H., Oct. 1-2.

Army Human Factors Research and Development Conference, sponsored by OCRD, Fort Benning, Ga., Oct. 2-5.

4th Annual Research and Development Management Program, sponsored by the Battelle Memorial Institute and Ohio University, Athens, Ohio, Oct. 2-14.

National Electronics Conference, sponsored by IEEE, Chicago, Ill., Oct. 3-5.

Meeting of the Aerospace Electronics Systems, Washington, D.C., Oct. 3-5.

1st Materials Research Symposium on Trace Characterization Chemical and Physical, sponsored by NBS, Gaithersburg, Md., Oct. 3-7.

SAE Aeronautics and Space Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 3-7.

10th Annual Organic Chemistry Conference, sponsored by Nattek Laboratories and NAS-NRC Advisory Board on Military Personnel and Supplies, Nattek, Mass., Oct. 4-5.

Conference on Circuit and Systems Theory, sponsored by IEEE and University of Illinois, Monticello, Ill., Oct. 5-7.

American Congress of Surveying and Mapping, Houston, Tex., Oct. 6-8.

Meeting of the Society of American Military Engineers, St. Paul, Minn., Oct. 7.

Fall Meeting of the Electrochemical Society, Philadelphia, Pa., Oct. 9-14.

Meeting of the Association of the U.S. Army, Washington, D.C., Oct. 10-12.

7th Annual Symposium on Advanced Techniques for Aircraft Electric Systems, sponsored by BUWEPS, Washington, D.C., Oct. 11-12.

General chairman of the conference is Dr. Lynn E. Baker, chief psychologist, U.S. Army, assigned to the Army Research Office, Arlington, Va. Cochairmen and topics of the five technical sessions are:

Special Interface Between U.S. Troops and Local Peoples: Dr. Paul Spector, American Institute of Research, Washington, D.C. *Training for Modern Combat Operations:* Dr. T. O. Jacobs, Human Resources Research Office, Alexandria, Va., Division No. 4 (Infantry), Fort Benning, Ga.

Troop Performance in Modern Combat Operations: Maj Wayne Evans, Fitzsimons General Hospital, Denver, Colo. *Human Factors in Night Operations:* Dr. Andrew Eckles, U.S. Army Human Engineering Laboratories, Aberdeen Proving Ground, Md. *Information Processing Surveillance Systems:* Robert Sadacca, U.S. Army Personnel Research Office, Washington, D.C.

13th National Conference of the AFMA, Washington, D.C., Oct. 11-13.

4th Canadian Symposium on Communications, sponsored by IEEE, Montreal, Canada, Oct. 11-14.

12th Weather Radar Conference, sponsored by AMS, Oct. 17-21.

36th Symposium on Shock and Vibration, sponsored by NRL, Los Angeles, Calif., Oct. 18-20.

3rd Guidance Test Symposium, sponsored by AF Missile Development Center, Holloman AFB, N. Mex., Oct. 19-21.

13th Nuclear Science Symposium, sponsored by IEEE AFOSR, NBS, AEC and NASA, Boston, Mass., Oct. 19-21.

12th Conference on the Design of Experiments in Army Research, Development and Testing, sponsored by ARO-D, Gaithersburg, Md., Oct. 19-21.

Electron Devices Meetings, sponsored by IEEE, Washington, D.C., Oct. 20-22.

21st Annual Conference of Instrument Society of America, N.Y.C., Oct. 24-27.

Colloquium on the Photographic Interaction Between Radiation and Matter, sponsored by AFOSR and the Society of Photographic Scientists and Engineers, Washington, D.C., Oct. 26-27.

East Coast Conference on Aerospace and Navigation Electronics, sponsored by IEEE, Baltimore, Md., Oct. 26-28.

American Nuclear Society Meeting in conjunction with 14th Conference on Remote System Technology and the Atomic Industrial Forum, Pittsburgh, Pa., Oct. 30-Nov. 6.

New England Research and Engineering Meeting, sponsored by IEEE, Boston, Mass., Nov. 2-4.

5th Annual Symposium on the Physics of Failure in Electronics, sponsored by the Rome Air Development Center, place and date undetermined.

ECOM Avionics Laboratory Responding to Army Aviation Needs

By Lt Col Leslie G. Callahan, Jr.
Director, Avionics Laboratory
U.S. Army Electronics Command

Increasing U.S. Army emphasis on airborne operations, highlighted by deployment of the 1st Air Cavalry Division to Viet Nam, is having a profound impact on the Electronics Command's Avionics Laboratory at Fort Monmouth, N.J.

From an initial strength of 102 civilians and 4 officers when established in March 1965, the Avionics Laboratory has grown to nearly 200 civilians and 12 officers. Its currently authorized strength of 250 civilians and 20 officers is expected to be reached by December 1966.

Joint Chiefs of Staff Publication 1 and Army Directive 320.5 define it as "the application of electronics to aviation and astronautics."

Avionics is a word contracted from aviation and electronics.

As applied by the Army, avionics includes all airborne electronic equipments and ground systems which are required for the operation of an aircraft. Excluded are mission-type equipments, such as surveillance radars, and electronic warfare systems which are the concern of other laboratories in the Electronics Command.

Responsibilities of the Avionics Laboratory encompass the complete R&D cycle, from exploratory research to engineering development and systems integration. To perform its mission, the Laboratory is organized into seven technical areas: Navigation and Landing, Environment Sensing, Cockpit Instrumentation, Flight Control, Airborne Communications and Antennas, Airborne Systems and Ground Systems.

Each of the Technical Areas is concerned with equipments or systems which have their counterparts in the



Lt Col Leslie G. Callahan, Jr.

other Military Services. The Army, however, has unique problems imposed by the need for tactical mobility of ground systems; by the need for tactically advantageous low-level, or nap-of-the-earth, flight at night or in reduced visibility; and by the fact that Army aircraft are, in general, smaller than those of the other Military Services.

The need for transportable ground systems is exemplified by air traffic control centers which must be designed and built to permit rapid set-up, dismantling, and relocation in a changing tactical environment.

Avionics Laboratory engineers are helping to solve this problem by providing technical supervision for the fabrication, on a crash basis, of a number of air traffic control facilities which are not available as standard items at the Lexington (Ky.) Blue Grass Army Depot.

Designed in several configurations for either en route or terminal area control, these facilities will give the Army a new degree of flexibility in meeting its increasingly serious air

traffic control problems under both visual and instrument flight rule (IFR) conditions.

The Army's need for nap-of-the-earth flight in limited visibility has led to modification of a Mohawk aircraft under direction of the Avionics Laboratory. A terrain-avoidance radar, coupled to the aircraft's automatic flight control system, provides the capability of detecting and displaying terrain features. The pilot may optionally take manual evasive action or allow the aircraft's automatic system to take charge.

The complete system, which provides for input from a radar altimeter and a doppler navigator, is undergoing evaluation by Army Test and Evaluation Command personnel at Fort Huachuca, Ariz.

Impending introduction of the Light Observation Helicopter (LOH) into the Army's aircraft inventory created a problem in space and weight reduction for Avionics people asked to provide a new series of radio transceivers. Typical of the benefits expected to be realized is a reduction from 25 to 8 pounds of the VHF/FM tactical radio.

Application of the latest techniques in microcircuitry and solid-state technology will be primarily responsible for this dramatic decrease in weight with no sacrifice to operational capability.

Army aircraft are becoming increasingly sophisticated and complex, to the extent that serious attention must be paid to reducing the pilot's growing workload. A first step in that direction has been taken with development of the Advanced Army Aircraft Instrumentation System (AAAIS).

AAAIS processes the information from a number of sensors and performs various navigational, fuel management and fail-safe functions which are translated into vertical and horizontal situation displays on separate cathode ray tubes.

The pilot is thus presented with an easily interpreted distillation of the significant data from a somewhat formidable assortment of gauges, instruments, dials and indicators.

An advanced development model of the AAAIS has been installed in an aircraft and is currently undergoing an extended period of demonstration to agencies and evaluation by pilots.

With an eye on future generations of Army aircraft, the Avionics Laboratory is involved in a variety of challenging programs expected to enhance present capabilities or provide



AN/TSQ-70-71 terminal control facility is one of the joint design and fabrication efforts being carried out between the Avionics Laboratory and Lexington (Ky.) Blue Grass Army Depot to meet Army air traffic safety requirements.

giant steps toward the realization of currently unavailable capabilities.

A representative sample of equipments to enhance present capabilities would include:

- A radar altimeter to provide accurate altitude indications over ice or snow.
 - An improved, lightweight weather radar to pinpoint dangerous storm build-ups.
 - A new ground-based navigation system, Loran-D, which is being developed jointly with the Air Force to provide orders of magnitude increases in position-fixing accuracy.
 - A gyro-magnetic compass using new suspension techniques to achieve greatly increased heading accuracy.
 - Automatic flight control mechanisms to cope with the inherently unstable flight characteristics of anticipated future aircraft.
- Equipments which will provide new capabilities include the following items in various stages of the development cycle.
- A Laser-based device which will warn the pilot of impending collision with elevated wires and cables.
 - An automatic terrain-avoidance system for helicopters.
 - Computers which will automatically and safely control the anticipated dense air traffic of the future.
 - A self-contained hybrid doppler inertial navigator of a cost, size and accuracy compatible with Army requirements.
 - A device which will enable flights of aircraft to fly safely in close formation at night or in restricted visibility.
 - An electronic system which will give Army aircraft the capability to land safely at night or in bad weather in a tactical environment.

Integrating these devices into efficient and compatible systems will be a fundamental task of the Laboratory's "Tactical Avionics Systems Simulator." This system was described in the February 1966 issue of the *Army Research and Development Newsmagazine*. Designed by Laboratory engineers, it has been used to simulate and analyze simultaneously the avionics, weapons, and aerodynamic subsystems for the Army's forthcoming weapons aircraft, AAFSS, with remarkably successful results.

Someone once said, "Army aviation is not a fly-by-night outfit, but with better Avionics it will be." Perhaps this is as fair a statement as any on one of the Avionics Laboratory's main goals: to provide Army aircraft with the means to operate with equal facility in daylight, darkness or restricted visibility.

Viet Nam Air Traffic Control Net Work Expedited

Army aircraft capabilities in South Viet Nam are being increased by installation of an air traffic control network.

The program is being carried out as a combined effort of the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J., the Lexington (Ky.) Blue Grass Depot of the Army Supply and Maintenance Command, and the 125th Air Traffic Control Company in South Viet Nam.

Although the Department of the Army started work recently, much of the mobile equipment that makes up the control net is in operation and the facilities are being expanded and improved on a priority basis.

Urgent necessity for the system, being developed largely from standard equipment, has been brought about by increased numbers of Army aircraft operating in South Viet Nam. Helicopters and fixed-wing types are used for numerous purposes, such as weapon mounts, for combat surveillance, hauling supplies, liaison and medical evacuation.

The Army's air traffic control in Viet Nam is based on agreements reached by the Vietnamese government, the U.S. Army and the U.S. Air Force. The Vietnamese government has overall responsibility for traffic regulation and control in Viet Nam. However, by letter of agreement, the Army is responsible for internal control of its own tactical aviation operations.

The expanded control facilities, which make it possible to keep close track of the progress of flights, will provide commanders with up-to-the-minute status reports on the mission and deployment of all Army aircraft.

A communications system employing several types of radios, teletypewriters and telephones provides high-capacity message exchange between ground control points, with aircraft, command centers and with widely dispersed support elements.

The improved takeoff and landing aids and controls being put into operation at the Army airfields make it possible for pilots to get into the air and return to their bases quicker and with greater safety. The fliers are being aided by radio beacons, and new equipment, for positive aircraft identification.

Three types of facilities are being provided as terminal aids to pilots. These are airfield towers, which control takeoffs and landings visually; ground control approach radars (GCA) for let-down control in low-visibility weather, and a shelter-mounted tower facility which provides for both visual and GCA control

at landing strips which have been operating without such equipment.

Direction of the ECOM's part of the development program is centered in the Commodity Management Office for Avionics and Navigation Aids, headed by John N. Montgomery, III, with Sam Kramer, the task leader.

ECOM contributors to the project include the R&D Directorate, the Avionics Laboratory, the Materiel Readiness Directorate, and the Production and Procurement Directorate.

Col Healey Takes Command Of Nike-X Kwajalein Site

New commanding officer of the Nike-X Project Kwajalein Test Site is Col Frank C. Healy, formerly with the Atomic Energy Commission's Division of Military Applications, Washington, D.C.

Col Melvin D. Clark, who became CO at Kwajalein in December 1964, six months after the Army assumed management, has been assigned to the staff of the Army War College, Carlisle Barracks, Pa.

Col Healy has a BS degree in chemistry from Massachusetts State University and an MS degree in electrical engineering from the University of Illinois. He has taught mathematics at the University of Louisville, University of New Mexico and Frederick (Md.) Community College.

The Kwajalein command includes some 3,000 American residents and technical and community facilities valued at about \$500 million. The test-site—a national range of the Department of Defense—consists of several islands in the Kwajalein Atoll, Marshall Islands, about 2,000 miles southwest of Hawaii.

Col Healy has 25 years of military service. He has been closely associated with special weapons projects during the past 15 years.

MICOM Awards \$5.9 Million For Hawk Launching Units

Mobile launchers for the Hawk air defense missile system have been ordered by the Army Missile Command, Redstone Arsenal, Ala., under a \$5.9 million contract with Nortronics, Anaheim, Calif.

A division of Northrop Corp., Nortronics will manufacture the launchers at facilities in California.

Hawk is a 17-foot-long supersonic missile that can reach out to destroy attacking high-performance aircraft or air-breathing guided missiles at low altitudes. The missile homes-in on the target by following a reflected radar beam. It is operational in the U.S. and overseas.

ARADCOM Initiates Testing of Missile 'Command Posts' for SAM

Testing of new Missile Mentor "command posts" for improved coordination of surface-to-air missile (SAM) defenses of American cities, initiated recently by the Army Air Defense Command (ARADCOM), is scheduled to continue several months.

Lt Gen Charles B. Duff, ARADCOM commander, announced that installation of Missile Mentors in selected defense areas will proceed though final acceptance of the system will await completion of the test program. The first test unit is at Arlington Heights, Ill., for the Chicago-Milwaukee SAM defense area.

Missile Mentors will be substituted for all the remaining Missile Master and some of the BIRDIE (Battery Integration and Radar Display Equipment) systems now in use, it was stated.

The computer-assisted, semiautomatic electronic complex will harmonize battle actions of missile firing units within a single defense, providing greater flexibility and reliability.

General Duff said that Missile Mentor will "significantly improve" the coverage and effectiveness of Nike Hercules and Hawk missile defenses while sharply cutting operating costs and reducing manpower needs.

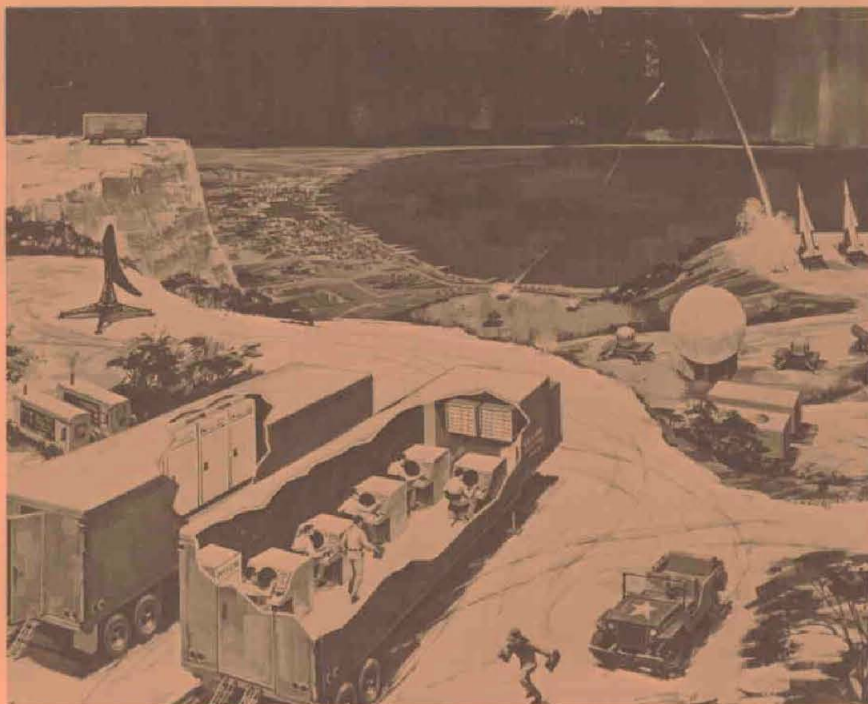
Until the tests are completed by the Army Materiel Command and by ARADCOM, as the "user" of the new systems, regular air defense operations in the various defense areas involved will continue to be managed from the existing command centers.

Development of Missile Mentor reflects the rapid strides made in the field of electronics in less than a decade since the Missile Master, with its radio tube circuitry, was first positioned in the air defense system.

Missile Mentor solid-state circuits fit snugly into two trailer vans which would occupy only a small corner of a Missile Master building. Consequently, costs are much lower and fewer operational personnel are required (50 to 60 per unit as compared to 200 for the Missile Master).

For example, the cost of a single Missile Mentor is approximately one-tenth the cost of a single Missile Master purchased 8 to 10 years ago at \$10 million. Cost of operating a Missile Mentor is estimated at \$250,000 a year, about one-fourth that of the old Missile Master.

As the first system to employ a general purpose computer for coordination of Army defense units, Missile Mentor makes it possible to give commanders more complete target data



MISSILE MENTOR fire coordination system for surface-to-air missile batteries (artist's concept) shows operational configuration of the electronic "command post." Trailer-van cutaways show housing for solid-state circuitry (left) and general purpose computer and display consoles (right) on which Army Air Defense Command personnel can follow and guide the course of the air battle.

than they have ever had on which to base their battle decisions.

Modular design makes it possible to enlarge coverage. Remote Radar Integration Stations (RRIS) can be satellited on the basic system for that purpose. These remote stations are an innovation which makes it possible to "net" additional radars located at great distance from the command post into the overall surveillance coverage. An RRIS can be converted to use as a command post.

While designed to make the separate Army air defense areas more self-sufficient than ever, Missile Mentor will provide the vital link between Army air defense units and other elements of the North American Air Defense Command (NORAD), of which ARADCOM is the U.S. Army component.

Years of time normally required for research and development of systems have been saved in the production of the Missile Mentor by using "off the shelf" techniques. Many proved components have been adapted to the new system for final acceptance tests by ARADCOM.

Hughes Aircraft delivered the prototype Missile Mentor system to the

Army Air Defense School, Fort Bliss, Tex., for use in training Army personnel, in March 1966, less than two years after the production contract was awarded.

Army commands which have been involved in initiating the requirement and procuring the Missile Mentor systems are the Army Combat Developments Command, the Army Materiel Command and ARADCOM.

Formerly known only as the AN/TSQ-51 system, Missile Mentor was given its popular name after a contest was conducted among Army air defense missilemen.

Study Seeks Improved Accuracy On Military Air-Drop Missions

Dynamics of air-drop missions by the V/STOL XC-142A aircraft is receiving engineering analysis under a \$56,500 contract awarded to the LTV Aerospace Corp., by the Army Aviation Materiel Labs, Fort Eustis, Va.

Expected to be completed by December, the studies of V/STOL aircraft potential to perform Army in-flight delivery of equipment and personnel at various altitudes and speeds could provide a basis for more precise air-drop procedures.