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# R&D Achievement Awards Recognize 38 In-House Scientists

Exceptional results of the work of 38 scientists and engineers employed at in-house laboratories are recognized in announcement of Department of the Army Research and Development Achievement Awards for 1967. The awards will honor eight individuals and six teams at 11 Army installations.

Chief of Research and Development Lt Gen Austin W. Betts, for the first time since the awards were initiated seven years ago, plans to make the presentations during a tour of Army R&D activities in June and July. (For pictures of the winners, turn to pages 35 and 36.)

In previous years, winners in the metropolitan area of Washington, D.C., have been honored at a formal ceremony in the Pentagon Office of the Chief of Research and Development. Major commanders concerned have made the presentations to their respective personnel. Each award consists of a wall plaque to an individual or a group and a lapel pin for each winner.

Criteria for selection of Army R&D Achievement Award winners require that they be directly responsible for a significant scientific or engineering accomplishment that:

Establishes a scientific basis for subsequent technical improvement of military importance and/or

Materially improves the Army's technical capability and/or

Contributes materially to national welfare.

Nominations of candidates are submitted by each of the major commands engaged in R&D activities and are re-

*(Continued on Page 3)*

## SEATO Center Opening As Example of Teamwork

Modern medicine has one of its finest research facilities created as a result of humanitarian teamwork between the U.S. Army and a foreign government in the new Clinical Research Center (CRC) in Bangkok, Thailand.

Formal dedication ceremonies for the new building have not been definitely scheduled. U.S. Army and Thai medical researchers, however, are moving into the 5-story, 50,000-square foot facility, which is part of the Southeast Asia Treaty Organization Medical Research Laboratory and Clinical Research Center.

U.S. medical authorities have termed

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## ECOM Laboratory Plans Visionics Research Facility

Night-vision research capabilities at the U.S. Army Electronics Command laboratory at Fort Belvoir, Va., will be augmented by a simulation facility to be built at estimated cost of $1.473 million.

Construction is scheduled to begin this fall. Plans also call for a far infrared laboratory at an estimated cost of $840,000. Work on the latter building is tentatively scheduled to begin in the spring of 1968.

The U.S. Army Corps of Engineers has developed plans for the structure, which will complement a $1.8 million night-vision laboratory built in 1964-65.

The new facility will provide a capability for complete parametric studies of man-viewer systems in the concept phase through simulation to insure proper tech-

*(Continued on Page 6)*

## ATAC Schedules Effort To Update Personnel

Concerned about a condition becoming common at R&D installations — a high percentage of personnel who are not keeping pace with rapid technological advances through continued education — the U.S. Army Tank-Automotive Command (ATAC), Warren, Mich., is reacting vigorously.

All five of the major universities in the Detroit area and Educational Television Channel 56 are cooperating in a program aimed at updating and upgrading professional competence of ATAC's scientists, engineers, technicians and managerial staff.

Participation is strictly voluntary, but about 90 percent of ATAC's professional staff has indicated a desire to take advantage of opportunities for advanced education in the Army career development program.

Commanding General (Maj Gen) W. W. Lapsley laid the foundation for the ATAC program now being developed when he ordered an education study in

*(Continued on Page 8)*

**UNIVERSITY MEMBERS of Army Tank-Automotive Command (ATAC) Planning Committee shown with Chairman Dr. Ernest N. Petrick, ATAC chief scientist and technical director of laboratories, are (l. to r.) Dr. N. R. Scott, associate dean, College of Engineering, University of Michigan; Dr. J. S. Johnson, dean, College of Engineering, Wayne State University; Professor J. W. Hoffman, Division of Engineering Research, Michigan State University; and Dr. C. T. Hardwick, dean, University Center for Continuing Education, University of Detroit. R. E. Tresse, assistant to dean of engineering, Oakland University, was not present for photo.**

### Featured in This Issue

Army R&D Newsmagazine

Vol. 8, No. 6 June 1967

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# Power Sources Meet Chided on Pollution

Advances in the development of new batteries for electric vehicles were among major topics discussed at the 21st annual Power Sources Conference in Atlantic City, N.J., May 16-18.

Rep. Richard L. Ottinger, Democrat from New York's 25th Congressional District, chided U.S. industry on the air pollution problem when he spoke on electric vehicles at the conference banquet.

Industry should not misjudge the strength of Congressional determination to halt the growing air-pollution menace from autos, trucks, and buses, he said, and urged auto manufacturers to take the lead in producing feasible alternatives to modification of the gasoline engine.

Researchers of major auto, electronic and petroleum firms and the Army delivered papers at a technical session on battery-propelled vehicles.

The Power Sources Conference is sponsored by the Army Electronics Command (ECOM), Fort Monmouth, N.J., in cooperation with the Interagency Advanced Power Group. Some 1,200 representatives from industry, the Armed Services, other U.S. Government agencies, universities, and research and development organizations attended.

Successful development of battery-operated vehicles is dependent on the availability of low-cost batteries having high energy and power densities, according to the researchers presenting papers in this field.

Dr. J. T. Kummer of Ford Motor Co. and H. A. Wilcox of General Motors Corp. reported on high-temperature secondary (rechargeable) batteries and the high level of efficiency which can be obtained for vehicle use. The Ford battery operates at about 600 degrees Fahrenheit, and the General Motors battery at about 1,200 degrees F.

High operating temperatures, however, increase problems of corrosion, emphasize the need for stable components, present more difficulties in the construction design of a multicell battery and can have an adverse effect on the battery lifetime and its recycling characteristics.

The Ford sodium-sulfur system has been investigated mainly on a single-cell basis, but current work is concerned with larger battery structures. One type consists of a sodium reservoir from which plates of ceramic tubes are suspended and to which they are sealed with a resistant glass. These ceramic tubes are immersed in sulfur contained in a porous graphite electrode which in turn contacts a current collection plate. It is planned to enclose the assembly in an aluminum container.

Dr. Kummer reported batteries of this type should have an energy density of 148 watt-hours per pound and a power density of 11 pounds per kilowatt, both at 80 percent discharge efficiency.

Dr. Wilcox stated that General Motors work on the rechargeable lithium-chlorine battery has indicated the technical feasibility of a power system in the 100-horsepower — 100 hp.-hour range. The present system uses molten lithium metal, molten lithium chloride electrolyte and a porous graphite cathode through which hot chlorine gas finds its way to the electrolyte interface.

Power densities up to 10,000 watts per square foot have been achieved, with coulombic efficiencies of 95 percent or better on charge-discharge cycling.

Another approach to powering electric vehicles was discussed by Dr. Galen R. Frysinger of the Army Electronics Command, who proposed a fuel cell-battery hybrid system.

He showed the advantage of combining a high-power-density molten electrolyte battery (which can easily provide the peak currents required for fast acceleration and heavy service) with a fuel cell, which can convert a hydrocarbon fuel into electricity at low power density but high efficiency.

He suggested as a typical system, the use of a molten electrolyte lithium-chlorine battery operating at about 1,000 F. together with a reformer and a molten carbonate matrix electrolyte fuel cell operating at the same temperature.

To achieve "full range" capability in vehicles, a 150 watt-hour per pound battery and a 20-35 lb./kw. hydrocarbon fuel cell are required. Progress indicates that these goals should be achieved in operational hardware within the next 5 to 10 years.

Papers were presented by Dr. A. L. Jones of the Standard Oil Co. (Ohio) on "Fast Charge Molten Salt Batteries"; Dr. R. C. Shair of Gulton Industries on a hybrid system using an organic electrolyte lithium-nickel halide battery and a bipolar nickel-cadmium battery capable of being discharged at very high rates for short periods of time; and Dr. A. M. Moos of Leesona Corp., who discussed zinc-air batteries for electric vehicles propulsion.

An all-day session was held on fuel cell systems. Investigators from American Cyanamid, Engelhard Industries, General Electric Co., Tyco Laboratories and Union Carbide Corp. discussed a number of approaches to reliable, long life, high-performance electrodes.

John Perry of the Army Electronics Command reported on his development of non-noble metal catalysts, such as iron, for hydrazine fuel cells. Not only do such electrodes give good electrochemical performance, but deleterious side and ammonia-producing reactions are sharply curtailed, he said.

B. S. Baker of the Institute of Gas Technology reported on the institute's two fuel-cell efforts on behalf of the gas industry which are directed at stationary systems for "on-site" energy production.

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# R&D Achievement Awards Recognize 38 In-House Scientists

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viewed carefully by senior scientists before they are forwarded for consideration by a panel of judges representative of expects in the various scientific disciplines. All the judges are on the staff of the Chief of R&D.

Deputy and Scientific Director of Army Research Dr. Richard A. Weiss was chairman of the panel this year. Others who served are Dr. I. R. Hershner Jr., chief, Physical and Engineering Sciences Division; Col. W. E. Rafert, Assistant Director of Developments; Col J. E. Kuffner, chief, Nuclear, Chemical and Biological Division; Lt Col F. F. Hickey Jr., Air Defense and Missiles Division; Lt. Col W. H. Young, Management and Evaluation Division; and Lt Col R. W. Leach, Special Warfare Division.

Successful rapid response to urgent requirements of the war in Vietnam is recognized in selection of some award winners, narrowed from a field of 26 nominations. Other awards reflect the depth and diversity of Army R&D.

Award winners and a synopsis of work which gained recognition are:

JOHN C. ACKERMAN, U.S. Army Limited War Laboratory, Aberdeen (Md.) Proving Ground, reduced the R&D cycle to an average of 10 months or less from the time a requirement is placed on his division to the time when the device or material is ready for delivery to Southeast Asia.

During the past year he has been responsible for development of 17 items of equipment delivered to Vietnam for operational use or evaluation. Among these are an elevated site marker, armor kits for vehicles, battlefield illumination, free-drop water container, tunnel exploration kit, grenade flotation adapters, Claymorette counterambush weapon system, pilot's inertial microphone and a Resojet man-pack tunnel flusher.

A 13-man team from the Harry Diamond Laboratories in Washington, D.C., was responsible for the success of a "crash" program initiated in February 1966 to develop a proximity fuze for the 2.75-inch rocket to meet the requirements of helicopter rocket-firing tactics.

Laboratory environmental and field firing tests of the fuzes have proved highly successful. The program has entered the limited procurement phase, during which 100,000 fuzes will be produced and facilities established for manufacture of 50,000 a month.

The team members include Maurice Apstein, Murray Ressler, Howard Bilbrough, Paul E. Landis, Robert W. Tucker, Morton A. Barron, Harold L. Hines, George R. Yetter, David Williams, Quentin C. Kaiser, William Marroletti, Lawrence R. Davis, and Clifton L. Massey.

Picatinny Arsenal employes were responsible for two team awards and an individual award. Three employes at the Dover, N.J., installation were recognized for outstanding technical achievements and project leadership in advancing the technology of mine warfare through the design and development of a new family of mines.

Proving feasibility of the "gravel" concept of mine warfare earned an award for Maurice Baer, Robert W. Heinemann and Joseph H. Severini. Small in size and low in cost, the mines can be delivered in mass quantities from ground or air vehicles; they provide the services with a much improved cost-effective means of denying vast areas to enemy troops.

DONALD E. COSTA was recognized for proving the engineering feasibility of the projectile conversion kit concept which enabled radical revision of nuclear weapon projects. The two major projectile development projects previously required have been reduced to one major project.

Another team of four employes at Picatinny Arsenal engineered a technological breakthrough in the field of armor-defeating munitions by successful developmental work on the XM578 armor-penetrating fin-stabilized, discarding-sabot cartridge for the U.S.-Federal Republic of Germany Main Battle Tank 1970 program.

Sidney S. Jacobson, Elie L. Barrieres, Ralph F. Campoli, and Joseph Hegedus demonstrated the feasibility of incorporating a high-velocity, high kinetic-energy round in the Shillelagh weapon system.

JAMES P. TORRE Jr., U.S. Army Human Engineering Laboratories, Aberdeen (Md.) Proving Ground, provided leadership for development of new methodology in weapon system concept analysis and feasibility study.

This methodology has been applied to the analysis of new antitank, small arms, and night-vision devices being considered for development by the Army. Results of the research permit designers to manipulate the various human factors design characteristics in order to develop optimum systems to meet effectively specific operational requirements.

A 5-man team from the U.S. Army Engineer Geodesy, Intelligence and Mapping R&D Agency, Fort Belvoir, Va., is credited with leadership and responsibility for a 6-year, multimillion-dollar project which culminated in delivery of three Universal Automatic Map Compilation Equipments (UNAMACE) to the Army.

These instruments are the first successful automated high-speed instruments of their kind. They provide flexibility and speed in stereocompilation heretofore not available.

Edward R. Demeter created the basic specifications and design, and Kent T. Yoritomo, John D. Mayer, Edward F. Burzynski, and Morton Stromberg were responsible for significant development contributions to success of the UNAMACE system.

CLEMENT A. DOCK, Frankford Arsenal, Philadelphia, Pa., invented a new escapement mechanism for timing devices. Based on the use of a circular cross-section stainless steel spring, rather than the conventional flat type, the "Dock Escapement" is considered the most significant innovation in the field of fuzes in over three decades, the award synopsis states.

B. LYLE HANSEN, U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H., developed basic concepts for new equipment and techniques that led to the successful completion of the deep ice core drilling project at Camp Century in Greenland.

Through his leadership and guidance, the award nomination states, the bottom of the ice cap was reached after drilling through nearly a mile of ice. Efforts to accomplish this task by no less than six other countries, including the USSR, had met with failure.

DR. WILFORD F. WEEKS, CRREL, conducted outstanding research in glaciology and geology which has stimulated renewed interest in the understanding of sea ice, to the extent that the United States has become the center for work on the scientific aspects of this material.

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## Britain Manages Procurement Of Chinook Through AVCOM

Great Britain's procurement of 15 U. S. Army-developed CH-47B *Chinook* helicopters is being managed from the U. S. Army Aviation Materiel Command (AVCOM), St. Louis, Mo., by a new United Kingdom-CH-47 Office.

Four Royal Air Force officers fresh from England, an RAF flight lieutenant trained at Robins Air Force Base, Ga., and four civilians comprise the group. Through AVCOM, they will control configuration, programing, avionics and spare-parts logistic support.

The United Kingdom Ministry of Technology signed an agreement to purchase the *Chinooks* from the U. S. Department of Defense under a prime contract with Boeing Aircraft Crop.

*Chinook* was selected as "the helicopter best suited for certain logistical tactical transport missions in support of the British Army." Wing Commander John H. Ramsden, head of the new CH-47 office, said the United Kingdom version will have a "British accent" with British-made avionics and communications systems. Delivery is expected to begin in 1969.

# SEATO Opens New Clinical Research Facility

*(Continued from Page 1)*

the SEATO Clinical Research Center the largest and most modernly equipped overseas medical facility for clinical research in the world for which the U.S. Government is the major source of funds and highly skilled personnel. It is modeled after the clinical center of the U.S. National Institutes of Health in Bethesda, Md. The CRC is also the largest tropical medical research laboratory in existence.

Consolidated in the new Center are several medical research facilities formerly scattered throughout Bangkok. It contains 40 metabolic beds, clinical laboratories, radiological and surgical facilities, conference rooms, its own emergency electrical power system, and elevators to move patients.

Construction costs were borne by the Thai government and the U.S. Army Medical Component furnished equipment. An 8-story Medical Research Laboratory (MRL) for the complex is under construction. Completion is scheduled for the spring of 1968.

The SEATO Medical Research Laboratory and Clinical Research Center is an outgrowth, a 10-year climax, of efforts by U.S. and Thai government agencies initiated during the 1958 cholera epidemic at the request of the Thai government.

When the cholera research program was transferred to Dacca, East Pakistan, in 1960, the Bangkok laboratory was assigned its present wider-ranging mission and became the SEATO Medical Research Laboratory. The Clinical Research Center was added three years later.

Staffed by the Walter Reed Army Institute of Research, Office of The Surgeon General, the SEATO MRL and CRC are concerned with studying the diseases that could incapacitate the fighting men in Southeast Asia, and with civilian population health problems.

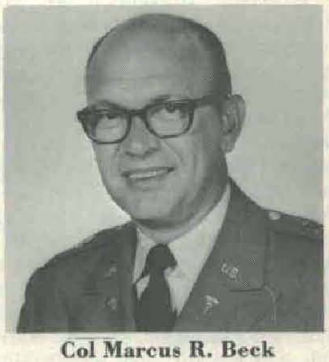
The U.S. Army Medical Component has a single director for the MRL and the CRC, Col Stefano Vivona, MC, former chief of the WRAIR Medical Research Unit in South Vietnam. Col Marcus R. Beck Jr., MC, is scheduled to succeed him at the end of his tour this summer. Maj Francis C. Cadigan Jr., a pediatrician formerly with the Department of Virus Diseases, WRAIR, is deputy director.

The U.S. Army portion of the CRC is under Dr. Joseph F. Fazekas and is one of five divisions of the U.S. Army Medical Component, others being the Medical Research Laboratories, Special Projects, Logistics and Administration.

Thai participation is divided into two separate administrations. The Royal Thai Army controls the Thai Component of the MRL under Maj Gen Pung Phintuyothin as director general.

The CRC Thai component operates under the Thai University of Medical Sciences, a civilian element of the Royal Thai Government. Under the Office of the Prime Minister, it is responsible for medical education in the country.

**Clinical Research Center, Bangkok, Thailand**



**Col Marcus R. Beck**

***Scheduled to succeed Col Stefano Vivona as director for the MRL and CRC this summer, Col Beck has been special assistant to the director of WRAIR since July 1966. Col Beck received an MD degree (1947) and MSc (1948) from the University of Nebraska. He served his residency in pathology at Letterman General Hospital in San Francisco and has served with the 25th Infantry Division in Korea (1950); Tripler General Hospital, Honolulu, Hawaii (1957-60); and as chief of the Pathology Service, Letterman General Hospital (1960-66).***

Dr. Swasdi Skulthai is the director general of the Thai portion of the CRC. Dr. Aree Valyasevi, a pediatrician whose background includes extensive training at the University of Pennsylvania Hospitals, is chief of clinical research for the Thai group.

The U.S. Army Medical Component staff of the MRL and the CRC has doubled from 194 in June 1964 to 383 in November 1966. It includes 70 Americans, 29 officers, 32 enlisted men, and 9 civilians. The 313 foreign service local Thai personnel include highly qualified scientists and are primarily technicians.

One of the major medical problems of U.S. troops in Southeast Asia is malaria, and work with drug-resistant malaria now comprises the largest single effort at the laboratory. Work on other communicable diseases and immunology makes up a large proportion of the total effort. Smaller projects include investigations in the fields of gastroenterology, hematology and neuropsychiatry.

Another MRL effort is directed toward defining the intermediary metabolic pathways in malaria plasmodia. In the CRC, studies are under way by Thai scientists on the role of dietary phosphate in the prevention of bladder stones in children. American and Thai scientists are working jointly on cerebral circulation as related to cerebral malaria.

Continuing studies are conducted on susceptibility, pathogenecity, and immunologic aspects of Thai hemorrhagic fever, a clinical syndrome related to dengue fever and prevalent among the Thai.

Other research includes studies of the very high endemicity of rabies in domestic animals, the development of psychological testing procedures applicable to the Thai, and establishment of biochemical, physiological and anthropometric norms in Thai population groups. The latter task is considered basic to establishing the validity of all medical studies involving Thais.

The Thai component of the MRL is working mainly with rickettsial diseases. Postgraduate medical education is also provided for students from Thai medical and allied science institutions associated with the University of Medical Sciences.

The MRL supervises a Primate Research Field Station in Phrabuddhabat, about 65 miles north of Bangkok, which has been successful in infecting gibbons with human falciparum malaria. Compared with other primates, the gibbons have been found to be remarkably gentle and easy to handle.

Operated by the Thai Ministry of Public Health, the District Hospital in Phrabuddhabat cares for large numbers of Thai malaria patients available for clinical study by SEATO researchers.

The SEATO complex has a close association with the Royal Thai Army

Pramunkutklao Hospital and the Royal Thai Army Institute of Pathology, located in the same medical complex as the MRL. It also collaborates with the Siriraj School of Medicine and the Chulalongkorn School of Medicine.

Close MRL-CRC contact is maintained with U.S. Army units in Kuala Lumpur, Malaysia and Vietnam, as well as with the Southeast Asian Ministers of Education Secretariat (SEAMS).

SEAMS was established in Bangkok in March 1967 to serve the medical education requirements of regional tropical medical centers in the Philippines, Indonesia, Malaysia, Thailand and Vietnam. The first training course, 20 weeks in duration, will begin in July, and the first regional seminar on tropical medicine is slated at Bangkok in August.

U.S. Army Medical Service activities reach deeply into many regions of the world where research is needed to develop methods of prevention of disease and treating millions of people for diseases not yet fully understood or controlled by the worldwide medical community. The SEATO Medical Research Laboratory and Clinical Research Center fulfills an important role in this humanitarian effort.

## Medic's Records Donated To University of Virginia

Extensive archival material that tells the story of Army Maj (Dr.) Walter Reed's part in the conquest of yellow fever at the turn of this century has been presented to the University of Virginia.

Dr. Reed, an Army Medical Corps major who graduated from the University of Virginia Medical School in 1868, died in 1902. He headed the Army Yellow Fever Commission which conquered the disease by proving it was carried by a mosquito that could be eradicated in populous areas.

It took 30 years for the late Dr. Philip S. Hench, Nobel Prize winner (for cortisone research) and professor emeritus of English at the University, to assemble the "Walter Reed — Yellow Fever Archive."

The widow, Mary Kahler Hench, made the presentation to the University of Virginia president, Edgar F. Shannon Jr., who termed the collection of letters, documents and memorabilia an "unparalleled" accumulation by "one great medical discoverer of the work of another such pioneer."

Dr. Hench explored the life of Dr. Reed, his colleague Dr. J. W. Lazear, and the Commission's work. The collection includes correspondence, records of interviews, fever charts of experimental cases, medical histories, Dr. Lazear's folding microscope and specimen slides, and the Congressional Medal for Conquest of Yellow Fever, awarded posthumously to Dr. Reed.

# Noted Speakers Stimulate 235 at Fifth JSHS

Stimulating viewpoints expressed by United Nations officials, eminent educators, industrial executives and Army leaders contributed to success of the Fifth National Junior Science and Humanities Symposium at the U.S. Military Academy, West Point, N.Y., and UN Headquarters, New York City.

Sponsored by Chief of Research and Development Lt Gen Austin W. Betts, the conference was attended by about 235 high school science students and their teachers, selected from 23 regional JSHS throughout the nation. The JSHS Program is sponsored by the Army with the support of academic and industrial institutions.

Judged by audience response, one of the highlight addresses was that given by Maj Gen Walter E. Lotz Jr., Chief of Communications-Electronics, Department of the Army. Formerly Director of Army Research, General Lotz traced the evolution of communications to the electronic age and reviewed its impact on world scientific progress.

Marvelous as the advance of electronics and the use of computers have been to date in providing a better way of life, however, General Lotz predicted that, as comedian Jimmy Durante expressed it, "You ain't seen nothin' yet." The best is still to come, he said, in accelerating dissemination of knowledge gained through research and development worldwide, and also in impact upon cultural changes. In conclusion, he stated:

"What does this mean? Does it mean that the rate of advance of knowledge and technology may be accelerating to the point beyond human capacity to handle?

"What about the intangibles of human culture — human morals, human ethics, human values? We have no way of measuring and plotting these. Are they changing at the same rapid rate as the tangibles? There is circumstantial evidence that cultural values lag behind man's invention of machinery.

"Will the language of the binary bit (in computers) assist us in sorting, storing, classifying and compiling the mountains of facts at our disposal? Will our culture develop hand-in-hand with knowledge so that we can sort the good from the bad, the right from the wrong? Or, in the 20th century, has man, in his aspirations and arrogance, built a 'Tower of Babel' so high as to evoke the wrath of God?

"It is apparent that these are the problems of *your* generation. It is *you* who must determine which path man will take. *You* who sit in this auditorium today are among those uniquely equipped to attack and contribute to the solution of these problems. If the United States Army, which sponsors this symposium, succeeds in stimulating you to use your talents wisely, this conference will have achieved its purpose."

Resounding applause also recognized the excellence of addresses by Dr. Frederick C. Steward and Dr. Margaret Mead. Dr. Steward is Alexander Professor of Biological Sciences and Director of Laboratories for Cell Physiology Growth and Development at Cornell University. Dr. Mead is Curator of Ethnology, American Museum of Natural History, New York City, and professor of anthropology at Columbia University.

Speaking on "A Botanist Looks at the Problems of Growth," Dr. Steward discussed his studies in the field of carrot embryology. He discovered that the rate of growth of cells in carrots not only can be stimulated but can be turned on or off, depending on the use of the proper chemicals. He stated a remarkable conclusion that in the growth of cells, there is nothing peculiar about the fertilization of the cell, except for the genetic instruction it receives.

Dr. Mead gave a fascinating account of her experiences and findings on many of the extended studies of primitive peoples in remote parts of the world that have gained her international renown. Primitive societies, she said, are rapidly disappearing or being absorbed in the great cultural and economic changes now taking place. Stressing the importance of anthropological studies, she explained:

"It is still very important to record ways of life that, once they have been destroyed, will be absolutely unrecoverable. . . . .There is a dynamic relationship between our study of living people, in situ, in groups, and what we will be able to do with all our new tools of analysis and prediction, which always have to take into account the relationships between unique living human beings and unique human situations. . . ."

Noted educator Dr. Charles H. Wesley, executive director, Association for the Study of Negro Life and History, spoke on "Responsibility to Do Our Best" in discussing today's critical problems.

"Our Culture Indivisible with Variety Enough for All" was the subject of a major address by Dr. Harold G. Cassidy, Yale University professor of chemistry. Dr. Paul R. Elliott, Department of Zoology, University of Florida, spoke on "The Enlightened Animal World."

The concluding address at the U.S. Military Academy was by Dr. Robert W. Krebs, research coordinator of ESSO Research and Engineering Co., on "Science and Business in Research."

USMA Superintendent Maj Gen Donald V. Bennett was host to the conference and gave the welcoming address.

When the conference moved to United Nations Headquarters in New York City on the final day, participants were escorted on a tour prior to hearing two UN officials.

Dr. Frank P. Graham, UN representative for India and Pakistan, spoke on "The UN in Perspective and Hope." Dr. Ernest V. Nagelstein, chief, Research Division,

# ECOM Laboratory Programs Visionics Research Facility

**Night Vision Simulation Facility, Fort Belvoir, Va.**

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nical direction to long-term night-vision Army R&D programs.

Since 1961, the Army has been devoting increasing attention to night-vision systems which enable the military to operate effectively with only the aid of starlight. A number of significant advances in development of passive night-vision systems have been achieved.

With respect to the planned facility, initial design studies have been completed and prototype simulator systems have been evaluated and put into operation. Initial studies have been made on current night-vision equipment. Interim operational simulator equipment is expected to be completed in the near future.

Basic functional capabilities of the full-scale simulator will be operational in late FY 1968 or early FY 1969, with further refinements in subsequent years, it has been announced. The new laboratory will include three major simulation systems.

The first system will consist of optical projection from photographic film. Wide-screen, large-format, high-resolution projectors will present imagery on a 35-by 140-foot screen in both still and cine modes. Included will be provisions for varying brightness and contrast, and techniques for real-time insertion of targets in a nonadditive manner.

The second system will consist of a 4,000-square-foot, 3-dimensional terrain model with a scale of 1:200. Particular emphasis will be placed on faithfully reproducing the spectral reflection characteristics of individual terrain features and targets over the range .4 to 1.5 microns.

Initially, the model will provide signature simulation in the spectral interval between .4 micron and 5 microns, and will be expanded eventually to 14 microns.

Provision will be made for placing and moving selected targets in typical tactical situations on the model. Image-forming systems will be transported over the terrain model in a programable real-time manner and this imagery will form the video system input.

Three smaller facilities are to be provided for highly specialized investigation of man-viewer systems, studies of psycho-physiological vision processes, and synthesization of proposed night-vision equipment for parametric analysis.

All of the described simulation systems will be controllable on-site by operators or by on-line or pre-programed computer control. Observational data will be computer processed and analyzed.

## Operation Cloud Gap I Draws to Conclusion

Operation Cloud Gap I, a field exercise to test methods of locating and identifying suspected underground nuclear explosions, is nearing conclusion in the Fort Huachuca, Ariz., area.

About 150 military and civilian personnel have been assigned to the program since January as inspectors and controllers. Planted "evidence" provides the realism necessary for the project without using actual nuclear explosions.

Test director Col Charles S. Brice, U.S. Army, said operations have been in different areas to test inspection methods over varying terrain at Huachuca, Santa Rita, Los Guijas and the Sierrita mountain ranges. Other areas are along the California-Nevada border near the Atomic Energy Commission's Nevade test site.

Cloud Gap is expected to produce more information on detection of nuclear tests through on-site inspection in cases where smaller explosions are often confused with natural earth tremors on recording devices.

## ASAP Member Honored in Aerospace Science

Dr. Antonio Ferri, U.S. Army Scientific Advisory Panel member since 1963, was selected recently as the first occupant of the Astor Chair in Aerospace Science, New York University.

The new chair in the School of Engineering was established with a $500,000 grant from the Vincent Astor Foundation. NYU President James M. Hester announced the appointment of Dr. Ferri, renowned for his work in development of the world's first jet aircraft.

Assigned as professor of aeronautics and astronautics at New York University since 1964, Dr. Ferri settled in the United States following the liberation of Rome in World War II and became a naturalized citizen in 1952.

His first employment in his new homeland was with the Langley Memorial Laboratory of the National Advisory Committee for Aeronautics, the forerunner of the National Aeronautics and Space Administration.

Dr. Ferri's discoveries date back to the early 1930s in Italy where he was the first scientist to obtain a supersonic flow field in a wind tunnel. He also was the first to measure the characteristics of aircraft wings for flight through the sound barrier.

Technical reports credit him with conceiving and applying the principles of combustion in supersonic streams to the formulation and development of the Scramjet (Supersonic Combustion Ram Jet) concept. This propulsion system is expected to power aircraft at speeds up to 8,000 miles an hour.

**Dr. Antonio Ferri**

Dr. Ferri earned doctoral degrees in electrical engineering (1934) and aeronautical engineering (1936) at the University of Rome. During his studies, he was assigned to the research staff of the Italian Air Ministry. In 1938 he received the Premio dell Accademia d'Italia for Science, one of Italy's highest awards.

From 1940 to 1943, he was head of the aerodynamics branch of the Direzione Superiore Studi ed Esperienze and also an associate professor at the University of Rome.

In 1951 he joined the Polytechnic Institute of Brooklyn. There he organized and became director of the institute's aerodynamics laboratory, one of the most advanced laboratories for research in hypersonic aerodynamics in space flight.

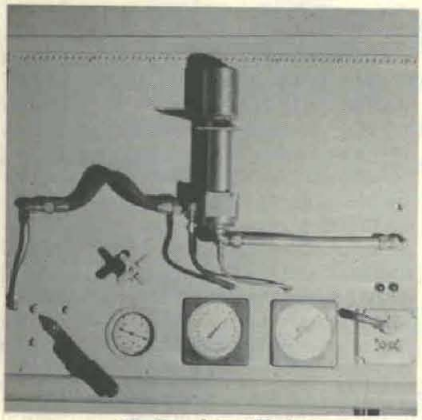
Named head of the institute's Department of Aerospace Engineering in 1957, Dr. Ferri continued in that capacity until he went to NYU in 1964.

# Hydroclone Filterless Filter Viewed for Applications to Army Needs

Potential applications to Army requirements of a filtering device that works without a filter are viewed as "exciting possibilities" by U.S. Army Research Office personnel present at a May 24 demonstration.

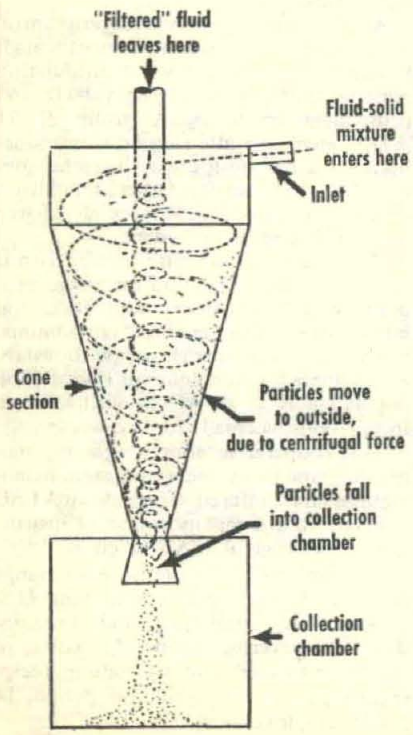
Oklahoma State University's "hydroclone" is the invention of Dr. E. C. Fitch, associate professor in the OSU School of Mechanical Engineering.

Behind what after more than a decade of research and development gives promise of phenomenal success is the time-tested truism of product creativity — "Build a better mouse trap and the world will beat a path to your door."



**Hydroclone Unit**

## How the Hydroclone works




Actually, the basic theory of the hydroclone is the principle of the cyclone, that of high-speed force whirling around a vortex, as applied in the dust collectors dating back to 1885 and, later, the cream separator.

Dr. Fitch and his OSU associates have refined this principle through research that started in 1955 and since 1959 has been substantially supported by the U.S. Air Force. The result is a simply constructed machine that permits the "juggling around" of 11 parameters to achieve desired results. Radial, vertical and tangential velocities are involved.

The function of the hydroclone as it has been developed in prototypes is to remove suspended solids from fluids (gas or liquid) without the use of moving parts or porous barriers.

The mixture moves through spiral grooves at high pressure and velocity. When the direction is reversed suddenly, the solid particles are dropped into a self-cleaning collection chamber. The filtered fluids emerge at the top of the hydroclone.

Results are comparable to those achieved by conventional edge-type, micronic-screen filter elements, Dr. Fitch stated, without the need of replacing filters.

Experiments to date have been concentrated basically on viscous fluids, although applications to air and water filtration are foreseen. The hydroclone is being used successfully in dry cleaning to remove lint from fluids in commercial machines.

An OSU publication lists among the possible applications of the hydroclone such general uses as separation of solids from liquids and gases, separation of liquids (vapors) from gases, and the classification of solids mixed in a liquid or gaseous dispersion medium.

Listed among the specific uses are removal of solids from water, oil, hydraulic fluids and solvents; removal of water vapor from steam, or water and oil droplets from air; removal of solids from air; and removal of wood pulp from water.

Tests of the hydroclone at the U.S. Army Waterways Experiment Station at Vicksburg, Miss., are reported to have produced "sparkling clear" water from contaminated water. Use for filtering air for certain requirements is anticipated, though not for such duty as air intakes on jet engines.

Application of the hydroclone to various requirements for filtering dirt from oil, fuel and hydraulic systems of Army vehicles and aircraft is considered feasible on the basis of extensive tests conducted by Dr. Fitch and associates.

Army Research Office scientists who attended the hydroclone demonstration envision possible application to a number of critical requirements of the Army Medical Service. Among these are uses on the dramatically new Medical Unit, Self-contained, Transportable (MUST), as well as for filtering intravenous water, filtering viruses from solutions, and for filtration in aerosol studies.

**INVENTOR Dr. E. C. Fitch discusses hydroclone capabilities with Charles W. Henry of the Cessna Aircraft Co.**

Many commercial organizations have evidenced interest in possible application to their requirements. In the year since the hydroclone was patented, five manufacturing companies have been granted licenses to produce units designed for special purposes.

"We have not had a failure yet on all the applications we have tried," Dr. Fitch pridefully announced at the Army Research Office briefing. "We are looking for new and exciting applications."

## *Pentagon Conference Honors Top Army Executive Alumni*

Twenty-seven familiar top executive faces graced the halls of the Pentagon May 5 to attend the fifth one-day conference of alumni of the U.S. Department of War (of yore) and the Army Sectretariat.

They were brought up to date on Army programs and swapped ideas with senior Army officials. The crack "Old Guard" of the 3d Infantry saluted the alumni on the Pentagon's Mall parade grounds.

Attending were:

*Secretaries of the Army.* Stephen Ailes, Gordon Gray, Frank Pace, Kenneth C. Royall, Elvis J. Stahr Jr. and Robert T. Stevens.

*Under Secretaries of the Army.* Archibald Alexander, Karl R. Bendetsen, William H. Draper Jr., Paul R. Ignatius, Earl D. Johnson, John Slezak and Stuart Symington.

*Assistant Secretaries.* Willis M. Hawkins, Fred Korth, Finn J. Larsen, Daniel M. Luevano, William H. Martin, Howard Petersen, Edmund T. Pratt Jr., William F. Schaub, Francis Shackelford and Tracy S. Voorhees.

*General Counsels of the Army.* Frank G. Millard, Bernard A. Monaghan and Powell Pierpoint.

*Director of Civil Defense.* William P. Durkee.

# ATAC Develops Continuing Education Program

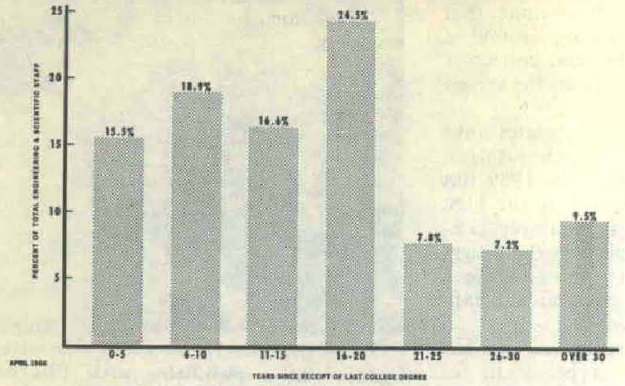



Fig. 1. ATAC Engineers and Scientists.

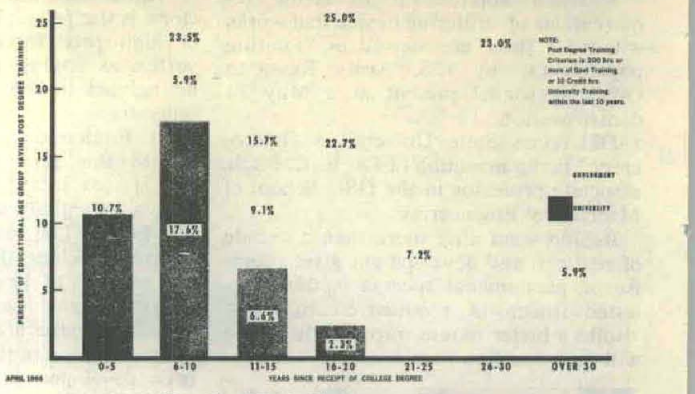



Fig 2. ATAC Training Participation

*(Continued from Page 1)*

October 1965. Objectives were to determine training needs and to formulate a realistic educational program on a joint government-employe relationship.

Results of an educational survey definitely established the need of a positive approach to the problem. For example, it revealed that 84.5 percent of ATAC's professional staff had received degrees five or more years previously, and that only 11 percent of those 10 years out of school had since "had the benefit of an appreciable amount of subsequent training."

Statistics showed that 18.9 percent of ATAC scientists, engineers and technicians had degrees dating back 6 to 10 years; 16.6 percent had graduated 11 to 15 years before; 24.5 percent had "sheepskins" 16 to 20 years old; and that 9.5 percent had obtained degrees 30 or more years prior to the survey.

In April 1966, shortly after the Army Mobility Command was phased out with the establishment of the Army Tank-Automotive Command as a major element of the U.S. Army Materiel Command, General Lapsley appointed Dr. Ernest N. Petrick to head a Planning Committee for Long-Term Training.

Assigned now as chief scientist and technical director of ATAC laboratories, Dr. Petrick is spearheading the development of an educational program geared to ATAC requirements. Plans for the program were outlined in two briefings he gave to about 500 professional employes May 10. About 700 of ATAC's 6,000 employes are scientists or engineers.

In a letter to ATAC professional personnel requesting them to fill out an interview data sheet "to gain an overall picture of the interests and goals of our personnel," Dr. Petrick stated in part:

"Many of you . . . completed your formal education years ago and feel a need to fill the gaps which may now exist in your professional background. These gaps could have been brought about by advancing technology, by a shift of area of specialty, or simply by assuming more administrative than technical responsibilities.

"Whatever the cause, it is incumbent upon a dynamic organization such as ours to maintain the highest degree of technical and administrative competence possible, and to explore all methods toward achieving this goal."

Participating in the program are the University of Detroit, Wayne State University, Oakland University, Michigan State University and the University of Michigan.

Each of these institutions was represented on the Planning Committee for Long-Term Planning, along with such key ATAC employes as Paul Denn, Harmon L. Eaton, Fred Pratko, John Simmons and Joseph Williams. Conclusions of the committee gained support in October 1966 when the Army Materiel Command held a Conference on Continuing Education at Fort Lee, Va.

One of four major recommendations made by the committee called for assignment of an ATAC Educational Program Planning Adviser. Prof. Paul Reinhard is filling this position on a consultative basis. He is chairman, Department of Engineering Design and Simulation, Engineering College, University of Detroit. Ralph Trese, assistant to the Dean of Engineering at Oakland University, is also a consultant.

Initiation of in-house refresher courses at ATAC also was recommended by the committee. This proposal is currently being adopted with a mathematics course offered by Detroit Educational Television Channel 56.

About 250 employes are enrolled in a program piped into TV-equipped classrooms at several ATAC locations. Make-up sessions are scheduled each week for those who may be away on temporary duty or whose work may prevent them from hearing the first broadcast.

Students in the mathematics course and other Channel 56 courses to be scheduled in response to demand will not receive college credits. The purpose is to update their professional competence and provide the basis for credit courses at the five universities participating in the program.

The plan is to focus credit courses sharply toward individual and ATAC mission goals. Some of these courses may be offered on-the-job at ATAC as well as on the university campuses.

An experimental course on semiconductors was completed in which the instructor remained at his home university. Telephone channels transmitted his voice and a view of the blackboard, made visible at ATAC as the projection of an x-y plotter. Students were in continuous 2-way voice and blackboard communication with the instructor.

ATAC officials said this method of instruction promises improved utilization of university faculty members. It avoids the disruption in work efforts and the higher costs associated with personal attendance of employes at the participating universities.

Another part of the ATAC program of updating professional competence through training is directed toward stimulating creative thinking in solving vehicle and component problems. A group of 31 ATAC engineers attended brief introductions to various group creativity techniques at Oakland University. Others attended a course on synectics, a special 15-step creative discussion procedure.

Complementing the educational courses is a coordination exchange program with government and industrial laboratories. This enables nonadministrative technical personnel with established needs for techniques or information not available at ATAC to visit selected installations, normally for two weeks.

This cooperative effort is gaining momentum and two vehicle subsystem manufacturers have offered to include an ATAC engineer in a company course of instruction in skills useful to ATAC goals.

To implement the employe exchange program, letters were sent to nine U.S. Government installations and three industrial concerns, proposing visits of ATAC personnel and welcoming reciprocal visits. In the April-June period, 14 ATAC employes made such trips.

Still under consideration as the fourth recommendation of the ATAC Planning

Committee for Long-Term Training is a proposal to establish an "Institute of Mobility Technology." The function of the institute would be to provide for expanded opportunities for college credit courses for qualified persons, either on-the-job or on campus.

Through the educational and training program now being launched, ATAC leaders are confident that the overall professional competence of employes will be substantially enhanced for a mission of developing, procuring and maintaining wheeled and tracked vehicles used by the U.S. Armed Forces and many allied nations.

# Army Contract Awards Exceed $413 Million

Army contracts in excess of $1 million each for research, development, testing, evaluation and procurement listed by the Department of Defense since the May issue of this publication totaled $413,205,000.

The Magnavox Co. received a $5,160, 671 first-year increment to a $31,130,055 3-year contract for radio sets. Hercules Corp. gained a $24,193,578 contract modification for production of propellants and explosives.

General Dynamics Corp. was awarded a modification and definitization totaling $18,870,582 for radio sets and for reconfiguration of Autodin equipment.

A $16,772,847 contract went to Bowen-McLaughlin for retrofit of M48A3 and M48A4 tanks. Bell Aerospace Corp. received delivery orders totaling $16, 199,628 against contracts for UH-1 helicopter components.

R. G. LeTourneau, Inc., will supply metal parts for 750-pound bombs on modifications totaling $15,765.455. U.S. Rubber Co. was awarded a $35,327,814 modification for loading, assembling and packing ammunition components, manufacturing explosives, and operations and maintenance activities.

Raytheon Co. won contracts and modifications totaling $20,855,982 for equipment and advanced production engineering for the improved Hawk missile system, bomb fuzes and code modulation equipment. Definitizations totaling $12, 840,675 with the Levinson Steel Co. are for plant reactivation and procurement of 105mm projectiles. Fruehauf Corp. will supply semitrailers for $12,622,815.

Thiokol Chemical Corp. received a $12,210,753 modification for loading, assembling and packing shells, loading rocket motors, and operations and maintenance activities. General Motors was issued three contracts totaling $10,617, 040 for Sheridan tank transmissions, truck starters and generators, and breech mechanisms for 152mm gun launchers.

American Machine and Foundry Co. will provide metal parts for 750-pound bombs on a $9,120,211 modification. Three contracts aggregating $8,371,095 with U.S. Steel Corp. are for armor plate line items for ammunition testing, 8-inch howitzer projectiles, and reactivation, repair and relocation of equipment.

Beech Aircraft Corp., will get $12,833, 468 on a modification for U-21A utility aircraft and related data. Union Carbide Corp. won two contracts totaling $7,692, 595 for dry batteries for radios. International Harvester Co. will receive $5,688, 272 for trucks and scoop-type loaders.

Norris Industries will get $7,950,000 for cartridge cases, and Collins Radio Co. $7,108,491 for radio sets and stations. RCA was awarded a $4,094,745 first-year increment to a $10,087,431 contract for radios, and $1,000,000 for electronic equipment.

Honeywell, Inc., will provide grenade fuzes for $4,519,999, and Westinghouse Air Brake Co. will supply road graders on two modifications totaling $4,193,196. Philco-Ford Corp. will receive $4,062,658 for Shillelagh spare parts and repair, equipment, and operation of a repair facility. Caterpillar Tractor Co. received a $4,053,050 modification.

A $3,823,260 modification with Chrysler Corp. will procure 140 rough-terrain, forklift trucks. FMC Corp. received a $3,547,892 modification for M113A1 armored personnel carriers.

Vertol Division of Boeing Co. received a $3,500,000 modification for preproduction planning, procurement and production of long-lead-time materials and items for CH-47B helicopters for the United Kingdom. Hupp Corp. is receiving $3,261,152 as the third increment to a 3-year contract for 10-and 20-horsepower engines. Vinnell Corp. will install and operate an equipment reconditioning facility in South Vietnam on a $3,099,553 modification.

Albion Malleable Co. won a $2,989, 800 contract for projectile body and band assemblies for 81mm explosives. Gasoline engines provided by Continental Motors Corp. will cost $10,043,800.. Stewart Warner Corp. gained $2,897,550 on a modification for metal parts for 60mm projectiles.

Head assemblies for M525 fuzes will be furnished by the Bulova Watch Co. on a $2,806,210 contract definitization. AVCO Corp. will supply engines for CH-47 helicopters for the United Kingdom for $2,797,313. Dry radio batteries provided by Burgess Battery Co. will cost $2,739, 176, and Eltra Corp. will furnish generators and truck starters for $2,712,839.

Kentucky Manufacturing Co. won a $2,490,715 contract for 12-ton semitrailer vans and Chamberlain Corp. will provide parts and smoke projectiles for $7,452,859. L. T. Industries was issued a $2,406,967 modification for 750-pound bomb fin assemblies. Northrop Corp. will supply missiles and mortar fin assemblies for $3,966,269.

Day and Zimmermann, Inc., received a $2,238,120 modification for loading, assembling, and packing miscellaneous fuzes, boosters, primers and detonators. Lear Siegler, Inc., was issued a $2,227,784 modification for artillery ammunition boosters. The Anthony Co. was awarded a $2,184,000 modification for 80 rough-terrain, forklift trucks.

Emco Porcelein Enamel Co. will provide ammunition boxes for $2,020,000, and 81mm projectiles supplied by the Olin Mathieson Chemical Corp. will cost $2,091,508. KDI Corp. will supply metal parts for 2.75-inch rocket fuzes for $2,077,351 and Hughes Tool Co. will be paid $2,065,450 for XM27 El helicopter armament subsystems.

John Wood Co. was awarded a $2,049, 082 modification for fin assemblies for 750-pound bombs. Rebmar, Inc. in Puerto Rico, will be paid $2,008,793 on a 2-year buy of protective field mask carriers.

Other recent contract and modification awards under $2 million are:

Barber-Green Co., $1,946,494 for eight asphalt mixing plants; Hughes Aircraft Co., $1,740,000 for thermal night signs and the engineering procurement data package for the TOW missile; Otis Elevator Co., $1,704,259 for 75 semitrailer vans to house teletype relay facilities; Poloron Products, Inc., $1,533,129 for fin assemblies for the 750-pound bomb; the Hol-Gar Manufacturing Co., $1,520,031 for 400-cycle Diesel generators and spare-parts; and

Cadillac Gage Co., $1,458,000 for armored cars; Kaiser-Jeep Corp., $1,395, 141 for 2½-ton trucks with government-furnished engines; Mason and Hangar, Silas Mason and Co., Inc., $1,333,358 for 750-pound bombs and operation and maintenance activities at the Cornhusker Army Ammunition Plant; Ward La France Corp., $1,322,199 for 55 fire-fighting trucks; and

Marathon Battery Co., $1,261,872 for radio batteries; Pace Corp., $1,249,560 for illuminating signals; LTV Electro-Systems Inc., $1,231,410; Okaw Industries, Inc., $1,228,385 for reinforced plastic containers; and

Aircraft Radio Corp., $1,198,975 for radio test sets; Leece Neville Co., $1,165, 315 for starters for 2½-and 5-ton trucks; Kennedy Van Saun Corp., $1,151,900 for metal parts for PP-T105mm projectiles; Loadcraft, Inc., $1083,147 for semitrailer wreckers; Isotopes, Inc., $1,047,405 for classified research work; Atlas Chemical Industries, $1,041,845 for TNT and operations and maintenance activities; Radio Corp. of America, $1,000,000 for classified electronic equipment.

## So We Dropped *Deputy* . . . Sorry!

**U.S. Army Aviation Materiel Laboratories commander Col Harry L. Bush may have been mildly surprised to read in the May edition of this publication that Lt Col Eugene W. Dow was the new commander, but he did not protest loudly about the blunder—as numerous other readers did!**

**With all due apologies to Col Bush, who has commanded the AVLABS since June 1966, may the editors say that any embarrassment he may have suffered is mild compared to theirs. Lt Col Dow is *deputy commander*.**

# Studies Reflect Characteristics of RDT&E Personnel

Characteristics and compensation factors of military and civilian personnel assigned to research, development, test and evaluation activities are reflected in three reports of studies made for the Office of Laboratory Management, Office of the Director of Defense Research and Engineering.

Lt Col Henry F. Magill, who recently concluded a 3-year tour of duty in the Physical and Engineering Sciences, U.S. Army Research Office, is the author of the latest in the series of reports. Termed a "Management Analysis Report," it is titled "A Comparative Study on the Characteristics and Compensation of Technical Military Officers."

Earlier studies also concentrated on military compensation. "A Pilot Study on Compensation of Technical Military Personnel" was authored by Lt Col Ernest J. Davis, U.S. Air Force. "A Comparative Study on Characteristics and Compensation of the Military Officer in Research, Development, Test and Evaluation" is by Comdr Milton Gussow, U.S. Navy.

The current study by Lt Col Magill compares age, education, and compensation of Army RDT&E officers with their Navy and Air Force counterparts and with professionals in the Defense laboratories and in the civilian aerospace industry.

Army officers engaged in RDT&E were defined as all holding any duty Military Occupational Speciality (MOS) with a research and development prefix, all technical and tactical board members, and all others with an R&D-oriented MOS, for a total of 2,347. Medical, veterinary, dental and law officers were excluded.

The Navy sample consisted of the 1,823 identifiable officers working in RDT&E as of Jan. 13, 1966. The Air Force sample was comprised of the entire officer population of 7,889 participating in RDT&E as of Sept. 30, 1965.

The defense laboratory sample was comprised of all 24,031 civilian scientists and engineers in 83 in-house defense laboratories as of June 30, 1965.

The sample used to represent private industry consisted of 29,083 scientists and engineers in 14 aerospace companies in the Boston and Los Angeles areas.

Compensation was computed on the basis of both regular pay and total compensation, including fringe benefits, for both officers and civilians. The Magill report is based on three general assumptions:

- Similarity of job positions permits a valid comparison.
- Age, as a reflection of professional experience, is a factor in the explanation of salary differentials.
- Education is a measure of potential worth.

The report notes that there is a drift from the concept of specialists to that of generalists for Army RDT&E officers. Twenty-nine percent hold the duty MOS of R&D coordinator, with 38 percent scattered among 14 scientific and engineering MOS fields. The 2,347 officers represented 71 different MOS fields.

Approximately 2.8 percent of all Army officers have duty assignments in RDT&E, compared with 2.5 percent for the Navy and 6.0 percent for the Air Force.

Eighteen percent of the Army RDT&E officers are with the Signal Corps, 17 percent with the Corps of Engineers, and 15 percent with the Artillery. The Chemical Corps has the highest proportion of RDT&E officers, with 10 percent.

Median age of the Army sample is 35.5 years, compared with 36.5 for industry, 37.7 for the Navy, 33.5 for the Air Force and 38.5 for civilians in defense laboratories.

Of the 12,059 RDT&E military officers, 3.7 percent hold doctoral degrees. The Army has the highest percentage, with 9.6 percent. Defense laboratories have 7.8 percent; industry 3.2, the Air Force 2.5, and the Navy 1.5 percent.

The Air Force is ahead with master's degree holders, however, with 38.4 percent compared with the Army's 33 percent. The Navy has 27 percent, defense laboratories 16 percent, and industry 13 percent.

RDT&E personnel with BS degrees comprise 67 percent of those assigned to the defense laboratories, 57 percent of those in industry, 56 percent of those in RDT&E in the Air Force, 46 percent of those in the Navy, and 43 percent of those in the Army.

RDT&E personnel without degrees comprise 27 percent of the industry sample; 26 percent of the Navy; 14 percent of the Army, 9 percent of the defense laboratory civilians; and 3 percent of the Air Force sample.

The Army has a large group of young PhDs on duty, lowering the average age of those with doctorates to 29. The average age of PhDs in the Navy is 43 and in the Air Force, 36.

In the military, compensation is generally a function of rank, which is associated with age rather than education. For civilians in defense laboratories and industry, however, there is a definite correlation between degree and compensation.

A civilian PhD engaged in industrial RDT&E can expect almost 41 percent more in pay than a similarly employed contemporary with no degree. The comparable figure for defense laboratory personnel is 25 percent.

The report also notes that one reason for discrepancies in the pay of military technical officers is that there is no way of compensating those with advanced degrees for the additional time they spend in acquiring their special skills.

An ROTC graduate engineer who defers his military service until he earns a master's or doctor's degree will find that a classmate who went on active duty immediately upon receiving his bachelor's degree will, for purpose of pay and promotion, be several years ahead of him during his entire military career. (This does not apply, however, to someone who earns an advanced degree while on active military duty.)

The report recommends crediting

# Missile Command Employe Wins SARS Fellowship

Nearly a quarter century after he entered the career service of the U.S. Government, Leonard Brockman has been selected for a Secretary of the Army Research and Study (SARS) Fellowship to enhance his potential for continued federal service.

Assigned to the U.S. Army Missile Command at Redstone Arsenal, Ala., as a personnel management officer since 1965, he will enter Cornell University late this summer to begin a year of research and study in labor relations. He is the first Missile Command employe to be granted a SARS Fellowship in a nontechnical field.

In less than a year, two other staff members of the MICOM Research and Development Directorate have received SARS Fellowships. William McKnight is completing a year at Oxford University, England, and Dr. Vitalij Garber began research and study at Harvard University last February.

Brockman has more than 20 years of federal employment and is currently serving as adviser for labor relations to the MICOM chief of civilian personnel.

Leonard Brockman

A graduate of Wyoming Seminary Prep School in Kingston, Pa., Brockman received a BS degree in education and an MS degree in political science from Pennsylvania State University. He had done graduate work at the University of Pennsylvania and the University of Cambridge, England.

In 1943 he began federal civilian service with the Department of the Navy and later served as assistant personnel director for the Panama Canal Co., Panama, C.Z. He is a native of Patterson, N.J.

SARS Fellowships are awarded on the basis of demonstrated professional competence in areas of vital concern to the U.S. Army. The purpose is to develop talents of gifted personnel by enabling them to study under the guidance of authorities in their individual career field.

RDT&E officers with service from the time of receiving a bachelor's degree, if the period before entering military service was spent in obtaining advanced education or industrial experience applicable to the service's mission. This could be accomplished, the report states, by step increases in pay. It also recommends giving special rewards in pay or promotional opportunities for advanced scientific and engineering degrees and training.

A third recommendation attacks the problem of losing outstanding technical officers as a result of present retirement policy. It suggests keeping unusually able RDT&E officers after they pass the age at which they are considered prospective general officers, perhaps with a distinctive designation to distinguish them from other colonels.

A study to determine the issues involved in keeping military officer scientific and technical personnel in the service is recommended.

A fourth recommendation is for studies leading to a better understanding of the role fringe benefits play in compensation, and to the development of methods by which the comparability of fringe benefits in organizations can be measured.

The report also notes that there should be a more effective relationship between advanced-degree programs in the RDT&E field and the R&D Officer Specialization Program. It recommends a complete review of the program's value.

Listing 525 officers as of February 1966, the program is one of several Army efforts to earmark officers with special training and experience for recurring assignments in their field.

Officers enter the R&D Specialization Program voluntarily, normally after having attended the Command and General Staff College or after at least 10 years of service. Participation varies greatly among the different arms of service.

## Army Lets $2,100,000 For Advanced SAM-D

Army-Navy joint effort on SAM-D (Surface-to-Air Missile Development) for the nation's air defense system for the 1970s entered the advanced development phase May 18 with award of a $2,100,000 contract to Raytheon Co.

The Department of Defense announcement of the award said the selection resulted from an Army-funded contract definition program.

The resulting weapon system, it was stated, will be fully acceptable to the Army and will contain components of a system that "could measure up to the environmental conditions found aboard a ship at sea."

Eventually it is planned that SAM-D will replace the Nike Hercules and a portion of the HAWK air defense systems, both developed by the Army and deployed in the United States and overseas. The SAM-D project office is at Redstone (Ala.) Arsenal, Army Missile Command.

## DoD Schedules NDT Meet At Naval Ordnance Lab

The Naval Ordnance Laboratory, White Oak, Md., will be host to the Sixteenth Defense Conference on Nondestructive Testing, Sept. 26-28.

Presentation and discussion of important testing and inspection problems in the Department of Defense (DoD) is the primary purpose of the meet. Participation is limited to DoD personnel.

Scientists, engineers, management and technical personnel who have responsibility for development or application of nondestructive testing methods in research and development, engineering and quality assurance are invited to attend.

Agencies intending to participate or send representatives to the conference should send the names and mailing addresses to Stephen D. Hart, Naval Research Lab., Washington, D.C. 20390.

## Horton, Fischer Win DoD DCS Awards

Technical Director Billy M. Horton, Harry Diamond Laboratories, Washington, D.C., and Mrs. Irene K. Fischer, U.S. Army Map Service, Corps of Engineers, received Department of Defense Distinguished Civilian Service Awards at Pentagon ceremonies May 9.

Assistant Secretary of Defense (Manpower) Thomas D. Morris presented the awards before a large gathering of dignitaries of the Department of Defense and the Military Departments, as well as fellow employees of the six recipients of the highest DoD award conferred on civilian employees.

Significance of the discovery and invention for which Horton was recognized — the epochal principle of fluid amplifier controls (fluidics) — was highlighted in a feature article in the April 1967 edition of the Army Research and Development Newsmagazine. It was titled "Fluidics Hailed as Next Big Payoff of Army R&D to Nation."

The citation mentioned Horton's "many scientific achievements" but stressed the importance of the discovery of fluidic controls, saying:

"This invention has challenged the imagination of systems designers throughout the world, and represents an exciting technological breakthrough — an advance which has, in the six years following its first disclosure, initiated a major new field of research and development. Mr. Horton's invention constitutes not only a highly significant contribution to the defense posture of our nation, but to U.S. industrial and medical engineering, . . ."

LIFE Magazine also gave a feature play in a spread of several pages devoted to the importance of Horton's discovery of fluidics (May 19, 1967).

Mrs. Fischer was recognized for the "major contributions she has made to world geodetic research." Her citation continued, "Mrs. Fischer's ability to utilize all available geodetic techniques to produce original solutions to unconventional problems has led scientists within and outside the Department of Defense to call upon her for advice and assistance.

"Her work has proven to have important applications to the Mercury, Gemini, and Apollo projects and to the scientific activities of the Air Force, Navy, and defense agencies, as well as those of the Department of the Army. Mrs. Fischer's technical accomplishments, diplomacy, and dedication to the advancement of geodetic research warrant recognition at the highest level within the Department of Defense."

Mrs. Fischer has been with the Army Map Service since 1952. Developer of the Fischer Ellipsoid used in the Mercury, Gemini and Apollo Projects. she is also the author of 39 technical reports and journal articles.

**DISTINGUISHED Civilian Service Award winner Billy M. Horton (right) is congratulated by Assistant Secretary of Defense (Manpower) Thomas D. Morris at Pentagon ceremonies.**

**SECRETARY of the Army Stanley R. Resor congratulates Irene K. Fischer during recent Pentagon ceremonies at which she received the Distinguished Civilian Service Award.**


# Detrick Breaks Ground for New Laboratory

**Construction of a $7 million medical biological laboratory for the U.S. Army Medic l Unit at Fort Detrick, Md., an Army Medical Research and Development Command element, started May 19 with ground-breaking ceremonies.**

Participating dignitaries included Congressman Charles McC. Mathias Jr.; Maj Gen James T. McGibony, Deputy Surgeon General; Brig Gen C. F. Vorder Bruegge, CG, U.S. Army Medical Research and Development Command; Col Richard H. Taylor, chief, Biological and Medical Sciences Division, and Albert E. Hayward, assistant director, Chemical Technology, Office of the Director of Defense Research and Engineering; Col Peter G. Olenchuk, commanding officer of Fort Detrick, and Mayor John A. Derr of Frederick, Md.

The 440 by 194-foot building is the first of a 2-phase construction project. Work on an addition to the east side of the structure being built is expected to begin in 1969.

Phase one construction will house the Virology, Bacteriology and Animal Assessment Division of the Medical Unit. Equipment will be provided for studying the effects of exposure to both acute and chronic radiation on the infectious process and for handling all types of infectious organisms.

The Fort Detrick Medical Unit was organized in 1956 under Col William D. Tigertt, now commandant and director of the Walter Reed Army Institute of Research, Washington, D.C., and is attached to Walter Reed Army Medical Center for logistical and administrative support.

Col Dan Crozier has been commander of the Medical Unit since 1961. Its primary mission is research and development of medical defense against biological warfare through the development of vaccines and rapid diagnostic procedures. Results of investigations are applicable equally to treatment and diagnosis of naturally occurring disease.

# *First Ladies' Day Awards Ceremony Honors 3*

In a May 26 Ladies' Day Awards Ceremony unprecedented among Department of Defense organizations, Secretary of the Army Stanley R. Resor presented two Decorations for Exceptional Civilian Service and a $5,000 award under the Army's Incentive Awards Program.

Before a distinguished audience assembled in his office at the Pentagon, Secretary Resor presented the Decoration for Exceptional Civilian Service to Mrs. Irene Fischer and Mrs. Dorothe K. Matlack. Miss Shirley J. Gomora was the $5,000 incentive award winner.

Both Mrs. Fischer and Mrs. Matlack were listed in the March 1967 edition of the *Army Research and Development Newsmagazine* among seven Department of the Army nominees for the Department of Defense Distinguished Civilian Service Award.

The Ladies Day Awards Ceremony recognized Mrs. Fischer for her contributions to the international scientific community in the field of geodesy, in which she is one of the U.S. Army's most honored scientists. She is chief of the Geoid Branch, Research and Analysis Division, Department of Geodesy, Army Map Service, Corps of Engineers.

Mrs. Matlack was honored for her exceptional ability in the collection of information and reporting to fill gaps in the national intelligence surveys. Results of her work, the citation accompanying the award stated, have added significantly to the currency of U.S. national intelligence estimates.

Miss Shirley J. Gomora, inventory management specialist at the U.S. Army Ammunition Procurement and Supply Agency, Ill., utilized a concept dating back to 1933 and received $5,000 for saving the government $10.4 million.

Miss Gomora noted that due to the obsolescence of the 155mm M59 gun, the U.S. Army has a large stock of projectiles for which there was no known requirement. She recommended that a modification, approved in 1933 and applicable to World War I ammunition, could be applied to the projectiles to adapt them to the engineered configuration for the modern 155mm M107.

# *56 Military Pharmacists Attend Course at WRAIR*

Fifty-four U.S. Army pharmacists and two officers of the Royal Canadian Army and Air Force attended the Army Pharmaceutical Service Management Course at Walter Reed Army Institute of Research (WRAIR), Washington, D.C., May 1-5.

Brig Gen Philip W. Mallory, CG of Walter Reed Army Medical Center, welcomed the officers from Army installations throughout the U.S. He commented on advances in the pharmaceutical field since the course was first held at WRAIR six years ago, saying:

"As pharmacists, you must work hand-in-hand with the physician in the serious business of evaluating the safety and efficacy of the thousands of drugs and drug combinations which appear on the market each year."

Chief of the Medical Service Corps Brig Gen William A. Hamrick and Col Thomas P. Caito, MSC, Office of The Surgeon General, addressed the class on the MSC role generally and in Vietnam.

Course subjects included recently enacted drug-control laws, pharmaceutical education, pharmacy design, operation and space requirements, and medical supply.

## *11 Officers at WRAMC Win A-Prefix Awards*

Signifying the highest degree of military occupational speciality qualification, the A-Prefix was awarded May 12 to 11 Army Medical Service officers.

Brig Gen Philip W. Mallory, MC, commanding general of Walter Reed Army Medical Center and Walter Reed General Hospital, presented the awards.

Recipients are Col Frederick C. Biehusen, MC, chief, Pediatric Service; Col Robert J. Hall, MC, chief, Cardiology Service; Col Forrest W. Pitts, MC, chief, Pulmonary and Communicable Disease Service; Col Joseph N. Stabile, MSC, biochemist, Pathology Service; and Col Harold E. Ratcliffe, MC, chief, Department of Hospital Ciniics; and

Lt Col John D. Amos, MC, chief, Physical Medicine Service, Lt Col Nelson R. Blemly, MC, assistant chief, Radiology Service; Lt Col Albert B. Kilby, MSC, chief, Social Work Service; Lt Col Thomas W. Sheehy, MC, assistant chief, Department of Medicine; Lt Col Michael H. Sulak, MC, chief, Pathology Service; and Lt Col William R. Vineyard, MC, chief, Dermatology Service.

For an officer of the Army Medical Service to receive the "A-Prefix," he must be recognized by both his military and civilian counterparts as an expert in his field. Normally the recipient has the same level of proficiency as a university professor.

Recommendations for the award are reviewed by a special board in the Office of The Surgeon General of the Army and approved by The Surgeon General.

# Device Offers Hope of Early Detection of Prostate Cancer

Possibility of early detection of cancer in the human prostate gland is considered significantly nearer with recent successful scans of living organs by researchers at Walter Reed General Hospital (WRGH), Washington, D.C.

A scintillation detector, which reveals areas of tissue absorbing radioactive material, was employed to make the first known scans of the prostate using zinc-69m radioisotopes as the tracer.

Army Medical Corps Lt Col Gerald S. Johnston is chief of the WRGH Radioisotope Section. He will present a paper on the scan experiments with animals and humans at the First International Symposium on "Radioisotopes in the Diagnosis of the Diseases of the Kidney and Urinary Tract." The meeting is scheduled in Liege, June 22-25, in conjunction with the 32d Belgian Congress on Urology.

Col Johnston also has been invited to chair a symposium roundtable on "Radioisotope Exploration of the Prostate and of the Urinary Bladder."

The scintiscan experiments at Walter Reed were reported in the May 8 issue of *JAMA* (The Journal of the American Medical Association) as having "significant surgical ramifications." *JAMA* commented that "The development of a clinically useful prostate scanning procedures . . . could provide information for a preoperative choice between a total prostatectomy and a simpler transurethal resection."

Col Johnston has been working on the zinc-scan experiments since May 1965. He was assisted in animal studies, using zinc-65 by several doctors at the Brady Urological Institute at The Johns Hopkins Hospital, Baltimore, Md., and in the work on humans by Lt Col Bernard T. Mittemyer, assistant chief of Urology Service, WRGH.

The doctors developed the prostate scanning procedure on dogs and monkeys and determined that the relatively long half-life and high radiation energy of the zinc-65 are undesirable for human scanning. The short half-life of zinc-69m and its lower radiation energy are better suited for humans.

Human experiments began last Feb. 1 when the first zinc-69m isotopes were flown from the Oak Ridge (Tenn.) National Laboratory (ORNL) to Walter Reed. The zinc-69m was prepared at the Isotopes Development Center of ORNL by the neutron irradiation of highly enriched zinc-68 in the Oak Ridge reactor.

The isotope (zinc 69m) was prepared for Walter Reed as part of a cooperative effort to supply commercially unavailable material to medical and biological researchers. ORNL is operated by the Union Carbide Corp. for the U.S. Atomic Energy Commission.

One of the patients at Walter Reed selected for the scan study was scheduled for a prostatectomy which allowed the doctors to perform *in vivo* (living organism) scans before surgery, and postsurgical *in vitro* (test tube) scans.

*Cancer of the prostate gland occurs most frequently in men over 60 and increases with age, according to a "fairly representative" report by the State of Connecticut.*

*Dr. Sidney Cutler of the National Cancer Institute, Bethesda, Md., said that Connecticut has an excellent statewide cancer reporting system and that its findings "in a general way" can be considered a reliable estimate of the national incidence.*

*The most recent statistics available are for 1960-62, published in "Cancer in Connecticut," by the Connecticut State Department of Health, 1966. Excerpts follow:*

*All types of cancer for all ages combined: 299 cases per 100,000. Of these, 41 cases per 100,000 were cancer of the prostate.*

*By age bracket, the incidence rate of cases per 100,000 per year are reported by Connecticut as follows:*

| Age | All types cancer | Prostate cancer |
|---|---|---|
| 60-64 | 991 | 113 |
| 65-70 | 1,482 | 212 |
| 70-74 | 1,959 | 366 |
| 75-80 | 2,360 | 531 |
| 80-84 | 2,859 | 748 |
| 85 and over | 2,981 | 963 |

The procedure of scanning the prostate is similar to that used to detect thyroid gland tumors using radioactive iodine-131 tracer.

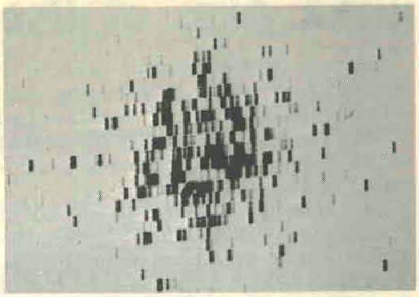
Col Johnston said that 10 patients have been "visualized" using zinc-69m in either citrate or chloride solution. "Although we are not yet satisfied with the solution used," he said, "the prospects are good for visualizing primary lesions, metastases and for prostatic physiology studies."

While it has been demonstrated that the prostate gland will concentrate injected zinc, there is no definite evidence yet that malignant tissue will accumulate zinc in a manner different from normal prostatic tissue.

The doctor's paper summarizes the scintiscanning findings to date as "an adjunctive diagnostic test in the detection of prostatic disease in man."

Zinc has been recognized as a biologically essential trace metal since 1869, Col Johnston said in tracing the history of zinc leading to the new procedures. French investigators studied extensively the biological occurrence of the metal.

In 1921, Drs. G. Bertrand and R. Vladesco are reported to have found zinc to be present in high concentration in the prostates of humans and bulls. The doctors postulated that zinc might play an important reproductive physiology role.



**FIRST PHOTO of zinc-69m prostate scan in a human is shown. The patient had prostatic cancer and was treated with orchiectomy and estrogen therapy, which reduce zinc concentration in the prostate. A good scan was gained.**

Since 1940 the prostate has received much attention because it seemed probable that a high zinc content was associated with prostatic metabolism.

Evidence of the specific biological activity of zinc was determined in 1940 when the enzyme carbonic anhydrase was isolated and shown to contain zinc as part of its molecule. Zinc has since been shown to be part of other enzymes, including several dehydrogenases, a peptidase and a phosphatase.

Col Johnston said that the metal's widespread involvement in biological enzyme chemistry has demonstrated it is necessary for proper growth in microorganisms and plants, and for proper function of various mammalian organs.

The 36-year-old Army doctor was assigned to WRGH in June 1963 after a year's course in Military Medicine and Allied Sciences at the Walter Reed Army Institute of Research. He served an internship at WRGH (1956-57) after graduation from the University of Pittsburgh School of Medicine. His residency in internal medicine was served at Brooke General Hospital, Tex.

In Korea from July 1961 to July 1962, he was successively chief of medicine, 43d Surgical Hospital, and commander of the 48th Surgical Hospital and the 548th General Dispensary. He is a member of Phi Beta Pi, the American Medical Association, Society of Nuclear Medicine, American Federation for Clinical Research, Association of Military Surgeons,

**Lt Col Gerald S. Johnston**

# IDEEA Aims at Use of Data on Ongoing Research Activities

Solution of the problem of how to provide bench-level scientists, engineers and project managers with the data output of ongoing Army research is the goal of the Information Data Exchange Experimental Activity (IDEEA).

The network is being developed at Frankford Arsenal, Philadelphia, Pa., under the staff supervision of the Director of Army Research, Office of the Chief of Research and Development. The IDEEA project is assigned to the U.S. Army Materiel Command, which has delegated management responsibility to the U.S. Army Munitions Command.

A feature of the experimental network is its ability to operate with a variety of military and commercial equipments and information programs. No standardized hardware is implied in the concept.

IDEEA has been established to conduct experimentation in the Army scientific and technical information area. In recent years, a number of discipline-oriented research projects, such as the Chemical Information and Data System (CIDS), the Engineering Data and Information System (EDIS), and the Army Technical Library Improvement Studies (ATLIS), have been initiated to investigate scientific and technical information (S&TI) data-handling problems as they affect the suppliers and users of data and information.

The goal of these projects is to establish the feasibility of S&TI systems, with advanced search capabilities, to support the Army's research, development, test and evaluation (RDT&E) programs. Many fundamental questions must be answered before such a system or a prototype system can be considered feasible. These questions are not of the usual hardware and software type; they refer to the broad area of the nature of the information-handling processes. For example:

- What is the nature of the queries?
- What is the nature of the data?
- What will the use patterns be?
- What are the anticipated traffic rates and modes?
- What will the network communications requirements be?
- Is it feasible (or possible) for the user to address the system in his own natural language?
- What are the cost-effectiveness considerations?

Established as a means of answering these basic questions concerning system usage and network planning, the IDEEA approach involves experimentation within an information network by a limited group of scientists, engineers, technicians and managers.

Further, it establishes an experimental information network, computer-linked and polymorphic in nature, capable of supporting the network experiment requirements for all S&TI projects. A key feature is a versatile man/machine console (Figure 1) that will enable users to address the IDEEA network (Figure 2) with the ease and dispatch of a telephone receiver.

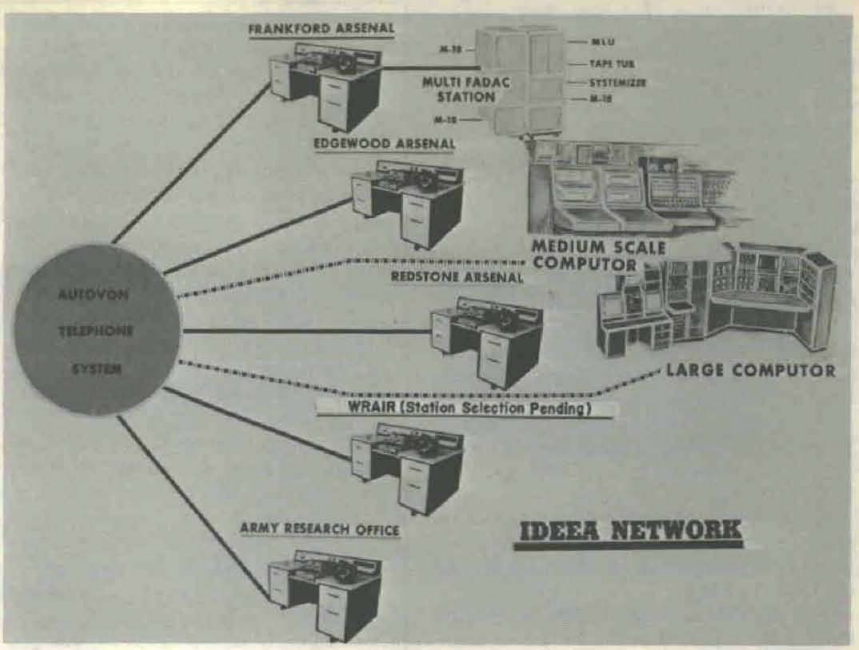



**Figure 2. IDEEA Network**

The IDEEA concept was developed at Frankford Arsenal as a way of measuring the information traffic among real users and suppliers of chemical information subscribing to a computer-linked network.

Later IDEEA was expanded into a broader user experiment to encompass additional classes of information such as engineering (EDIS) and RDT&E management (Research and Technology Resume, DD Form 1498). Experimentation with the management information included in the new Army Research and Development Information System (ARDIS) project is to be added.

The compelling reason for the establishment of the IDEEA project was the recognition that no user survey — whose results are usually distorted by considerable subjective content or whose participants cannot adequately visualize an advanced retrieval system — will establish specific information system needs and benefits on a credible quantitative, statistical basis.

Nothing short of a realistic user experiment will determine user needs, system functional characteristics, and projected improvement of mission performance effectiveness. Although the hardware and software performance can be simulated, predicted and even gamed, the critical performance can be simulated, predicted

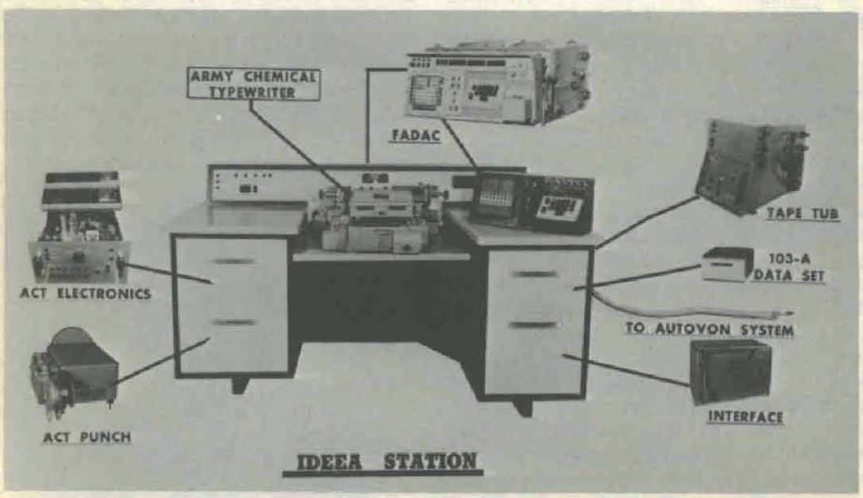



**Figure 1. IDEEA station console. Also to be added to the station is a cathode-ray tube (CRT) unit which will be placed at the left of the Army chemical typewriter.**

and even gamed, the critical component of the sytem, *the user,* cannot.

The following functions will be performed under the IDEEA project:

- Establish the experimental system, the IDEEA network.
- Provide for measurement and analysis of the experimental operation to include usage patterns, data rates and volumes, error analysis, traffic patterns, response relevance, etc.
- Support research in the areas of linguistics, computer programing, man/machine interface problems, analysis, and advanced information systems concepts.
- Specify the basis for Data Automation Requirements for an operational S&TI system.
- Develop specifications for interfaces with S&TI-related management information systems, such as the Army's information-to-industry program for release of qualitative development requirements information (QDRI).

Prime objective of the IDEEA project is to acquire and analyze data derived from live experimentation on the limited, controlled experimental information network for the purpose of: determining the user need for improved technical information systems; specifying the characteristics of future scientific and technical information systems and Technical Information and Analysis Centers (TIACs); and assessing the cost effectiveness of such systems.

The first test of the IDEEA experimental network will be conducted soon. It will support a test of the Chemical Information Data System which is underway at Edgewood Arsenal, Md.

The network test will link IDEEA stations at Frankford Arsenal and Edgewood Arsenal with the PDP 8/7040 computer at the University of Pennsylvania which contains the stored chemical data. Stations will employ Army chemical typewriters developed at the Walter Reed Army Institute of Research, associated electronic equipment, and FADAC computers developed at Frankford Arsenal.

Each IDEEA station will be connected by telephone lines to the other station and to the computer at the University of Pennsylvania. If the first network tests are successful, other IDEEA stations will be added to the network. Other scientific disciplines will be included in the test program at a later date.

The CIDS project has been established for the investigation of chemical data processing and retrieval techniques, and the design of a chemical information system. User-oriented, it will provide specialized data and information in the life science and physical science areas, as well as data sources, to the research chemist or technician.

An experimental file of chemical structures and related hardcore data items is under development. Files presently contain 300,000 structures, of which about 100,000 are currently related to Army work and interests. Thus, chemical queries for the test may relate to retrieval of (1) specific compounds (whole structures), (2) portions of compounds (substructures), or (3) families of compounds.

In addition to the above, as a second part of the tests, chemically related data e.g. biomedical or biological data, may be requested. Example of these questions could pertain to toxicity, taxonomy, physical state, chemical properties, pathology, dosage, action and response, etc.

A third part of the test will consist of a demonstration of document retrieval. The CIDS files include abstracts of about 35,000 CRDL technical reports.

The Army chemical typewriter which will be employed in the IDEEA stations for the first network test can be converted to handle symbols and characters other than those required for the handling of chemical data by changing the typewriter font. This will make it possible for the IDEEA network to experiment with data from diverse information data systems.

## ASD Ignatius to Keynote Value Engineering Parley

More than 300 middle-management and higher-level personnel of the military services and the Defense Supply Agency (DSA) will meet Sept. 12-14 in Washington, D.C., to discuss "The Role of Value Engineering in Support of Defense Management Objectives."

Assistant Secretary of Defense (Installations and Logistics) Paul R. Ignatius is programed to keynote the 1967 Department of Defense In-House Value Engineering (VE) Conference, hosted by the Department of the Army. The Department of the Air Force was host at the first conference in 1964.

Chief of Research and Development Lt Gen A. W. Betts is scheduled for the welcoming address. Assistant secretaries for installations and logistics of the military services have accepted invitations to speak at the three luncheons — Dr. Robert A. Brooks, Army; Graeme C. Bannerman, Navy; and Robert H. Charles, Air Force.

**George E. Fouch, Deputy Assistant Secretary of Defense (Equipment, Maintenance and Readiness) is scheduled for the principal address at the banquet Sept. 13. He will also lead the closing VE workshop summary. Maj. Gen Roland B. Anderson, Director of Procurement, ASA (I&L), is scheduled for an address on "Value Engineering in the Army."**

Technical papers and discussions will provide an exchange of information on Value Engineering in management, contract administration, cost reduction, procurement, auditing and other operations required in the business of national defense.

## ECOM Assigns Col Knight to Plans and Programs

Designated acting deputy for U.S. Army Electronics Command Plans and Programs, Col Darce R. Knight takes over duties formerly performed by Brig Gen Paul A. Feyereisen, newly appointed Mallard Project, program manager.

As reported in a page 1-featured article in the May edition of the *Army Research and Development Newsmagazine,* Project Mallard involves long-range development of a common communication system for field armies of the United States, Canada and Australia.

Assigned mainly in training and field operations in communications and electronics since 1942, Col Knight was until recently chief of the Electronics Command's Commodity Management Office for Combat Surveillance, Night Vision and Target Acquisition.

**Col Darce R. Knight**

Graduated from the Signal Corps Candidate School in 1942, he was accepted into the Regular Army as a Signal Corps officer in 1947. Some of his major assignments have included chief of the Plans and Operations Signal Division, HQ U.S. Army Europe, where he also served as commanding officer of the 516th Signal Group, and as commander of the U.S. Army Signal Brigade.

Col Knight has served with the staff and faculty of the Army Signal School at Fort Monmouth; with the Signal Division, Fourth U.S. Army, Fort Sam Houston, Tex.; as deputy signal officer, Military Assistance Advisory Group in Formosa; executive officer, Signal Training Group, Fort Gordon, Ga.; chief of the Maintenance Engineering Branch, Deputy Chief of Staff for Logistics; and chief of the Latin American Division, Office of the Joint Chiefs of Staff.

Col Knight attended Trinity University, San Antonio, Tex., and the University of Maryland. His service education includes the Infantry Communications School, the Signal Corps advanced course, Command and General Staff College, Armed Forces Staff College, and Industrial College of the Armed Forces.

William B. Taylor

Col Thomas W. Mellen

Lt Col R. M. Connell

Lt Col David L. Davis

# 7 New Personnel Assigned to OCRD Staff

Addition of a scientific adviser to the Director of Missiles and Space and assignment of a Deputy Director of Developments head the list of new personnel in the Office of the Chief of Research and Depelopment (OCRD).

WILLIAM B. TAYLOR, the scientific adviser, has been with the National Aeronautics and Space Administration (NASA) since 1962. Successively, he has served in the Office of Manned Space Flight as aerospace technologist, director of special manned space flight studies, and director of Apollo applications.

His work at NASA included conceiving and contributing to the design and development of the Apollo Lunar Mapping and Survey System.

From 1960 to 1962, he was assistant director for global systems, Geodesy, Intelligence Mapping Research and Development Agency, U.S. Army Corps of Engineers. He has also contributed to the design, development, test and operation of several Army nuclear power plants and equipment for studying the effects of underwater nuclear explosions (1951-60).

A 1945 graduate of the U.S. Military Academy (USMA), he holds an MS degree in electrical engineering from Johns Hopkins University, has studied at the U.S. Navy Postgraduate School and has taken special weapons training.

COL THOMAS W. MELLEN, new Deputy Director of Development, was until recently chief of staff, 25th Infantry Division, Vietnam. Prior to that he was commanding officer, 3d Brigade, 25th Infantry Division, Hawaii.

This is Col Mellen's second tour with OCRD. Following 30 months with the Programs and Budget Division, he became chief of the Programs and Analysis Division, in March 1960. Six months later he left to attend the U.S. Army War College, Carlisle Barracks, Pa.

Other recent assignments have included staff officer, HQ U.S. Army Pacific; commanding officer, 2d Battle Group 4th Cavalry, Korea; and operations officer, I Corps, Korea.

Col Mellen studied forestry at the College of San Mateo, Calif., and is a graduate of the Command and General Staff College (CGSC). He holds the Silver Star with two Oak Leaf Clusters (OLC), the Legion of Merit, the Bronze Star Medal with OLC and the Army Commendation Medal with OLC.

LT COL R.M. CONNELL came from the U.S. Army Engineer Command, Vietnam, where he was deputy assistant chief of staff for engineering. He is assigned as a staff officer in the Management and Evaluation Division, OCRD. In Vietnam, he also served six months as commander, 299th Engineering Battalion (combat).

From May 1965 to April 1966, he was executive officer, Directorate for Acquisition, Defense Intelligence Agency (DIA), Washington, D.C., and staff officer, DIA. From 1960 to 1963, he was an exchange officer in the Royal School of Military Engineering, Chatham, England.

A 1949 graduate of the USMA, Col Connell received an MS degree in civil engineering from the Massachusetts Institute of Technology in 1955 and has attended the CGSC. He holds the Legion of Merit, the Joint Service Commendation Medal and the Army Commendation Medal.

LT COL DAVID L. DAVIS, assigned to the OCRD Combat Materiel Division, last served as a staff officer with the Office of the Deputy Chief of Staff for Personnel, Washington, D.C.

He served as deputy G-3 in 1965-66 at the U.S. Army School/Training Center, Fort Gordon, Ga., following a year there as battalion commander. Other assignments include: operations and training officer, J-3, with the United Nations Command/U.S. Forces, Korea; and operations officer with the U.S. Army Airborne, Electronics and Special Warfare Board (USAAESWBD), Fort Bragg, N.C., where he also was a project officer with the USAAESWBD.

Col Davis received a bachelor of education degree from the University of Omaha in 1966 and has completed CGSC. He holds the Army Commendation Medal with two OLC.

LT COL JAY A. HATCH, staff officer in the Management and Evaluation Division, recently commanded the 2d Battalion, 12th Cavalry, 1st Cavalry Division in Vietnam. Other recent assignments have included: sector adviser, Military Advisory Command, Vietnam; staff officer with the Combat Developments Command; and instructor at the USMA.

Graduated from the USMA in 1948, he received an MS degree in mechanical engineering from the University of Southern California in 1963 and has attended the CGSC. He holds the Air Medal with 10 OLC, the Vietnam Service Medal, the Vietnam Combat Medal, and the Combat Infantryman Badge.

LT COL PAUL S. LAWRENCE was assigned recently to the Studies and Analyses Division, U.S. Army Research Office, following a year with the Research Analysis Corp., McLean, Va. For two years prior to that, he was a training officer in operations with the Strike Command, MacDill AFB, Fla.

Other recent assignments include commanding officer, F Company (Airborne), 23d Infantry, Fort Richardson, Alaska,

Lt Col J. A. Hatch

Lt Col P. S. Lawrence

Lt Col J. D. Park

and aide-de-camp to the commanding general, U.S. Army, Alaska.

Col Lawrence received an LLB degree from Brooklyn Law School in 1951, an MA degree in international affairs from George Washington University in 1964, and he has attended the Naval War College, Newport, R.I. He holds the Bronze Star Medal with "V" device, the Joint Service Commendation Medal, and the Army Commendation Medal.

LT COL JOSEPH D. PARK was chief of the Studies and Analysis Branch, Advisory Division, and assistant chief of staff J-1, HQ U.S. Military Advisory Command, Vietnam, prior to his recent assignment to the International Office, OCRD.

Following a 4-year tour as commandant, U.S. Military Academy Preparatory School, Fort Belvoir, Va., he studied international relations at the American University (1964-1966). He is a 1946 graduate of the USMA and has attended the CGSC.

Col Park holds the Bronze Star Medal, the Army Commendation Medal, the Purple Heart, and the Combat Infantryman Badge.

## Gamma Ray Projector Tested For Checking Pipeline Welds

Three prototypes of a 40-pound gamma ray projector and a laboratory darkroom designed for field-testing of pipeline welds are undergoing engineering design tests at the U.S. Army Engineer R&D Laboratories, Fort Belvoir, Va.

The projector uses a 100-curie radioactive source (iridium 192) which eliminates electrical power requirements and range limitations of X-ray equipment. Ease of handling and application is increased and weight and cubage reduced by use of depleted uranium, instead of lead as the shielding material.

The environmentally controlled darkroom incorporates all essential film processing and storage facilities. It can be removed easily from its 2½-ton trailer for transfer to a 2½-ton truck, a wanigan, or an offshore marine construction barge engaged in pipeline construction.

Capable of providing rapid, nondestructive inspection of 150 welds per day, the prototypes were produced for the Army by Picker X-Ray Corp., White Plains, N.Y.

## UH-1D Delta Redesignated UH-1H

Beefing up the Huey Delta helicopter transport with a 1,400-horsepower engine has led to Army redesignation of the "Vietnam workhorse" as the UH-1H.

Formerly the UH-1D, powered by the 900-horsepower Lycoming T53-L-11 engine, the Delta is one of the most thoroughly proven aircraft in military service. The Army Aviation Materiel Command (AVCOM) St. Louis, Mo., began supplying UH-Ds to Army units in 1963 for the job of moving troops quickly into combat.

# Power Sources Meet Chided on Pollution

*(Continued from Page 2)*

The systems, a high-temperature molten carbonate fuel cell (attractive because of the low cost of materials), and a low-temperature acid fuel cell, are indirect and operate on reformed natural gas.

Baker reported successful operation of the molten carbonate cell on reformed natural gas and air over an 18-month period. He concluded that the outlook for larger molten carbonate cells, where stationary power-generating equipment is required, is optimistic from both a cost and service life viewpoint.

New developments in the field of metal-air batteries were presented in three papers by Bruce Sagid of Leesona Corp., Clifford E. Kent of General Electric Co. and David Linden of the Army Electronics Command. These metal-air batteries, using high-performance fuel-cell type electrodes, are capable of delivering over 100 watt-hours per pound.

During the past year, 24-volt batteries with a 25-ampere-hours rating have been designed for use with military radio sets. They use a replaceable anode (negative electrode), changed after each complete discharge of the battery.

Linden's report was on the development of a family of zinc-air batteries, which are designed in the standard military "back-pack" configuration and use the standard 6-pin 12/24-volt connector. Two sizes of batteries are contemplated: a 7-pound, 480 watt-hour and a 15-pound, 1,150 watt-hour battery.

In addition, ECOM is considering development of zinc-air "throwaway" batteries, which use inexpensive components and are cost competitive with conventional batteries. They will be used only once, and do not require anode replacement.

The session on secondary batteries covered lead-acid and nickel-zinc cells. Maintenance-free, lead-acid batteries are available which, by means of special alloys, separator systems, container design and charging procedures are spill-proof, have a long standby (shelf) life and low water loss.

The nickel-zinc battery, a relatively new entry in the secondary battery field, has many potential advantages which make it an attractive system. In addition to its low cost, it should be superior to nickel-cadmium on energy density, have good voltage regulation during discharge, have efficient low-temperature operation and moderately good cycle life.

Nonrotating thermal energy conversion devices employing the thermoelectric, thermionic and thermophotovoltaic methods of conversion were discussed at a session on Hydrocarbon Fired Thermal Energy Conversion.

A new thermoelectric power system, designed in a 300-and 560-watt version, was reported by T. L. Nystrom of the Minnesota Mining and Manufacturing Co. This generator incorporates an ultrasonic atomizing burner which permits operation from a variety of military logistic fuels, including leaded gasoline, jet fuel or diesel fuel. Designed as a vehicle-mounted battery charger, the generator is in parallel with the vehicle battery.

The system runs on fuel from the vehicle fuel tank and is used to operate communications and other electronic equipment during those periods when the vehicle engine is not operating. The vehicle battery is charged by the thermoelectric generator and is used to handle the peak power demands. The 300-watt, 25-pound unit is 13¼ inches in diameter and 23 inches high.

F. J. Wrublewski of ECOM introduced a session on Power Technology with a survey of the requirements for battlefield electric power and an assessment of both conventional and new power sources that can effectively fill these needs. The electrical power source must obviously be silent, lightweight, and place a minimum burden on maintenance and logistic support.

Development activity on new power sources supported by the government and industry, he concluded, should significantly enhance the ability to power present and future combat electronic equipment under the many adverse operational and environmental conditions that are encountered in the field.

Other speakers presented details of some of these new developments, including lightweight forward-area battery chargers, advanced power conditioning and modulation techniques for silent-battery charging systems and lightweight static inverters for d.c. to a.c. inversion.

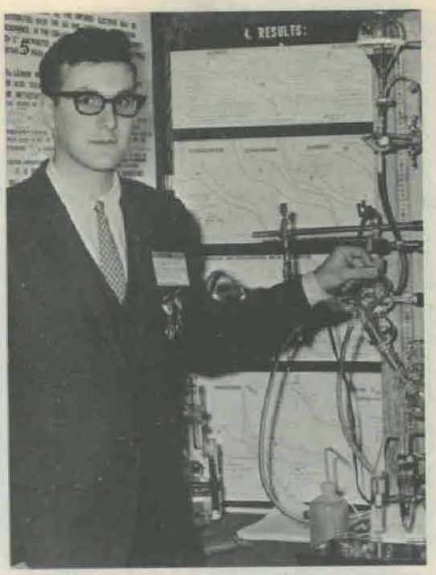
The Power Sources Conference provides an opportunity for the different laboratories throughout the nation to benefit from each other's investigations in the power field. "Proceedings" are published and distributed by the PSC Publications Committee, P.O. Box 891, Red Bank, New Jersey 07701, and will be available in October.

The 22nd annual Power Sources Conference has been scheduled for May 14-16, 1968, in Atlantic City.

## Army R&D Monograph on Sale

***High Intensity Radiation Dosimetry with SEMIRAD*, authored by Dr. Stanley Kronenberg of the U.S. Army Electronics Command, has been placed on public sale through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., at $1.25 a copy.**

**This is the third in the series of U.S. Army Research and Development Monographs, the purpose of which is to give a comprehensive report on areas of research considered of profound worldwide importance.**


# Army Selects 10 ISF Winners for Special Awards

Ten teenage researchers and 20 alternates selected at the 18th International Science Fair (ISF) in San Francisco, May 10-13, for summer jobs or visits in U.S. Army in-house laboratories share an added distinction. They represent the climax of 10 years of continuous Army participation in what is for budding young scientists truly "The Greatest Show on Earth."

Magnitude of the ISF for the uninitiated is difficult to grasp. This year 425 displays filled a huge hall. Each of the exhibitors was a finalist in 229 local and regional fairs sponsored by Science Service in the United States and in 10 foreign countries. Each of these fairs averaged 241 exhibitors and each of the finalists was representative of 1,842 entries.

Science Service is a nonprofit organization which has the cooperation of most of the nation's scientific and technical societies, educational institutions, industry, the U.S. Department of Defense and the Army, Air Force and Navy in sponsoring the ISF.

Canada, for example, sent four finalists from three fairs; Germany, four from two fairs; Puerto Rico, six from three; and Switzerland, five from three. Japan, the Philippines, Nicaragua, Portugal, Sweden and Turkey also sent one or more young researchers.

In keeping with a policy established in 1963, the U.S. Army, Navy and Air Force each selected a representative to participate (not compete) as goodwill envoys in the 11th Annual Japan Student Science Awards scheduled in Tokyo in January (dates indefinite) 1968.

Representing the Army will be Scott A. Jenkins, 16, Valley H.S., Albuquerque, N. Mex., whose exhibit was titled "Development of a Neutron Boundary Layer Disturbance Theory for Drag Reduction by Acoustical Interaction."

The Air Force selected Robert A. Warriner III, 17, Mid-City Baptist H.S., New Orleans, La., for "Effects of Hypobaric Oxygen Tension on Prenatal Skeletal Development in the CD Mouse."

The Navy choice for the Japan Student Science Awards is Janice Marie Moos, 17, Circle (Mont.) H.S., whose display was on "*Typha latifolia*" research.

Alternates for the trip to Japan are: *Army,* David Scott Hutchens, 17, Terry Parker Sr. H.S., Jacksonville, Fla.; *Navy,* Ronald S. Hencin, 17, Melbourne (Fla.) H.S.; *Air Force,* Curtis Bryant, 17, LeMars (Iowa) Community H.S.

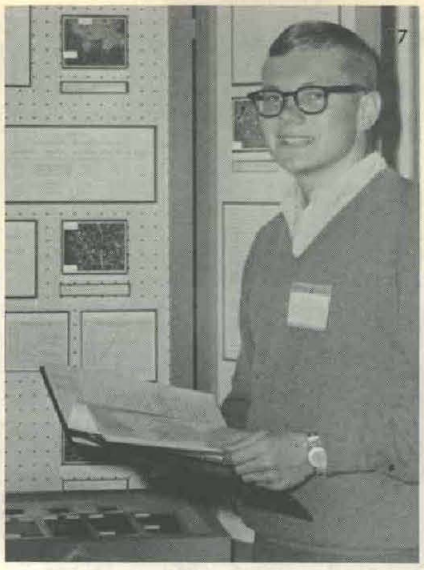
Army Chief of Research and Development Lt Gen Austin W. Betts was represented at the ISF by Brig Gen John R. Guthrie, Director of Developments, who presented Certificates of Achievement to Army winners and alternates.

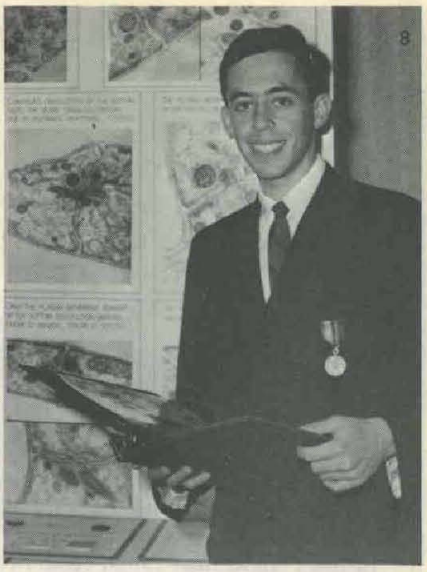
Strong parental stimulation in scientific research might be suspected for each of the 10 first-place award winners selected by the Army. The ISF record reflects that eight have one or both parents with degrees ranging from bachelor to doctoral.

One winner's father whose educational background is not listed is Robert L. Hutchens, president of National Foods, Inc. Another winner has a mother listed as a chemical technician, although no degree is mentioned.

The fact that a student selected by Army judges may not necessarily be ranked as a first-or second-place winner in the overall ISF competition is explained by a policy of choosing exhibits

**ARMY ISF AWARD WINNERS: Fig. (1) Scott A. Jenkins, (2) David S. Hutchens, (3) Nevin M. Summers Jr., (4) Martha C. Cragoe, (5) Robert A. Lipson, (6) Kathleen R. Page, (7) Ronald S. Hencin, (8) Douglas M. Brenner, (9) Sheldon J. Axler, (10) Joachim Messer.**


## Dr. Oesterling Chairs Army's ISF Panel of Judges

*The panel of U.S. Army judges for the International Science Fair this year, as in 1966, was chaired by Dr. J. Fred Oesterling, deputy scientific director for research at the U.S. Army Natick (Mass.) Laboratories.*

*In addition to judges selected from Department of the Army research and development in-house activities, the panel was assisted by members of U.S. Army Reserve R&D Units selected for expertise in specific disciplines.*

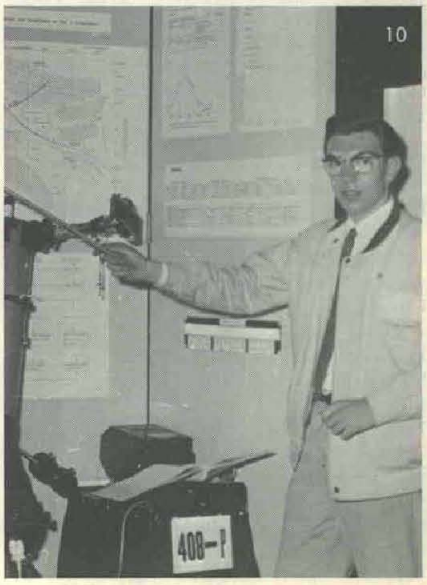
*Panel members and the disciplinary areas in which they judged exhibits are: Dr. John Bogusky (biochemistry), biological science administrator, U.S. Army Materiel Command (AMC), Washington, D.C.; Dr. Gordon L. Bushey (chemistry), assistant chief scientist, AMC;*

*Dr. Robert E. Elbel (zoology), Biological Division, Dugway Proving Ground, Utah; Dr. Woodland Hurtt (botany), research plant physiologist, Crops Division, Fort Detrick, Md.; Robert F. Jackson (earth and space sciences), research coordinator, Office of the Chief of Engineers, Washington, D.C.;*

*Lt Col John A. Morris Jr. (medicine and health — surgery and physiology), U.S. Army Medical Research Unit, Presidio of San Francisco, Calif.; Dr. Irvin Pollin (physics and mathematics), aerospace research engineer, Harry Diamond Laboratories, Washington, D.C.;*

*Col Norman M. Scott Jr. (medicine and health — internal medicine and gastroenterology), chief, Medical Service, Letterman General Hospital, Presidio of San Francisco; Dr. Elmer G. Worthley (biology), research biologist, Research Laboratories, Edgewood Arsenal, Md.*

*Reserve officers assigned to the 6051st, 6052d, 6053d and 6057th Army Reserve R&D Units in California assisted in the judging. Jack B. Fenn, Scientific and Technical Information Division, U.S. Army Research Office, Office of the Chief of Research and Development, was the Army project officer for the event.*


of outstanding work oriented in scientific areas of prime concern to the Army. Another factor is that the students will be able to observe later what is being done in that field at an Army in-house laboratory — a bid for a career in Army R&D.

For the first time since the U.S. Army has supported the ISF, two of the 10 winners selected for summer jobs or one-week all-expense paid visits to Army in-house laboratories are representative of the same school. David Scott Hutchens who exhibited "Correlative Effect of Indoklon and EST" and Nevin Morris Summers Jr., 17, whose exhibit was on "Radiochemical Studies on the Biogenesis of the Crab Cuticle Hardening Agent," are students at Terry Parker Sr. H.S., Jacksonville, Fla.

Joachim Messer, 17, is from Hohe Landesschule, Hanau, Germany. His exhibit was titled "Paradox of the Beta-Persei Systems." Other Army winners:

Martha C. Cragoe, 17, Methacton H.S., Fairview Village, Pa., "Synthesis and Investigation of Cholesteric Liquid Crystals"; Douglas Milton Brenner, 18, Churchland H.S., Chesapeake, Va., "Formation of Septal Pores and the Nature of Woronin Bodies in *Ascodesmis sphaerospora*"; Robert A. Lipson, 16, Curtis H.S., St. George, N.Y., "Electronalytical Identification of the Semiquinoid Free Radical";

Also, Kathleen Reavette Page, 18, Tulsa Central H.S., Okla., for "Factors Influencing the Orientation of Shells on

*(Continued on Page 20)*

## Army Selects ISF Leaders

*(Continued from Page 19)*

**DIRECTOR OF DEVELOPMENTS, Office of the Chief of R&D, Brig Gen John R. Guthrie presents Certificate of Achievement to Scott Jenkins, an Army superior award winner and representative to the 11th Annual Japan Student Science Awards scheduled in Tokyo.**

a Beach"; Sheldon Jay Axler, 17, Miami Palmetto H.S., Fla., "Original Investigations of the Calculus of Complex Numbers"; and Ronald Stephen Hencin, 17, Melbourne H.S., Fla., "Separation of Mammalian Immunological Capacities: A Functional Equivalent of the Avian Bursa of Fabricius."

Six of the top Army winners were selected from the 12 overall First Awards winners at the ISF, which earned them "Wish Awards" of $100 for scientific equipment or books of their own choice. They are Douglas Brenner, Martha Cregoe, Kathleen Page, Ronald Hencin, Sheldon Axler and Nevin Summers.

An Army alternate, Paul B. Re', who presented "Coanda Effect Propulsion by Negative Drag," also placed among the First Award winners. Others recognized for this award and their exhibits

Rosmarie Lehmann, 20, Lehrerinnenseminar, Thun, Switzerland, for "Comparison of the Lichen Vegetation from Oberdiessbach and Thun"; and Robert M. Swift, 16, Stephen T. Mather H.S., Chicago, Ill., "Biochemical Study of Prostanoic Hormones." Swift was also a finalist in 1966.

Also, Neil F. Martin, 16, Bethesda-Chevy Chase H.S., Bethesda, Md., for "Research and Design Procedures Resulting in a Variable Camber and Thickness Airfoil"; Eileen Maria Moffitt, 17, Presentation H.S., Berkeley, Calif., "Messenger RNA Comparison in Inducible and Constitutive *E. Coli*"; and

Gary Ray Rylander, 16, S.F. Austin H.S., Austin, Tex., for "Field-Effect Transistors and Field-Effect Transistor Amplifiers at -195 C." and Dorcas Joanne Harley, 15, Morgantown (W. Va.) H.S., "Identification of 55 Naturally-Occurring Equine Blood Factors."

One of the Navy top award alternates this year is Evelyn Jankowski, 17, Immaculate Conception H.S., Lodi, N.J. Last year her sister, Letantia, was selected as the Air Force representative in the Japan Student Science Awards.

Twenty representatives from Japan, Puerto Rico, and 14 of the United States were presented with Certificates of Achievement as alternates for visits or summer jobs at Army labs. These include:

*Japan* — Jiro Akiyama, 18, Funabashi Sr. H.S., Funabashi City; *Puerto Rico* — Ann L. Lallande, 17, Academia San Jose H.S., Villa Caparra, and Jose L. Torres, 17, Abraham Lincoln H.S., Caguas;

*Michigan* — Mark E. Wiedenbeck, 18, St. Thomas H.S., Ann Arbor; *New Jersey* — Joseph A. Cama, 17, Raritan Twp. H.S., Hazlet; *New York* — Mark L. Kaiserman, 17, Long Island City H.S.; *Texas* — Charlene Graham, 18, Andrews H.S.; and Gary Lewallen, 17, Central H.S., San Angelo;

*Utah* — Larry C. Ford, 16, Brigham Young H.S., Provo; *North Dakota* — Francis A. Hunkler, 16, Abbey Prep School, Richardton; *Ohio* — Sharon E. Nicholson, 16, Whitehall-Yearling H.S., Columbus; *Indiana* — Philip W. Payne, 17, Richmond Sr. H.S., and Gregory Shutske, 18, Kouts H.S.;

*Oklahoma* — David A. Priest, 17, Midwest City H.S., and Faye J. Roper, 18, Harding H.S., Oklahoma City; *New Mexico* — Paul B. Re, 17, Sandia H.S., Albuquerque; *Louisiana* — Paulette M. Stelly, 15, Mt. Carmel Academy, New Iberia; and

*Mississippi* — James J. Hasken, 16, Greenwood H.S.; *Tennessee* — Laura L. Jones, 18, Copper Basin H.S., Copperhill; *Georgia* — Linda S. Seymour, 17, Glynn Academy, Brunswick.

The Army Aviation Association of America presented five first awards of plaques and $100 to Dennis Johnson, 15, Denair H.S., Calif., for "Experimenting with GEM (Ground Effect Machines)"; Larry Lewis, 15, Emma Sanson H.S., Gadsden, Ala., for "Research on the Ionocraft";

Neil F. Martin, 16, Bethesda-Chevy Chase H.S., Bethesda, Md., for "Research and Design Procedures Resulting in a Variable Camber and Thickness Airfoil"; John Fenton Rollins, 19, Lawton H.S., Okla., "Design and Use of Wind Tunnel in the Development of High Performance Aircraft"; and William Maurice Schumacher, 18, Pampa H.S., Tex., for "Effects of Aramine and Other Drugs on the Low Temperature Survival of Mice."

## Experts of 25 Nations Review Technology, Trade Problem

Challenging issues of national and international importance today are examined by experts from 25 countries in a new book, "Technology and World Trade — Proceedings of a Symposium," available from the U.S. Government Printing Office.

Statesmen, scientists, economists and educators participated in the National Bureau of Standards symposium held in November 1966 in connection with the dedication of the new Department of Commerce NBS labs, Gaithersburg, Md.

Distinguished specialists focused their view on political, social, technological, cultural and economic differences of developed and less-developed nations as they affect international trade and the rise of technology.

Among those quoted in the proceedings are Vice President Hubert H. Humphrey; Professors Marshall McLuhan of Toronto University and Richard N. Cooper of Yale; Dr. Ibrahim Helmi Abdel-Rahman, Industrial Development Commissioner of the United Nations; Dr. Pierre Uri, counselor for studies for the Atlantic Institute in Paris; Bell and Howell President Peter G. Peterson; and

Dr. H. B. G. Casimir, director of research laboratories for N. V. Philips Industries, The Netherlands; and Dr. Aurelio Peccei, chief executive of Olivetti of Ivrea, Italy.

The 168-page book costs $1.25 from the Superintendent of Documents, GPO, Washington, D.C., 20402.

**PUEBLO ARMY DEPOT, Colo., quality assurance chemist Leo Kimmett spends many of his spare hours with his collection of antique phonographs. He is shown here working with the Columbia Concert which was produced around 1902 with an unusual 5-inch cylinder. In the background (l. to r.) are an Edison Triumph of 1913; the Victor disc-playing phonograph, 1903; an Edison Gem, 1908; and an Edison Fireside, 1908. His hobby has led to widespread friendships with phonograph collectors.**

## Ground-Breaking Planned For Wing of AFIP Building

Ground-breaking is scheduled for fall for a new wing for the Armed Forces Institute of Pathology (AFIP) building at the Walter Reed Army Medical Center, Washington, D. C.

The 5-story south wing, designed by architect Edward Durrell Stone, will house the Medical Museum, laboratories, offices and other facilities now located in the AFIP Annex at Seventh St. and Independence Ave., S.W., Washington, D.C. Occupancy is planned for 1969. A north wing will be added at a later date.

# THEMIS Proposals Receiving Final Review

Evaluation of preliminary Project THEMIS proposals for FY 67 — first year of the Department of Defense program to strengthen the nation's academic institutions — has reduced 479 research proposals to 107 for further consideration.

Sixty-nine institutions in 42 states, including the District of Columbia, were asked to submit further detailed proposals which are being evaluated. Final results are expected before the end of June and contracts will be negotiated promptly.

In an April 1967 status report on Project THEMIS, the Office of the Director of Defense Research and Engineering (ODDRE) explained procedures used in screening preliminary proposals to achieve program goals.

Funds requested in preliminary proposals from 173 institutions totaled approximately $389 million. Funds available for FY 67 total about $20 million, which DoD plans to concentrate in a maximum of 50 schools this first year.

All preliminary proposals were separated into major areas of scientific and technological research and development needs from a survey of DoD agencies.

General research problems, outlined in more detail in the ODDRE brochure inviting proposals, include: Detection, Surveillance, Navigation and Control; Energy and Power; Information-Processing Systems; Technology of Military Vehicles; Materials Sciences; Environmental Sciences; Medical Sciences; and Social and Behavioral Sciences.

Proposals were evaluated on the bases of technical quality, relevance to DoD needs, experience of proposed research personnel and the adequacy of proposed administrative support.

Quality was considered "absolutely essential" if a center of excellence is to be developed. Relevance is essential if the work is to be supported by the Department of Defense.

Proposals were evaluated by teams of experts in the subject areas from the U.S. Army, Navy, Air Force and the Advanced Research Projects Agency (ARPA). A representative of ODDRE served as chairman for each team and three or more reviews were given each proposal.

Each team arranged proposals in order of technical quality consistent with regular research programs. Acceptable proposals then were ranked according to DoD funding in FY 66. Schools receiving little support from DoD were favored over institutions receiving substantial funds. This method of evaluation also achieved a wide geographic distribution of schools asked to submit detailed proposals.

To give evaluators greater selectivity of detailed proposals, two proposals were requested for each contract expected to be awarded.

The FY 67 THEMIS fund was distributed among the research areas based on a study of DoD long-term research needs made by ODDRE, the Military Services and ARPA. Plans call for an additional 50 centers in 1968. Brochures inviting proposals will be distributed this fall.

# 15 TECOM Installations Meet To View Army T&E Program

Commanders and representatives of 15 installations of the Army Test and Evaluation Command (TECOM) convened May 1-5 to "review the Army T&E program and to plan for the future."

TECOM CG Maj Gen Leland G. Cagwin opened the sessions at White Sands Missile Range, N. Mex., stressing that continued emphasis will be placed on ways and means of improving the test program.

Brig Gen E. H. Almquist Jr., representing the Deputy Chief of Staff for Military Operations, Department of the Army, discussed the threat facing the United States and the strategy to meet it. He detailed U.S. objectives and strategy for the Vietnam war and deployments in support of these objectives. He reviewed current Army operations and gave a brief outline of Air Force and Navy operations.

"Human Factors in Testing" was discussed by Dr. Leon T. Katchmar of the Human Engineering Laboratories, Aberdeen Proving Ground, Md.

Representatives of the Army Munitions Command, Electronics Command, Weapons Command, and the Aviation Command discussed their research, development and testing programs.

Other presentations included Instrumentation, and Service Testing in the Future.

Conferees toured WSMR facilities and visited Holloman Air Force Base, Alamogordo, N. Mex., and the Army Air Defense Center, Fort Bliss, Tex.

## GPO Sends Source Reminder To 'Renew' Newsmagazine

According to Superintendent of Documents "Expiration Notice No. 691443," the U.S. Army Research Office subscription to the monthly *Army Research and Development Newsmagazine* it produces will expire with the July issue.

The renewal rate for the Newsmagazine, "ARDN" as the Superintendent calls it, was correctly quoted at $2.25 a year. Since the Army Research Office receives about 950 copies a month for free distribution to official sources in the Pentagon, Washington, D.C., the rate seems unimportant in this case.

A call to the Government Printing Office confirmed that a mysterious someone must have placed a "cash order" for the magazine because there is no requisition number on the Notice. The Army Research Office librarian is mystified, too, for she *can't* place a cash order through the library.

# Reilley Named 1st Post Office R&D Director

Problems of more efficient operation of the U.S. Post Office Department which have been much in the news in recent months will be probed by an intensive research and development program headed by Dr. Edward M. Reilley.

Postmaster General Lawrence F. O'Brien announced that Dr. Reilley, who has served since 1964 as Assistant Deputy Director of Defense Research and Engineering (Research), will resign effective July 1 to become the first director of Post Office Research and Development. Dr. Reilley was an Army scientist for 13 years prior to 1964.

"The selection of Dr. Reilley," O'Brien stated, "is the most recent in a series of high-level leadership appointments in science and technology to help meet the challenging needs of the Postal Service. His record of achievement in research, engineering and management will help us to fulfill our objectives to provide better mail service to the American people."

As director of one of the two principal segments of the Bureau of Research and Engineering, Dr. Reilley will be responsible for managing current Post Office R&D activities and generating long-range plans for advanced postal systems. He will report to Assistant Postmaster General Dr. Leo S. Parker.

Dr. Reilley was employed from 1951 to 1964 with the U.S. Army Electronics Research and Development Laboratory, Fort Monmouth, N.J. As founder and director of the Institute of Exploratory Research, he was responsible for basic research in electronics and the related sciences.

Author of a number of publications on nuclear physics, systems engineering and research management, he hold patents on electronic servo circuits for tracking radars. He also invented and designed electronic circuitry, instrumentation and engineering controls for the University of Pittsburgh cyclotron.

Dr. Reilley has held several consultative positions with the Department of Defense, including the Joint Services Technology Technical Advisory Committee on Electronics, the Ionospheric Research Committee AGARD, and the DoD Coordinating Committee on Science.

I 1963 he received the Army Meritorious Civilian Service Award for his contributions to military electronics, advanced scientific research and mathematics.

A graduate of the Carnegie Institute of Technology (1940), Dr. Reilley received his PhD degree from the University of Pittsburgh in 1951.

# Twin-Beam Laser Emits 100 Joules

Twin beams of a new giant-pulse ruby laser delivered recently to the U.S. Army have a peak light intensity equal to 10 million 100-watt light bulbs.

Designed for atmospheric and meteorological research, the laser (acronym for Light Amplification by Stimulated Emission of Radiation) was built to specifications for the Army Electronics Command, Fort Monmouth, N.J., by Korad Corp., a subsidiary of Union Carbide Corp.

The energy storage bank of capacitors is charged for each firing by a 25-kilowatt power supply. The output of 100 joules is believed to be five times greater than any other ruby device of its type.

The laser produces the parallel light beams every 10 seconds through use of five large-synthetic ruby crysfals, contained on an "optical rail" 14 feet long. The ultrapure beam is divided to spread the density of the power and thus avoid damaging the crystals. Capacitors and other circuitry are in five large cabinets.

One of the rod-shaped rubies is four inches long and nine sixteenths of an inch in diameter, another is nine inches by three-fourths of an inch, and the other three are 13 inches long and an inch thick. Each of the crystals is wrapped in a powerful spiral-shaped lamp which bathes them in brilliant flashes of ordinary light.

Although this light provides the input energy, the "monochromatic" light which a laser emits keeps a precise frequency — and color — and the "coherent" waves are in precise step. These qualities, which account for the intensely bright, narrow beam, differ greatly from diffused, multihued ordinary light.

The new laser's primary ruby crystal is controlled by an optical switch to serve as an oscillator for starting the laser action. The pulse from the oscillator is built up to its tremendous brilliance as it passes through the succession of amplifier rubies.

After the third crystal, the laser light which began as a single beam is divided by a beam-splitter prism before passing simultaneously through the fourth and fifth crystals. The twin beams rise to a combined power level of a billion watts (one gigawatt) at the high point of each pulse, lasting 100-billionths of a second.

## Red River 'Blacksmiths' Shoe Army's 'Iron Horses'

When "baby" needs a new pair of shoes and "baby" happens to be a 30-ton overland battle wagon, there's just one place in the whole U.S. Army to go for "repair that will wear" — the uniquely important Red River Army Depot, Tex.

Upon the Depot's Roadwheel and Track Branch, the U.S. Army depends mightily. It is the only maintenance shop in the United States performing track and roadwheel repair for battle tanks and other armored vehicles using track-type shoes.

Scores of depots for U.S. Armed Forces in various parts of the world turn to the Red River Army Depot for track and roadwheel repairs. Tank tracks produced at the Texas facility may roll across the rice paddies of Vietnam, the hills of Korea and the sand dunes of Jordan — or in any part of the Free World.

Working as a well-trained team, Red River's 127 rubber workers — the "blacksmiths of the mechanized era" — are doing their best to keep America's tanks well-supplied with a critically needed defense item. They are determined that the battle won't be lost for want of a track shoe.

## Precise Accuracy Seen by Laser Measurement

Army engineers are using "Laser Ultra Precise Distance Measuring Instrument" for studying the effect of the earth's atmosphere on measurements of distance made with light rays.

Developed by the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA) at Fort Belvoir, Va., the prototype unit is designed to measure millimeter changes of distance to a reflecting target up to 40 miles away.

One of the most accurate methods of measuring the distance between two points is to time the interval required for a beam of light to make a round trip over the path. Although done indirectly, accuracies approaching one part in one million are possible.

Accuracy is limited, however, by small differences in atmospheric pressure and temperature along the line being measured. This changes the velocity of light by an unknown amount.

The Army engineers will study ways by which these atmospheric errors may be minimized through a laser device to provide a highly collimated and directional beam.

In addition to the laser as a light source, the new measuring instrument is equipped with a Pockell cell as a modulater. Advanced electronic and optical devices produce finer resolution, longer range, and more precision that other instruments of this type.

The instrument weighs 75 pounds and operating power is supplied by a generator or other 110-volt power source. It was built by Spectra Physics, Mountain View, Calif.

## Becker Becomes AMC Deputy to Thomas

Brig Gen William A. Becker is the new U.S. Army Materiel Command Deputy Director of Research and Laboratories under Dr. Jay Tol Thomas.

Col Harvey E. Sheppard, served as acting deputy director from October 1966 until he retired May 31, ending 34 years of military service, and was honored at ceremonies at Edgewood Arsenal. General Frank S. Besson, AMC CG, presented him with the Legion of Merit.

General Becker returned in March 1967 from service in Vietnam as assistant commander of the 1st Cavalry Division (Airmobile). He had served previously as artillery commander during the testing period of the 11th Air Assault Division at Fort Benning, Ga., and went with the unit when it was redesignated and assigned to Vietnam.

**Brig Gen William A. Becker**

After a tour of duty in Yugoslavia as U.S. Army attache, he returned to the U.S. in 1961 for assignment as executive officer of the 2nd Infantry Division Artillery at Fort Benning. Transferred to Fort Sill, Okla., he organized and commanded the Combat Developments Command Artillery Agency, later becoming commanding officer of the 1st Field Artillery Missile Brigade.

General Becker entered military service in 1941 when he was commissioned upon graduation from Texas A&M College, and served 4½ years with the 1st Cavalry Division in World War II.

Returned to the U.S. in 1946, he served as assistant professor, Military Science and Tactics, at Texas A&M College until assigned with the U.S. Mission to Venezuela. There he assisted in establishing the Artillery School of Venezuela.

He has graduated from the Command and General Staff College, Army War College, Army Strategic Intelligence School, and Army Language School.

General Becker has been awarded the Distinguished Service Medal, the Legion of Merit with Oak Leaf Cluster, the Bronze Star Medal with "V" device and Oak Leaf Cluster, the Air Medal with 10 Oak Leaf Clusters, the Venezuela Army Cross, the Republic of Vietnam Gallantry Cross with Palm, with Silver Star, and with Bronze Star.

# Huey Cobra Team Trains for Vietnam Service

When the first of the Army's fast new AH-1G Huey Cobra helicopters arrives in Vietnam this summer, an expert New Equipment Training Team (NETT) will be on hand to check out pilots and maintenance personnel.

From some 350 selected Army helicopter specialists in training at the Bell Helicopter Co. plant in Fort Worth, Tex., about 50 military trainees and civilian experts equipped with Bell training equipment will comprise the NETT.

Headed by Maj Paul Anderson of the U.S. Army Aviation Materiel Command (AVCOM) Training Division in St. Louis, Mo., the NETT will be a cadre of specialists well-versed in the Huey Cobra. Maj Anderson is AVCOM on-site supervisor of training operations.

Huey Cobra courses include flying, maintenance, stability augmentation systems, avionics and trainer maintenance. Special instruction is given in the use of course materials and trainers to those who will conduct identical training programs at Army schools.

Trainees include personnel from AVCOM; U.S. Continental Army Command, Fort Monroe, Va.; Test and Evaluation Command, Aberdeen (Md.) Proving Ground; Weapons Command, Rock Island, Ill.; Munitions Command, Rock Island, Ill.; Electronics Command, Fort Monmouth, N.J.; Sharpe Army Depot, Lathrop, Calif.; Frankford Arsenal, Philadelphia, Pa.; and the Army Test Activity, Edwards Air Force Base, Calif.

## 39 Collegians Train In AVCOM Program

Thirty-nine juniors and seniors at Parks Air College, St. Louis, Mo., are gaining practical experience in aviation engineering as part-time employes of the Army Aviation Materiel Command (AVCOM).

Intended to stimulate interest of potential future employes in career opportunities in AVCOM's expanding role in the Army aviation research and development program, the experiment is exceeding expectations regarding participation.

Col Edward J. Chrysler, director of Research, Development and Engineering, said AVCOM is getting men who "already have had considerable indoctrination in aeronautical engineering. They will have had invaluable practical training by the time they receive their sheepskins and join us on a full-time basis."

The program was initiated with the support of John T. Harrison, a Parks Air College professor and an engineering consultant for AVCOM. Working hours of the students are arranged to be compatible with classroom schedules.

Clifford E. Sims, chief of the Aircraft Engineering Division, said the undergraduates are given engineering duties which increase in complexity, scope and responsibility as their capability develops.

Initial assignments have included preparation or review of modification work orders, engineering change proposals, evaluation and inspection reports, and technical reports.

Students are divided primarily among the Flights Standards, Research and Development, Value Engineering, Aircraft Engineering, and General Engineering Divisions. Twelve are in the Aircraft Engineering Division's UH-1 Branch.

AVCOM plans to expand the program to assure a continuing influx of engineering aides as those now employed graduate or accept engineering positions elsewhere.

## ERDL Tests Mobile Water Purifier Against Chemical, Biological Agents

*Effectiveness of a new mobile water decontamination unit against both chemical and biological warfare agents is being tested by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.*

*This dual effectiveness reportedly will simplify field water purification by eliminating the need to differentiate between the agents or to use separate decontamination methods.*

*The equipment superhypochlorinates and dehypochlorinates contaminated water before it enters the coagulation and diatomite filtration processes of standard water purification equipment.*

# Call Issued for Army Science Conference Proposals

Chief of Research and Development Lt Gen A. W. Betts has announced that the 1968 Army Science Conference will be held at the U.S. Military Academy (USMA), West Point, N.Y., June 18-21.

Sponsored by the Chief of Research and Development, the conference is the sixth in a series inaugurated in 1957 with the superintendent of the USMA as host.

Preliminary announcements soliciting narrative summaries of proposals for scientific and technical papers were sent to Army installations this month. Normally 400 to 500 proposals are submitted and about 100 are selected for presentation.

Purposes of the biennial conferences are to provide:

- A forum for the presentation and critique of original work, a stimulation to continued effort, and a recognition of achievement.
- A broader understanding of the scope and importance of Army scientific and technical programs, and an opportunity for the exchange of ideas.
- An opportunity for Army scientists and engineers to have their work published and disseminated as widely as national security permits.

A 1968 Army Science Conference Advisory Group, chaired by Deputy and Scientific Director of Army Research Dr. Richard A. Weiss, has been formed to plan the meeting.

Major agency representatives on the group include Dr. Craig Crenshaw, chief scientist. HQ U.S. Army Materiel Command; Dr. G. G. Quarles, chief scientific adviser, Office ot the Chief of Engineers; and Col Paul Teschen, deputy director. Division of Surgery, Walter Reed Army Institute of Research, Office of The Surgeon General.

# *Army Names Kwajalein Field for WWII Hero*

Memorial Day 1967 served to immortalize World War II gallantry in action on Kwajalein Island in the Pacific. The island is part of the U.S. National Missile Range, a $500 million principal test area for the U.S. Army's Nike-X missile defense system.

Bucholz Army Air Field was so designated May 30 at formal ceremonies to honor the memory of PFC Henry Bucholz, who heroically gave his life in his first battle.

As the transportation hub of the bustling Nike-X test complex, stretching along a string of islands some 2,100 miles west of Hawaii, Bucholz Army Air Field is often a welcome respite for aircraft en route to the far Pacific and another scene of gallanty in Vietnam.

PFC Bucholz was 37 years old when he rushed from a sheltered position to try to rescue his wounded platoon leader. He dragged the officer to the shelter of a shell hole. Prevented from further advance by fire from an enemy blockhouse, he rushed it and threw a grenade into the opening. He was killed, but his diverting action enabled other troops to destroy the emplacement.

Keynote speaker at Bucholz Army Air Field dedication ceremonies was Dwight Heine, native of the Marshall Islands and deputy administrator of the U.S. Trust Territory. Heine lost his own mother and father in World War II.

Brig Gen I. O. Drewry, commander of the Kwajalein Test Site Range, whose headquarters are at Redstone Arsenal, Ala., noted Bucholz's "valor in the (5-day) battle of the Marshalls."

Bucholz is survived by a brother and sister of Elmhurst, Ill. A third brother died last April and the parents are dead.

Bucholz Army Air Field is a mile-and-a-quarter runway that handles more than 1,300 passengers and 37 tons of mail each month. The terminal building, 3-story structure operations center, serves also as "city hall" for the 3,500 people of the Kwajalein community as well as Kwajalein Test Site Headquarters. There a plaque reads:

"Bucholz Army Air Field, named in honor of PFC Fred Henry Bucholz, Army Serial No. 36368645, posthumously awarded the Distinguished Service Cross for Extraordinary Heroism in the Battle of Kwajalein, February 4, 1944."

# RAC Performs Army Operations Research, Systems Analysis

Growth of the Research Analysis Corporation (RAC) since it was established Sept. 1, 1961 under an Army contract attests to the increasing importance of a scientific approach to problems of military operations.

RAC became the successor to the Operations Research Office of Johns Hopkins University and inherited its staff of about 450 scientists, technicians and administrative personnel. Since then the staff has increased to 727 employes. The professional staff represents 32 scientific disciplines.

Housed in a new building at McLean, Va., since late 1963 — a structure designed to facilitate its mission — RAC is organized into eight departments, a computer sciences center, and administrative support accommodations. Members of the professional staff are free to select approaches, develop methodologies and evolve conclusions, crossing organizational boundaries as the need arises.

Charged with conducting the major part of the Army's operations research and systems analysis, RAC is headed by Frank A. Parker, former Assistant Director of Defense Research and Engineering, Department of Defense. Hugh M. Cole and Fred W. Wolcott are vice presidents. James A. McFadden Jr is vice president and treasurer.

The professional staff has been assembled to provide a high degree of competence in physics, mathematics, economics, political science, chemistry and engineering as major areas of the RAC program.

Although the on-going nature of most of RAC's work, including numerous classified projects, precludes a neat cataloguing of its efforts and accomplishments, a rather random sampling of activities during the past year is indicative of the scope of its program.

*The Military Gaming Department,* using the most advanced gaming techniques, helps the Army maintain a high state of readiness to respond to multi-level challenges to national security by conducting research on nuclear, conventional, and counterinsurgency ground combat operations, with special emphasis on those problems not amenable to analytic solution.

**SENIOR MILITARY Adviser's Office members (from left) Col William J. Phillips, Col Leroy D. Brummitt and Col Robert W. Garrett confer with RAC Vice President Hugh M. Cole.**

**Frank A. Parker**
***RAC President***

In the past year, military gaming has been active in support of the U.S. Army Combat Developments Command investigations of special military weapons and nuclear warfare and of the problems of tactical transition from conventional to nuclear combat postures.

RAC gaming activities also have contributed to Assistant Chief of Staff for Force Development (ACSFOR) studies of aircraft requirements for combat support of the Army.

*The Strategic Studies Department* seeks to identify significant trends in international situations. In their continuing study of the Soviet economy, for example, members of the Department have been analyzing not only the performance of the economy and its relation to military outlays, but also the institutional constraints on efforts to improve the economy.

Emphasis is on studying U.S. Army support of national efforts to assist less developed nations to deal more effectively with external aggression and internal conflicts. In the coming year, the Department will expand its strategic analyses of Southeast Asia and Communist China.

*The Science and Engineering Department* focuses on the possible application of new technology to combat. The Department has explored the gamut of problems of technology in ground combat during 1966, from the contributions it will make in the Army of the 1980s to the improvements it can afford in airmobile operations, such as those being conducted in Vietnam today.

One of the studies undertaken by this Department; in the laboratory of actual combat conditions, has analyzed the combination of helicopter and weapons and has made recommendations for improved airborne artillery systems.

*The Economics and Costing Department* emphasizes systems analysis and its constituent elements of cost effectiveness, cost analysis and manpower projection. Manpower studies have supported the Army's personnel activities and, intermittently, the Office of the Assistant Secretary of Defense for Manpower.

Another direct impact of current events is being felt in the costing area. Economics and Costing has found itself increasingly involved in the costing of Vietnam programs, past, present, and future, for the Deputy Chief of Staff for Operations (DCSOPS) and the Office of the Assistant Secretary of Defense for Systems Analysis.

*The Combat Analysis Department* is primarily concerned with military combat and the battlefield employment of conventional armed forces, including the air defense of the United States. In 1966, Combat Analysis work concentrated on problems in command and control, communications and arms control.

Shorter-range studies have been carried out on such subjects as antitank weapons and the management of frequency assignment in the field. The Department has started a study on nuclear weapons planning factors, which stresses the interrelationships of political, operational and technological factors.

What is the best way to conduct military, political, and economic operations in areas controlled or threatened directly by enemy insurgent action? *The Unconventional Warfare Department* conducts studies into ways of preventing insurgencies before they develop and into methods of controlling them should prevention fail.

*The Advanced Research Department* seeks to understand and improve the methodology of operations research. In effect, this Department plays a role that

**RAC THEATERSPIEL provides capability for making extensive combat studies of division-size units. Shown in foreground are (left) Capt George L. Raring (USN, Ret.) and Col John T. Goodley (USA, Ret.) of RAC staff.**

is at once the most challenging and the most difficult to define, for it is concerned with no less a problem than pushing back the frontiers of thought in the search for new and better ways of making decisions.

RAC conducts wide-ranging investigations in many sectors of computer science, supported by complete electronic data processing and peripheral machinery, including IBM 7040 and System/360 equipment.

*The Logistics Department* conducts research and analysis in the field of military logistics including planning, organization and management of logistic resources and assists the Army in identifying future trends. It also develops new logistic support concepts, doctrine and organization.

Furnishing liaison between RAC studies and client Army agencies are representatives of the Military Advisers Branch of the newly formed Studies and Analysis Division of the Army Research Office.

Senior analysts comprise the RAC Research Council which advises on the direction of research studies for the Army, and reviews and provides critiques on RAC research publications.

An essential part of research is the first-hand information that can only be acquired on the spot. RAC maintains overseas offices in Thailand, Germany and Iran. Efforts of RAC analysts-in-the-field are supplemented by research teams from RAC in McLean which frequently accompany field forces on maneuvers to study such factors as organization and logistical support, as well as to measure performance.

A rapidly advancing technology and an expanding field of knowledge are confronting military planners with an ever-widening range of options. As the choices multiply, time to react, to select between alternate courses of action, grows shorter.

RAC's role is to provide military planners with the best possible advice, based on the most accurate and comprehensive information that can be obtained through the application of the most advanced techniques of management decision.

## Detrick Develops New Chromosomal Mapping Technique

Molecular biologists in the U.S. Army laboratories at Fort Detrick, Md., have developed a new chemical technique that makes possible the chromosomal mapping of microorganisms even in the absence of mating pairs.

In a briefing of U.S. Army Research Office scientists at Arlington, Va., Dr. Robert A. Altenbern reported on the work of the researchers he heads. The technique, he said, may make possible the isolation of small regions of a bacterial chromosome for use, *in vitro*, to produce their distinctive products, such as bacterial toxins and immunogenic substances.

The new method in principle permits chromosomal mapping of any bacteria, greatly broadening investigative possibilities. Since only a very few kinds of bacteria form mating pairs, the former method was limited. It involves the use of male and female chromosomes and the timing of the appearance of male genes in the female cell to construct a chromosome map showing relative positions.

Phenyl ethyl alcohol used in the new technique has the remarkable property of allowing chromosomal duplication to proceed to the end. However, it prohibits reinitiation of duplication at the beginning of the chromosome. Bacterial cells exposed for sufficient time contain only nonduplicating chromosomes.

When the chemical is removed, all the bacterial chromosomes in the culture commence duplication in synchrony. During replication, samples of the chromosome are treated at periodic intervals with a powerful mutagen, nitrosoguanidine. The number of mutants obtained for any particular gene doubles after that part of the chromosome has doubled.

Following release from exposure to phenyl ethyl alcohol inhibition, the time required for doubling in mutant numbers for a specific gene represents the doubling time for that gene. Doubling times for a variety of genes can then be arranged linearly as a representation of the order of genes on the chromosome (a chromosomal map).

Dr. Altenbern said that in studies to date, 10 genetic markers (genes) of *Staphylococcus aureus* have been mapped. The method is being extended to other bacteria, notably *Streptococcus* and *Pasteurella*. The genetic regions controlling virulence and toxigenicity of various bacterial agents, he said, may be readily located by this method.

### USAF Institute Schedules 2-Week STINFO Courses

The Air Force Institute of Technology has scheduled two 2-week Department of Defense courses in scientific and technical information, Oct. 9-20 and Apr. 8-19, 1968.

STINFO (375) is designed primarily for scientific and technical information officers, liaison officers, technical librarians, and others in the field.

The course covers methods of identification, acquisition, storage, retrieval and dissemination of scientific and technical information. It also aims to acquaint developers and users with their responsibilities for identifying, abstracting, key word use, and maintaining a publication philosophy for efficient retrieval.

Contract personnel with secret security clearances may participate.

## WRAIR Scientific Adviser Dies of Heart Attack at 63

Dr. Donald B. McMullen, scientific adviser to the director of Walter Reed Army Institute of Research (WRAIR), died May 27 of a heart attack at the age of 63.

Internationally recognized as an authority on schistosomiasis, a serious parasitic disease prevalent in tropical and subtropical areas, he was particularly concerned with methods of eliminating the snails which spread the disease.

During the past several years he was prominent in the Army's antimalaria research program.

Dr. McMullen entered full-time U.S. Government service in 1952. During World War II, he served as a cónsultant to the Army on the prevention of schistosomiasis in the Phillippines and was honored with the Medal of Freedom for this work. From 1958 to 1963, he was loaned to the World Health Organization to lead its schistosomiasis advisory team.

Dr. McMullen was on the faculty of the University of Oklahoma School of Medicine from 1938 to 1952 following 10 years as head of the biology department at Monmouth College. He received his early education at Tarkio College and Washington University, and earned a DSc degree from the Johns Hopkins University School of Hygiene and Public Health.

## Princeton Professor Joins Electronics Advisory Group

Princeton University's Prof. Enoch J. Durbin was sworn in recently as the ninth member of the Electronics Advisory Group, U.S. Army Electronics Command, Fort Monmouth, N.J.

The group of top executives, scientists and engineers advises Maj Gen W. B. Latta, ECOM commanding general, and his scientific staff on development of electronic equipment for Army combat forces.

Prof. Durbin has been serving ECOM since June 1966 on the Princeton-Pennsylvania, Army Avionics Research (PPAAR) multimillion-dollar program initiated under contract with Princeton University and the University of Pennsylvania.

As principal scientific investigator for Princeton in the program, he has made contributions in the principles and physics of instrumentation, and in methods for analyzing engineering data. He has been on the faculty of the Department of Aerospace and Mechanical Sciences at Princeton since 1953 and is head of the Instrumentation and Control Laboratory.

Among his other activities, he is a consultant to NATO, vice president of the Education and Research Department of the Instrument Society of America, and is on the executive boards of the Gordon Research Conference and the Foundation for Instrument Education and Research.

# Kudos

DISTINGUISHED SERVICE MEDAL. The U.S. Army's highest noncombat award for meritorious service, the Distinguished Service Medal, was presented to Maj Gen Selwyn D. Smith Jr. when he retired recently as chief of staff, U.S. Army Materiel Command (AMC).

**Maj Gen S. D. Smith Jr.**

The citation noted that "under intense pressure throughout his assignment, he consistently produced results of the highest order, making major contributions of inestimable value to the national defense of our country."

Before becoming AMC chief of staff, General Smith was chief of staff, Seventh U.S. Army, in Europe. From 1954 to 1956, he served in the Office of the Chief of Research and Development as chief of Operations Research.

MERITORIOUS CIVILIAN SERVICE. Donald R. Beeman, veteran Army munitions expert, received the U.S. Army Meritorious Civilian Service Award upon his retirement as deputy director of the Nuclear Engineering Directorate, U.S. Army Munitions Command (MUCOM).

**MUNITIONS EXPERT Donald R. Beeman is honored upon retirement with Meritorious Civilian Service Award presented by Maj Gen F. A. Hansen, CG of the U.S. Army Munitions Command.**

Starting in 1931 as a millwright at Picatinny Arsenal, Dover, N.J., he became associate director of Picatinny's Samuel Feltman Ammunition Laboratory in 1954. He was cited for having established the fuze division of MUCOM's Research, Development and Engineering Directorate and for centralizing the Army's fuze program.

An alumnus of Rutgers University, Beeman holds patents and co-patents on seven items used by the Army in its various fuzes.

LEGION OF MERIT. Brig Gen Stephen W. Downey, special assistant to the commanding general, U.S. Army Combat Developments Command, recently was awarded the Third Oak Leaf Cluster (OLC) to the Legion of Merit (LOM).

He was cited for materially enhancing the readiness posture of the Army worldwide while serving from April 1966 to April 1967, first as vice chairman of the Joint Chiefs of Staff Ad Hoc Special Study Group on the Rapid Deployment of Forces, and more recently as special assistant to the commanding general. The citation noted his "decisive leadership, sound judgment and superb managerial ability."

Col George H. Timke, former director of the U.S. Army Institute of Dental Research and the Division of Dentistry, Walter Reed Army Institute of Research (WRAIR), was awarded the LOM for his service from August 1957 to July 1966, when he retired from active military duty.

DISTINGUISHED FLYING CROSS. Maj Robert E. Denny, now at Davison U.S. Army Airfield, received the Distinguished Flying Cross for heroism while flying a helicopter mission in Vietnam. He also received an OLC to the Bronze Star Medal.

BRONZE STAR MEDAL. The Bronze Star Medal (BSM) was awarded to Col Vernon C. Ramberg, chief of the Training Division, Army Materiel Command (AMC) for meritorious service while stationed in Vietnam.

Lt Col Chester R. Mead was awarded the BSM for his performance while serving with the 1st Logistical Command in Vietnam. Now assigned to the AMC as an avionics R&D coordinator, he is responsible for publishing the original concept for Army helicopter operations in the forward battle area under instrument conditions.

**CHIEF OF R&D Lt Gen Austin W. Betts congratulates Lt Col Thomas U. Greer after presenting the Oak Leaf Cluster to the Legion of Merit for services as G-3 with the 25th Infantry Division, Vietnam. Lt Col Greer recently was assigned to OCRD Combat Materiel Div.**

The BSM was also presented to Maj Elford M. Mayson, Nuclear Power Field Office, Fort Belvoir, Va., for meritorious service while serving as senior engineering adviser with the 5th Area Logistic Command in Vietnam, March 1966 to February 1967.

Capt Lawrence R. Dewey, an aeronautical engineer in the Directorate of Development, AMC, also received the BSM for meritorious service while in Vietnam.

At the U.S. Army Aviation Materiel Command, St. Louis, Mo., Capt Clyde P. Wilson, chief of the Flight Operations Division (Maintenance), received the BSM for "outstanding meritorious actions and accomplishments while assigned to the 129th Aviation Company, Vietnam," October 1963 to September 1966. He also received the 16th OLC to the Air Medal.

CWO John P. Langwasser was awarded

## DCS Award Cites MICOM Propulsion Adviser

Dr. Maurice J. Zucrow, a member of the U.S. Army Missile Command Advisory Committee, was recently awarded the Decoration for Distinguished Civilian Service, the highest such award that can be bestowed by the Army.

Until his recent retirement, Dr. Zucrow was Director of the Jet Propulsion Center at Purdue University. He was cited for his significant contributons to Army missile development programs from the early days of the Corporal and Sergeant systems through the latest concepts, such as Lance and Sprint.

A major contribution was solving a leakage problem in the propulsion system of a particular missile that almost caused the program to revert to a research effort. Today the missile is considered one of the most successful of the newer Army systems.

Dr. Zucrow served as a member of the Selection Board for the Sprint missile and contributed advice and technical supervision, particularly in the propulsion area. He has also assisted the Nike-X Project Office over the past several years.

One of the significant efforts for which he was cited was a comprehensive review and evaluation of the Army propulsion program in 1965 for the Assistant Secretary of the Army for Research and Development.

the BSM for a series of missions with the 68th Assault Helicopter Company in Vietnam that included a midnight landing on a battlefield illuminated only by flashlight and under hostile fire. Now assigned to Davison U.S. Army Airfield, he also received the 20th OLC to the Air Medal.

S/Sgt John W. Bratton, Fort Belvoir, Va., also received the BSM for service in Vietnam from January to November 1966.

JOINT SERVICE COMMENDATION AWARD. Col William Minton, now deputy chief of staff for Operations, U.S. Army Strategic Communications Command, Fort Huachuca, Ariz., received this award for his services with the Defense Communications Agency.

VIETNAM GALLANTRY CROSS. This award to Maj Frank H. Miller, recognized by the Vietnamese government as an "excellent and brave pilot," was for his support of two Vietnamese battalions which engaged Viet Cong units in December 1965. Maj Miller is now stationed at Davison U.S. Army Airfield.

ARMY COMMENDATION MEDAL. Col Lyman P. Frick received the first OLC to the Army Commendation Medal (ACM) for significant contributions to research in tropical diseases from 1961 to 1966. He served consecutively as chief, Medical Zoology Division, and as commander and director of the Army Tropical Research Medical Laboratory, Fort Brooke, Puerto Rico.

Col Frick is now assigned to the Army Medical Research and Development Command, Office of The Surgeon General, as assistant chief, Research Division.

Lt Col Roger W. Baker, Life Sciences Division, Army Research Office, OCRD, received the Army Commendation Medal for his services as a veterinary staff officer with HQ U.S. Army Medical Research and Development Command, Office of The Surgeon General, Washington, D.C.

Lt Col Rubye W. Archer, assistant chief, Walter Reed General Hospital Nursing Service, received the ACM upon her retirement.

Others who received the Army Commendation Medal at Walter Reed Army Medical Center are Maj Paul Duffy, adjutant at WRAIR, for his work as a podiatrist at Tripler General Hospital, Hawaii; Capt Robert E. Brazier, ANC, for service in Vietnam; Capt John G. Gerukos, aide-de-camp to Maj Gen Douglas B. Kendrick, retired WRAMC commander; and Sgt Maj Robert C. Joyner (first OLC), sergeant major of WRAMC under Maj Gen Kendrick.

MISCELLANEOUS AWARDS. Dr. Leonard S. Wilson, chief, Environmental Sciences Division, Army Research Office, OCRD, received a citation from the Association of American Geographers. He was recognized for his "varied and valuable contribution to the geographic profession through his role as a teacher and administrator, and particularly for his success in achieving acceptance of the scientific role of geography in the Department of the Army."

At Redstone Arsenal, Ala., Dr. D. C. Sayles, a scientist in the Propulsion Laboratory of the Army Missile Command's Research and Development Directorate, received the North Alabama Chapter, American Institute of Chemists Honor Scroll. Dr. Sayles is president of the local chapter.

# 5 Natick Employes Selected for Key Awards

Gold and silver key awards presented recently to five employes of the U.S. Natick (Mass.) Laboratories recognized their achievements in research, engineering and administration.

Dr. Ludwig Seligsberger received the Scientific Director's Gold Key Award for research and engineering. Dr. Arthur V. Dodd and Robert J. Byrne received Silver Key Awards for accomplishments in this field. The Commanding General's Gold Key Award for Leadership in Administration honored Herbert K. Benedict and the Silver Key Award was presented to Samuel Rosenblatt.

Dr. Seligsberger, chief of the NLABS Leather Section, was honored for creative research in leather chemistry. His recent work deals with water vapor absorption of natural and man-made leathers, a comparative analysis of comfort, and hygienic properties.

In June 1966, Dr. Seligsberger was selected for the Alsop Award for creative research. This is the highest honor of the American Leather Chemists Association, which he joined when he emigrated to the United States in 1937. He is a native of Bavaria and received a PhD degree cum laude from the University of Erlangan, Germany, in 1928. He entered Federal Civil Service in 1954 and since then has published 12 technical papers in his field.

Scientific Director Dr. Dale H. Sieling honored Dr. Dodd for major accomplishments in climatology. He cited Byrne for engineering contributions to the laboratories' quality-assurance system.

Brig Gen W. M. Mantz, Natick CG, paid tribute to Benedict for his outstanding work in expediting procurement of materiel for Southeast Asia. Rosenblatt, an internal auditor, was commended for an effective internal review program.

## Gen Besson Commends 4 ECOM Employes for Joint Effort

General Frank S. Besson Jr., commanding general of the U.S. Army Materiel Command, recently commended four employes of the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J., for their work on a joint Army-Navy project.

The employes, whose efforts contributed to on-time delivery of two barracks ships for U.S. troops in Vietnam's Mekong River delta, are: Martin Ides and John Joyce, both in ECOM's Communications-Automatic Data Processing Commodity Management Office; Col J. J. Moran, chief of the Comm-ADP Office; and Maj Vance Batts, who retired recently from the Materiel Readiness Directorate.

Ides and Joyce acted as program managers on the conversion of two naval LSTs (Landing Ship, Tank) to floating barracks. ECOM provided the communications and electronics equipment.

General Besson's commendation stated in part: "Extensive technical advice and assistance were required to be provided the Navy in the resolution of serious engineering problems encountered; in the installation and placement of equipment components, and in development of a supply and maintenance support concept . . . "

# Lt Col Hays to Head Army Nurse Corps

Twenty-five years experience as an Army nurse has given Lt Col Anna Mae Hays a deep professional background for the duties of chief of the Army Nurse Corps she will assume Sept. 1.

Slated for promotion to colonel, she will succeed Col Mildred I. Clark, who will retire from the Army Aug. 31 with 30 years of service.

Col Hays is a graduate student in nursing service administration at the Catholic University of America, Washington, D.C., and holds a bachelor's degree in nursing from Teachers College, Columbia University. She is also a graduate of the Allentown (Pa.) Hospital School of Nursing.

During World War II, she was stationed in the China-Burma-India Theater of Operations and later served in Korea and Japan. From 1963 to 1966, she served as assistant chief of the Army Nurse Corps, for which she was awarded the Legon of Merit.

Lt Col Anna Mae Hays

## Quadripartite Engineers Meet

Potential common equipment requirements and procedures in fortifications, mine fields, and other barrier activities were discussed by Army engineers of the United States, United Kingdom, Canada and Australia, June 5-9, at Fort Belvoir, Va. The representatives met for the first time as the Quadripartite Working Group on Barrier Operations Equipment.

# Picatinny Lists 5 Economy Champs

Picatinny Arsenal leads the list of Army installations represented on the U.S. Civil Service Commission's latest list of Economy Champions.

Five employes at the Dover, N.J., munitions center will get a total of $4,995 through the Army Incentive Awards Program for saving an estimated $774,114 with cost-reduction suggestions. Savings for Army champions totaled $1,775,613, for which they received $16,180 in cash awards.

Each champion received a citation from President Lyndon B. Johnson which says in part, "It is gratifying . . . to know that you share my concern over the waste of even one dollar. I know it is equally gratifying to you to know that every dollar you have saved will be put to harder work, to better use."

Top winners for the month were Joseph R. Bowden and Vincent Suozzo, mechanical engineers in Picatinny's Nuclear Engineering Directorate. They shared $1,530 for an estimated saving of $476,000 by suggesting that an acceleration switch could do the same job as the more expensive velocimeter in meeting safety requirements for the Lance system.

Wayne A. Silbert, a maintenance engineer in the Installation Support Office at Picatinny , will get $1,165 for saving $111,681 by monitoring custodial contracts and providing legal interpretations and guidance on contract implementation.

Samuel J. Gillow Jr., a mechanical engineer in the Picatinny Nuclear Engineering Directorate received $1,155 for a $102,033 saving from a suggestion to substitute standard lead batteries for NICAD batteries on the MX15 ADC Trainer.

Work simplification studies leading to an estimated savings of $84,400 earned a $1,145 award for Richard J. Oatley, an industrial engineering technician in the Picatinny Industrial Services Directorate.

At the U.S. Army Mobility Equipment Command, St. Louis, Mo., Bosko P. Stamenic, an electrical engineer, received a $1,480 check for suggesting issuance of a technical data package request form and saving an estimated $127,309.

Herbert A. Hebeler, production controller at Rock Island (Ill.) Arsenal, was selected for the Economy Champions list for saving $212,684, for which he received $1,265. He suggested forged aluminum stakes in lieu of titanium for stake assembly on the M102 Howitzer.

A soldier and a civilian at the U.S. Army Strategic Communications Command, Schwetzingen, Germany, teamed up to win an initial award of $1,000 for a $339,280 saving on procurement and operating costs. CWO Kelton R. White and equipment specialist Max L. Conn proposed a change in radio testing equipment.

Jerry D. Brakhage, equipment specialist at the U.S. Army Ammunition Procurement and Supply Agency, Joliet, Ill., won $1,000 for saving $94,429 by suggesting components from excess units could be used to support the Sergeant Special Weapons Stockpile Reliability Program in lieu of procurement of parts.

At Anniston (Ala.) Army Depot, Elton E. Blackburn and Martin J. Owens shared $555 for a suggestion that saved $12,013. Renay Williams received $845 for an idea that cut costs by $38,694, and David A. Barnett won $700 for a suggestion that saved $18,000. Other champions are:

Maurice R. Vest, Army Ammunition Plant, Charlestown, Ind., $575 for savings of $12,896; Willie E. Greenarch and George M. Pickerel, Pueblo (Col.) Army Depot, $975 for savings of $64,449; Walter L. Kendall, Letterkenny Army Depot, Chambersburg, Pa., $700 for saving $17,880; and

Sgt/1 Earl S. Barrett, U.S. Army Europe, Heidelberg, Germany, $800 for $29,296 in savings; Vernon Adkins, Corps of Engineers, Louisville, Ky., $770 for savings of $23,861; and Edward K. Anderson, Corps of Engineers, Little Rock, Ark., $520 for saving $10,708.

# Radar Enhances OCE Mapping Program

Feasibility of using radar as an all-weather mapping sensor was demonstrated by the U.S. Army Corps of Engineers when it recently employed aerial photography for mapping an area that has defied conventional methods since 1947.

The Corps of Engineers has listed the development of a radar mapping capability as one of the major goals of its advanced topographic R&D program.

Project RAMP (Radar Mapping in Panama) was initiated in 1965. Topographic engineers selected for the experiment a 6,000-square-mile area in Darien Province in southeast Panama and northwest Colombia. Continuous heavy cloud cover had prevented photo coverage.

The project was designed to:

- Determine the feasibility of producing topographic maps from high-resolution, side-looking radar presentation.
- Determine the performance characteristics of state-of-the-art radar equipment in a new operational environment.
- Obtain original mapping coverage over an extensive area with a known history of continually inclement weather.
- Establish concepts and techniques for radar mapping data reduction and compilation.

Several other U.S. Government organizations and the governments of Panama and Colombia cooperated in the program. The Inter-American Geodetic Survey at Fort Clayton in the Canal Zone was headquarters for the operation. The survey also placed radar reflectors on control stations in the remote jungle of Darien Province.

The radar mapping project over a 20-day period utilized the Army AN/APQ-97 radar system developed by Westinghouse Electric Corp. for the Army Electronics Command.

End products of the project are radar mosaics and 1:250,000-scale topographic maps, to be available this October.

# New Flare Radiometer Tests Flame Munitions

Instant evaluation of such flame munitions as signals, stars, flares, colored markers and smoke markers, used increasingly in current warfare, is reported possible with a new Army device.

Developed by Chester Smith and Lewis Szabo of the Pyrotechnics Laboratory, Picatinny Arsenal, Dover, N.J., the flare radiometer is termed the first new effective tool provided to flare designers in many years.

The device, which measures the relative amount of color in a flare, is comprised of a series of photo cells which are swept by a light beam from an elliptical motor-driven mirror. Matched interference filters provide high resolution and assure distinct and complete data.

The radiometer takes the spectrum of a variable course in daylight or darkness. As no darkroom is required, data are available to the operator as the item is being tested.

With the instrument, color measurement is independent of intensity. Different areas with identical color distribution but different candle-power will yield the same result.

The flare radiometer is calibrated so that it has a uniform sensitivity over the entire visible spectrum, thus providing the simplest possible evaluation of results.

Designed to be independent of the electronics, the device is unaffected by changes in drift and gain. No specialized training is required for operators.

**FLARE RADIOMETER developers Chester Smith (left) and Lewis Szabo.**

# Support System Speeds Hawk Parts

Maintenance of combat readiness through fast supply of parts for the Army's Hawk ground-to-air missile system in Vietnam, which started about a year ago as an Army Supply Support Test, has become routinely successful.

Soldiers manning the supersonic missiles find it hard to believe that frequently only six days will elapse from the time a repair part is needed until it is delivered from the U.S. Army Missile Command (MICOM), Redstone Ala., to Saigon, more than 9,000 miles away.

This logistic speed is the result of a streamlined program which provides direct communication and transportation between Hawk units and MICOM.

The 79th General Support Unit was established at Tan Son Nhut near Saigon as a small depot for the Hawk battalions. On the other end of the pipeline is the National Inventory Control Point's Stock Control Division of the MICOM Supply and Maintenance Directorate, the sole point of contact and initial source of supply for all Hawk items.

Wheels of the supply system start turning when MICOM receives a requisition (2,602 were received in one month last year) directly from the Hawk depot in Vietnam. If the item is managed at Redstone, it is pulled from stock and shipped. If it is managed elsewhere, a requisition is placed with the appropriate activity. Either way, action is monitored until the Hawk missileman gets the supplies he requires.

Hawk is a 17-foot missile on guard around the world. It can knock down aircraft flying at altitudes ranging from tree-top level to more than 38,000 feet. The weapons system has been in operation since 1959.

Heart of the revolutionary logistics system is at Redstone Arsenal but many individuals and organizations throughout the Department of Defense and industry are involved.

Much of its success rests with the constant monitoring through supply and transportation echelons from the time the missileman fills out the first request.

How Hawk supplies are shipped depends on priority of individual items. They can move all the way by air or on the surface by highways, railroads and shipping lanes.

Air mail takes two days, the primary mode in the new support operation. To decrease further the time both ways, a special courier service has been set up between the main Huntsville, Ala., post office and Redstone Arsenal.

# ERDL Report Details ATLIS Program Model

When and how to mechanize a small technical library are detailed in Report No. 12 of the Army Technical Library Improvement Studies (ATLIS), distributed in May.

"An Approach to Cost Effectiveness of a Sensitive Mechanized Document Processing System" is based on a study of the technical library of the U.S. Army Engineer Research and Development Laboratories (ERDL), Fort Belvoir, Va. Carlos O. Segarra, chief of ERDL Technical Information and Library Branch, is the author.

Issued originally as an internal ERDL document, the report was deemed by the Director of Army Technical Information to be of sufficient interest to small or medium-sized Army libraries and information centers to warrant wider distribution under the ATLIS program.

Results of the ERDL study showed that application of sophisticated computerized techniques developed by large documentation centers is not practical for and is beyond the economic resources and processing needs of a smaller activity.

The purpose of the documented study was to identify and define the parameters that constitute an economical and practical information system responsive to ERDL data needs. Four phases were considered: data requirements definition; cost analysis and system definition; hardware selection, system test and evaluation; and development of software.

The report describes for each phase the method of approach, procedures used, and the criteria developed for making decisions.

The introduction states in part:

". . . The general implication of this analytical exercise determined that what was needed was a small, economical hardware package able to handle the present and future processing volume. Further, this package must provide capability to link with future computerized networks; it must be simple and economical to install and operate; and, above all, it must be able to be under the complete management and operational control of our information activity."

Mechanizing the ERDL library reduced processing costs by rejecting reports having no relevancy to ongoing tasks; eliminated the need for overtime required under manual conditions; reduced processing time per report from 75 to 5 days; and relieved the staff of routine clerical workloads.

The 64-page report, AD 651 486, is available from the Defense Documentation Center, Cameron Station, Va.

# Army Publishes New Resume on Materials R&D

Typical of summary technical reports in specific disciplinary areas available upon request from the U.S. Army Research Office (USARO) Information Center is the recently published *Army Science and Technology Resume — Materials.*

Prepared at the request of the U.S. Army Materials Research Agency for use by the U.S. Army Materiel Command, the document is a catalog of all ongoing work in the field of materials research and exploratory development. It is an unclassified updating of last year's report and is scheduled to be updated annually.

Data on over 1,200 Army in-house laboratory, grant and contract efforts were extracted from work unit reports submitted on DD Form 1498 (Research and Technology Resume) now in the Army Research Office Information Center.

Published extracts include the title, objective, technical or scientific area, work unit number, responsible individual, performing organization, chief investigator, and contract and accession numbers.

Arranged according to the responsible agency, the resumes are cross-indexed by technical area, project number, performing organization, principal investigator and keywords.

The USARO Data Bank now includes 7,000 resumes describing ongoing work and 3,000 reports on completed or terminated work unit efforts. The information is available in hard copy, punched card, and magnetic tape format to suit specific search and retrieval requirements.

The USARO Information Center honors requests for compilations, lists, and resumes for all data elements on the 1498. The branch also will obtain data from other Department of Defense centers and the National Aeronautic and Space Administration. Information from the National Security Agency is provided for authorized users on a need-to-know basis.

The ASTR on materials is available in limited quantity to Army elements by request to the Chief of Research and Development, Department, ATTN: CRDSTI, Washington, D.C. 20310.

Based on a justified requirement, the Army Research Office Information Center will compile similar compendiums of ongoing research and exploratory development activities upon request.

## COE to Survey DoD Test Range

A 90,000 square mile test range for evaluation of automatic map making equipment is being developed for the Department of Defense by the U. S. Army Corps of Engineers.

Scheduled for completion by September 1968, the BAR XC test range includes most of the state of Arizona and a strip of western New Mexico.

Acquisition of additional land and construction of photographic targets will be held to a minimum. Army Map Service civilians and soldiers of the 30th Engineer Battalion (Base Topographic), Fort Belvoir, Va. will conduct the survey.

# Four NLABS Scientists Patent Fly Repellents

Serendipity, the talent for making fortunate discoveries accidentally, and Army scientists have combined to produce a new means of curbing the common housefly as a worldwide menace to health.

U.S. patents (3,257,272-3) and Canadian patents (747,890-1) for housefly repellents were granted recently to four members of the U.S. Army Natick (Mass.) Laboratories.

Dr. Arthur M. Kaplan, Dr. John J. Pratt Jr., Morris Rogers and Dr. George F. Shambaugh, who is now associated with the Department of Zoology and Entomology, Ohio Agricultural Experimental Station, at Wooster, pooled their talents to produce the discovery.

The fly repellents, although recently patented as such, have long been in the military supply system as Disinfectant, Germicidal and Fungicidal Concentrate, a dry-type phenolic compound for housekeeping and field latrine sanitation.

The idea to probe the worth of the compound as a fly repellent arose in 1956 when a troop-user test of the disinfectant was planned by the Natick scientists. Two years later in a test at Fort Sam Houston, Tex., the concentrate proved to be a highly effective fly repellent, a finding concurred in by the Office of The Surgeon General.

The patents affirm that the housefly *(Musca domestica)* is found in nearly all habitable areas. It is responsible for transmitting disease to man by mechanically carrying the disease organism from a contaminated source to food.

Control has always been difficult because of the ability of the fly to develop resistance to organic chemical insecticides. Their rapid tolerance causes new insecticides to become obsolete within a few years.

Use of repellents, a new approach for outdoor fly control, shows great promise since they drive the insects away and do not foster further development of resistance.

The phenols, singly or in combination, can be used in solutions, emulsions, fogs or aerosols and applied by spraying or brushing areas where flies are present.

The disinfectant is also used for cleaning and washing raw feathers for military bedding, and during space flights for personal solidwaste sanitation.

## Radioactive Tabs Help To Locate Test Munitions

Test munitions or duds lost from sight in mud, snow, jungle growth or swampland now can be located by instruments which detect a tiny radioactive tab developed at Picatinny Arsenal, Dover, N.J.

A 1-millicurie (one-thousandth of the emanation from one grain of radium) wafer of scandium 46 with a desirable half-life of 85 days is secured to projectiles before firing. The tag is ½ inch in diameter and less than .015 inches thick, including its plastic covering.

Army research engineers Ronald Geany and Sam Helf of Picatinny report that instruments developed for this retrieval system can detect a millicurie of the rare-earth element at 100 feet in "free" air. Munitions items submerged in more than a foot of vegetation and water have been detected as much as 30 feet away.

The radioactive strength of the tabs is low enough to allow safe handling over an extended time by experienced personnel. Since development of the recovery technique last year. Picatinny ordnance engineers report 100 percent retrieval of fired items.

It is estimated that as much as 50 percent of munitions scheduled for firing in various environments could be lost if only visual location methods were used.

## MUCOM Engineer to Attend Systems Analysis Course

Edward Jaroszewski, nuclear weapons engineer at Picatinny Arsenal, Dover, N.J., has been selected with 54 other Department of Defense personnel to participate in the Defense Systems Analysis Educational Program for FY 1968.

Beginning June 26, participants will attend courses for 13 months at the Institute of Defense Analysis and the University of Maryland. Now in its third year, the program is designed to assist engineers in analyzing the full range of weapons systems at the DoD level.

Jaroszewski manages two supporting research projects in advanced systems and components for the Nuclear Engineering Directorate at the Arsenal. He holds a degree in aeronautical engineering and is the only man in the U.S. Army Munitions Command selected to attend the current session of the program.

## Oxidizer Control Governs Range of Hybrid Rocket

Successful flight testing of a hybrid rocket powered by both a solid-propellant rocket motor and a hybrid rocket motor has been announced by the U.S. Army Missile Command (MICOM), Redstone Arsenal, Ala.

The 5-foot, 2-stage rocket, which impacted at the desired range, employed a liquid oxidizer control which determined the burning time of the solid fuel.

Heretofore, selectable range has not been built into a solid-propellant missile because of the problem of controlling the burning of fuel. Solid fuel contains oxiders as part of the fuel block which normally burns until expended.

The booster stage of the test rocket contained a solid propellant ignited by an electrical black powder squib. It burned until a predetermined energy level was reached. Then the hybrid stage ignited to burn the time required to reach the desired range.

The hybrid stage is the critical one in range control. It is made up of a rubber-type solid fuel and liquid oxidizer which furnishes the oxygen needed for burning. In operation, the oxidizer is injected into the interior of the hollow fuel grain where the propellants burn.

To end the rocket's thrust, thus regulating its range, the supply of liquid oxidizer is shut off as desired.

Three laboratories of the MICOM Research and Development Directorate and two contractors are working on the hybrid rocket project.

## ECOM Schedules Panofsky For Meteorological Meet

Prof. Hans A. Panofsky, an internationally renowned meteorologist, will be the banquet speaker at the Unguided Rocket Ballistics Meteorology Conference, Oct. 31-Nov. 2, at New Mexico State University.

The conference at Las Cruces, N. Mex., is sponsored by the Atmospheric Sciences Laboratory, U.S. Army Electronics Command. Session chairmen are Louis D. Duncan of the Laboratory, Prof. Arnold C. Court of San Fernando State College and Prof. Gerald C. Gill, University of Michigan.

Further information may be obtained from Elmer J. Trawle, Atmospheric Sciences Office, U.S. Army Electronics Command, ATTN: AMSEL-BL-WS-M, White Sands Missile Range, N. Mexico. 88002.

**ROCK ISLAND ARSENAL commanding officer Col Harry A. Snyder holds an informal discussion with Dr. W. Grey Walter, Birden Neurological Institute, Bristol, England, and Edgar T. Horn of RIA, during a break in the first Biomechanics Symposium held recently at Augustana College. The symposium consisted of lectures by Dr. E. L. DuBrul, University of Illinois, and Dr. W. S. McCulloch, MIT, and 13 scientific papers, with a panel discussion on "Biomechanics—Where It's Going and How to Get There." The conference was attended by representatives of various Army agencies as well as organizations and academic institutions having an interest in mechanical systems and related subjects.**

# New Computer Speeds AFIP Research

Pathological research performed for several hundred military and civilian medical facilities by the Armed Forces Institute of Pathology (AFIP), Washington, D.C., will be expedited by an IBM-360 computer installed May 26.

The new computer center will serve Department of Defense, Veterans Administration and civilian hospitals, other federal medical facilities and more than 8,000 civilian pathologists.

As an international center of pathology, the AFIP receives more than 50,000 requests annually for consultive services. Records of approximately 1,240,000 cases stored at AFIP are used to diagnose and study pathological problems. In one day, the computer will make available about 7,000 cases related to that which the pathologist is studying — a volume which would have taken a week under the former system.

Although initial data fed into the computer is coded, AFIP plans within a year to experiment with a new system to replace coding. The system will incorporate automatic indexing and a greatly expanded record with a natural language input technique.

Lt Col N. R. Cheek, MSC, chief of the Automatic Data Processing Service, explained that the vocabulary of pathology, as it is used for morphologic diagnosis, has "order, regularity and discipline." Its adaptability to mechanical handling is expected to make the new system possible.

Natural language instead of a computer code has been used in medicine in the United States only at the University of California at Los Angeles, Western Reserve University, and Wake Forest College.

"When we use natural language," Lt Col Cheek said, "we don't have to code and therefore we don't have to interpret. Interpretation gradually changes meaning."

He said the computer will allow professional personnel to obtain a vast amount of knowledge which was hidden in the case records and virtually impossible to retrieve. Mathematical and scientific problems can be solved which previously were not attempted.

The $500,000 AFIP center will be staffed by 35 persons.

## Contractor Reduces Weight Of Glider Guidance System

Integrated and miniaturized circuitry has increased the efficiency and reduced from 10½ pounds to 7 pounds the weight of the remote control guidance system for aerial supply gliders produced for the Army.

Under contract with the U.S. Army Aviation Materiel Command, St. Louis, Mo., the Ryan Aeronautical Co. will supply the new equipment. Ryan developed the original units over the past five years while working with the Army to produce the Precision Drop Glider system.

The new concept combines several components into one walkie-talkie box for each receiver and transmitter. A soldier on the ground with a transmitter relays signals to the supply-laden glider after its release from the cargo plane. Two audio generators emit signals of different frequencies to direct the glider right or left. Ground personnel can talk with personnel in the cargo plane.

An automatic homing system enables the glider to land at night. Two antennae on the glider pick up a high-frequency signal. When one antenna receives a stronger signal, the glider turns to correct the path and equalize the reception. When the glider comes into sight, ground personnel may override the system to land the cargo 200 feet from the transmitter.

## Human Factors Design Studies Aid Development of MBT-70

Detailed human factors design studies "never before applied to U.S. Army tank development" are under way at the U.S. Army Human Engineering Laboratories, Aberdeen (Md.) Proving Ground, as part of development of the U.S.—Federal Republic of Germany Main Battle Tank 1970.

One study conducted by engineers Gary L. Horley and Nonnie F. Dickinson Jr. concerns design features of the tank pertaining to ammunition and loading. It is one of a number of operational studies seeking optimum compartment design.

The Laboratories have been participating for several years in the joint design program, including fire control and crew performance studies at Aberdeen and in Germany.

## Logistics Center Schedules Construction of New Facility

U.S. Army Logistics Management Center (USALMC) facilities at Fort Lee, Va., will be enhanced by construction of a $2.9 million academic building.

Work on the 126,500-square-foot building will begin this summer. It contains academic, administrative and support facilities for 620 students and 325 staff and faculty members. It will have 16 classrooms accommodating 40 students each and 4 classrooms for 25 students each.

Three auditoriums, 140 administrative offices, a 30,000-volume library and a cafeteria that can seat 500 persons are included in the plans. Furnishings for the building are expected to cost an additional $200,000.

The USALMC is a major educational and research field activity of the Army Materiel Command. Center commandant is Col J. P. Alexander Jr. His deputy is Col Paul E. Bruehl.

Since it was created in May 1954 to administer and teach the Army Supply Management Course, the Center has had some 25,000 officer and civilian graduates from the 18 resident courses. These include 500 senior officers from foreign nations.

The Nonresident Instruction Department offers extension courses, on-the-job-training and off-campus group-study programs. More than 42,000 students have participated in USALMC nonresident training.

The Logistics Research and Doctrine Department — founded in 1958 — conducts studies in logistics, develops logistics doctrine and prepares field manuals in logistiss management.

## Solid-State Air Conditioner Developed at Fort Belvoir

Solid-state environmental control, reportedly a revolutionary advance over conventional air-conditioning units, is being developed by the Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

A prototype of the new thermoelectric system is scheduled for delivery this summer under a development contract with Westinghouse Corp.

The 300-pound unit operates on the Peltier Effect. Engineers report that it uses electronic modules to eliminate the usual compressor, valves and the refrigerant leakage problem. Useful life of the unit is expected to be about 100,000 hours and replacement of any component will be possible with simple hand tools.

Rated at 24,000 B.t.u. per hour, the unit is designed to cool, heat, dehumidify and ventilate military shelters and vans housing electronic and other sensitive equipment.

It can operate with a 208-volt, 3-phase, 50-, 60- or 400-cycle-per-second power supply. The system is rectangular (40-by-40-by-20 inches) and functions vertically or horizontally with a choice of several conditioned-air outlets.

Precise cooling or heating is produced by the flow of thermostatically modulated current through pairs of bismuth telluride pellets.

## Fort Lee Stages LOGEX-67

LOGEX-67, the U.S. Army's largest logistical exercise to date, was held recently at Fort Lee, Va., with 146 personnel participating from the Army Ordance Center and School, Aberdeen (Md.) Proving Ground.

Ninety-one students and 55 faculty members performed as commanders and staff officers of maintenance and supply units in support of a theater army in a hypothetical general war.

LOGEX-67 was planned and developed to present logistic problems which might be met in a war situation under conditions of limited nuclear activity. The "war on paper" exercise presented for solution hundreds of theoretical problems of battle support.

# MBT-70 Development Approaches Midpoint

By S. P. Kaprielyan, *Editor of Aerospace Management*

*(This article is published by special permission in advance of its appearance in Aerospace Management, a General Electric Co. publication.)*

Sometime next year, the Aberdeen Proving Grounds in eastern Maryland, will resound with a new rumble of prototype tanks passing their torture tests.

If the tests prove successful as anticipated, the U.S. Army Materiel Command (AMC) will have dual reasons for jubilation: demonstrated proficiency in international project management, and a significant advance achieved in tank capability.

The prototype tests will mark the approximate midpoint of the Main Battle Tank (MBT-70) Development Program initiated by Defense Secretary McNamara in 1963, through a special agreement between the Government of the United States and the Federal Republic of Germany (FRG).

Designation of the program as MBT-70 implies that the tank is intended for production in the 1970's.

Although it was aimed at satisfying the basic military requirements of the North Atlantic Treaty Organization, "Nowhere in the design of the MBT-70 were the requirements of the U.S. Army compromised," according to Maj Gen Edwin H. Burba, U.S. Program Manager of the MBT.

It's a time-worn truism that no two programs or projects are alike in scope or complexity. But the MBT program by its international overtones provided in 1963 a different challenge for the newly-organized AMC in its throes of projectization.

The basic agreement for the MBT called for a $80-plus million cooperative development program to be shared on a 50-50 basis, leading to a model incorporating the best of the U.S. and German concepts, for production in both countries.

*Program Management Board (PMB).* Another part of the basic agreement was for the establishment of a Program Management Board as a bilateral decision-making body, with authority immediately below the level of chief defense executives of both countries. The overall function of the Board has been to direct design and configuration, funding allocation, and the scheduling of major milestones. This Board is presently headed jointly by the U.S. Program Manager General Burba, who is also the Project Manager in the Army Materiel Command, and his counterpart from the Federal Republic of Germany, Brig Gen (Dr.) Helmut Schoenefeld.

To direct and mesh the combined efforts of government and contractor organizations from both countries, the Program Management Board established a Joint Engineering Agency (JEA) of a government civilian and military mix, and a Joint Design Team (JDT) of representatives from Engineering Assistance Contractors chosen by each country. The JEA was charged with the details of managing the total design effort, while the JDT was given the task of coordinating the technical details.

In its decision-making, the PMB has also been relying on the expertise of ad hoc working groups of American and German specialists who serve in an advisory capacity on such diverse aspects as publicity, weapons design, military requirements, automotive requirements, patent rights, taxation, site problems, etc. Working groups are terminated with the resolution of their particular problem areas.

*Program Guidance and Authority.* After the signing of the basic agreement for the U.S. by the Secretary of Defense, the responsibility for the U.S. portion of the MBT program was delegated through Secretary of the Army (then Cyrus Vance) to his assistant for R&D (then Willis M. Hawkins).

As U.S. program manager, General Burba is the U.S. member of the international U.S.-FRG Main Battle Tank Program Management Board and as such reports to the Chief of Staff, U.S. Army, and is governed by policy and program guidance issued by HQ Department of the Army.

To execute the MBT program, the U.S. Program Office has the authority to call for support from other AMC project managers and from appropriate AMC Commodity Commands. Until last July, both the Joint Engineering Agency and the Joint Design Team functioned in Augsburg, Germany, each headed by an American assisted by a German deputy.

## Black Forest Antenna Plays Unique Radio Role

Atop the highest mountain in Germany's famed Black Forest, a site snow-covered 10 months of the year, stands a U.S. Army communications tower that is attracting worldwide attention because of its unique role.

The 160-foot-tall tower with four 30-foot parabolic antennas and several smaller antennas is an important tropospheric radio link between Italy and Germany. It is located at Feldberg-Schwarzwald, 25 miles east of Freiburg and 120 miles southwest of Stuttgart, Germany.

Interest in its operations is focused on difficulties inherent in establishing a 60-voice channel tropospheric scatter radio system 240 miles long, with the Swiss Alps as a midpoint obstacle and extreme weather variations to complicate the transmission problem.

In addition to the radio equipment providing communications to Italy and the south, the site has similar equipment for communications to the north and to various smaller tributary sites.

Development of the installation has been conducted since 1962 under project management of Headquarters, U.S. Army Electronics Command, Fort Monmouth, N.J. The ECOM Materiel Readiness and Procurement and Production Directorates at Fort Monmouth and Philadelphia have supported the installation of equipment.

The major share of the installation was completed by May 1, 1967, when it was turned over to the operational control of the U.S. Army Strategic Communications Command-Europe.

During the winter months, conventional vehicles can go only three-fourths of the way up the mountain and tracked vehicles must complete the hauling of supplies and manpower. Sixteen men assigned to Company A, 68th Signal Battalion, Karlsruhe, Germany, constitute the operational and maintenance staff.

Billeted at the Wald Hotel, about 10 miles from the radio station, the men share a chalet with French military personnel in accordance with an intraservice agreement.

Project Manager Lt Col Bernard J. Pankowski stated: "The men who must ride the electronically guided tracked vehicles up and down that snow-covered mountain and operate the site are truly professional soldiers of highest caliber.

**NIGHT EXPOSURE gives an illuminated dimension to the 160-foot tropospheric communication network tower on the highest mountain in Germany's Black Forest. Roof of chalet shared by U.S. and French military personnel is at left. "Snowcat" used for hauling supplies and manpower is visible.**

Since last July, both the JEA and JDT have been transferred to Warren, Mich., and each is presently headed by a German, assisted by an American deputy.

The pioneering efforts in cross-cultural communications and project management, made by the PMB, JEA, JDT and the working groups may in the long run prove to be the most significant spin-off of the MBT program.

By the frank admission of General Burba and his predecessor Maj Gen Welborn G. Dolvin, "Many honest differences of opinion, based on cultural differences, had to be faced and resolved bilaterally."

A most natural tendency of people uninitiated to the perplexities of international communication is to believe that linguistic differences provide the main barrier. As the participants in the MBT program will attest from both sides of the Atlantic, the language barrier has proved to be only the obvious portion of the difficulty, while the cultural differences provided the less tractable of communication obstacles.

In his very readable and revealing book on communication entitled ' *The :Silent Language,* anthropologist Dr. Edward T. Hall states: . . . the field work which anthropologists did as pure research, plus the applied projects on which we worked . . . taught us one thing . . . that culture is more than mere custom that can be shed or changed like a suit of clothes. The people we were advising kept bumping their heads against an invisible barrier, but they did not know what it was.

"We knew that what they were up against was a completely different way of organizing life, of thinking, and of conceiving the underlying assumptions about the family and the state, the economic system, and even of man himself. . . .

"Honest and sincere men in the field continue to fail to grasp the true significance of the fact that culture controls behavior in deep and persisting ways, many of which are outside of awareness and therefore beyond conscious control of the individual."

In another passage of his book Dr. Hall asserts: "Years of study have convince me that the real job is not to understand foreign culture but to understand our own. I am also convinced that all that one ever gets from studying foreign culture is a token understanding. The ultimate reason for such study is to learn more about how one's own system works. The best reason for exposing oneself to foreign ways is to generate a sense of vitality and awareness — an interest in life which can come only when one lives through the shock of contrast and difference."

The point here is not to overemphasize the cultural differences as a factor in international project management, but the fact that the motivation for mutual benefits can overcome such difficulties as demonstrated in the MBT program. And in view of Secretary of Defense Robert S. McNamara's expressed interest in cooperative ventures of this type, the MBT program may well serve as a prototype for other programs to follow.

*Project Management Progress.* As stated earlier, the MBT program was initiated through an executive agreement on an international level, thus providing the climate and a rough framework for cooperative effort. But when sleeves were rolled up on the working level, questions began to crop up on th exact boundaries of this high-level agreement, and the implementation of detail down to the very level of nuts and bolts.

"It was to be expected that both partners would start out with their own brands of built-in biases on every aspect," General Burba said, "but after almost four years of mutual maturing in this program we have learned to overcome them or work around them."

The leading decisions, at the outset, centered on the military characteristics the MBT-70 should have. This kindled the old controversy between tank experts, regarding the best combination of mobility, range, firepower and armor protection. However, since both nations were from the start committed to the NATO requirements as an acceptable working parameter, agreement on military characteristics was reached with relative ease.

On the next order of detail, involving design and the choice of major components and weapons, unanimity became more difficult to achieve. Thus the Program Management Board decided to build an impartial basic guideline through a Parametric Design and Cost Effectiveness (PDCE) study which would assist final decision-making. Through competitive bidding, the PDCE study was awarded on February 1964 to the Lockheed Missiles and Space Co., as a $377,000 cost-plus-award-fee contract.

"A mathematical model of a 'rubber tank' was computerized for the PDCE study," General Burba explained, "and basic configurations with literally hundreds of different combinations of major components, terrain and tactical requirements were tested under simulated combat conditions."

Later, five basic concepts were tested by the computer routine. The concept selected for development was a composite of those tested.

*Dynamics of Decision-Making.* The inputs for the PDCE studies came from four working groups comprising specialists from both countries on military requirements, concept design, weapons design and automotive requirements. The results from the computer were sent to the Joint Engineering Agency, which used the total data in work projects assigned to the Joint Design Team. During the course of these studies which lasted about a year and a half, feedback also continued from the JDT through the JEA and served to refine the inputs further.

Recommendations of the JEA based in part on the PDCE study and in part on independent technical analyses, were accepted as final by the Program Management Board. The chiefs of staff accepted these decisions for the respective armies and the respective defense secretaries accepted them for their countries.

With all the effort in mutual persuasion and bilateral decision-making at the level of the Program Management Board, it was inevitable that a point of impasse should occur on measurement standards and dimensioning.

The problem was brought to the level of the defense secretaries, where it was resolved by compromise: The U.S. threaded-fastener system would be used on components being developed by Americans, and the metric system would be used on components developed by Germans. The tank would be dimensioned in both metric and inch measurements, and the

*(Continued on Page 34)*

## General Betts Lauds Cheyenne at Roll-Out Ceremony

**Chief of R&D Lt Gen A. W. Betts and Daniel J. Haughton, chairman of the board, Lockheed Aircraft Corp., are shown during roll-out ceremonies for the Army AH-56A, Advanced Aerial Fire Support System (AAFSS) aircraft at the Lockheed Van Nuys plant in California.**

**As principal Army speaker at the event, General Betts stated in part:**

**"The Cheyenne is in reality an advanced weapons system—one that we are quite confident will meet our requirements for many years to come for airmobile firepower in support of ground forces in combat. . . . The AH-56A represents the best today's level of technology can do in a weapons system. . . . The Army-Lockheed team is a splendid example of government-industry cooperation."**

# Joint MBT-70 Development Approaches Midpoint

*(Continued from Page 33)*

International Standardization Organization's metric-thread fasteners would be utilized at the interface of all major components.

At the conclusion of the PDCE studies, and the agreement of both governments on the military characteristics of the tank, both countries proceeded with the selection of their Engineering Assistance Contractors (EAC) that would support the engineering and management efforts in their respective tasks.

The General Motors Corp. was selected competitively in July 1964 as the American EAC, and the German Development Corp. (a combine of German firms) became its counterpart overseas. Each of these contracts amounted to $750,000. The specialists from both EACs were incorporated into the Joint Design Team.

*Procurement phases and contracts.* The MBT Procurement Plan has consisted of three phases:

o Selection of EAC contractors.

o Technical and managerial support for the U.S. Program Manager and conceptual studies.

o Selection of component parts, the preparation of detail design and engineering specification, construction of test vehicles, and the determination of techniques for mass production.

For participation in all three phases, GMC was awarded a contract for $43,728,000 on a cost-plus-award-fee basis. Close to one quarter of this sum is going toward the development of a high-performance multifuel engine, and a hydropneumatic suspension system.

Subcontractor for the suspension system is the National Waterlift Co., which has a contract for about $1 million, and the Continental Aviation and Engineering Corp. developing a 1,475 horsepower, variable-compression engine for approximately $10 million. The development work on this advanced state-of-the-art engine is being administered by the Army Tank Automotive Command in Warren, Mich.

A more conventional backup engine, with high-horsepower output is being developed by Daimler-Benz of Germany, and a parellel suspensions system by Friesecke and Hoepfner in Germany.

Additional contract awards on MBT-70 announced by the U.S. Department of Defense include: a $47,482 contract to Chrysler Corp., Defense Operations Division, for a Heavy Equipment Transporter study, and a $7.6 million award to Philco Corp., Aeronutronic Division, to adapt the Shillelagh Missile System to the MBT.

With the Shillelagh 152mm gun launcher as its main armament, the MBT will be capable of firing either missiles or conventional ammunition. To date 10 major elements of the tank have been jointly designed, and some 28 items, which also comprise most of the electronic work, have been assigned to contractors.

The transfer of the Joint Engineering Agency and the Joint Design Team to Warren, Mich., last July marked the completion of the preliminary design phase of the tank. During the past year activities have been shifting to advance production engineering and the construction of eight prototype vehicles in each country.

When the delivery of U.S. prototypes is completed, they will be sent to installations and activities of the U.S. Army Test and Evaluation Command for engineering and services tests under a wide range of climatic conditions.

German models will be tested concurrently at the proving grounds of the German Army located in Trier, Munster-Lager, and Meppen. General Burba said:

"The lessons learned from this extensive, year-long test program including the heavy-equipment transporter — will serve to refine the design of the production models of both vehicles."

*Problem of geography.* Keeping the decision-making machinery moving and reasonably synchronous along its cumbersome length has required sustained legwork from both program managers and their staff members. General Burba is headquartered at the Army Materiel Command in Washington. He is assisted by a Deputy Program Project Manager, Col William Mulheron, and a staff of 40. General Burba directs the technical effort located at the Army Tank Automotive Command, Warren, Mich., through Col George Tuttle, chief of the U.S.-FRG MBT Detroit office.

General Burba is in constant communication with his counterpart, the German Program Manager, through Lt Col Harry A. Cartland, the MBT liaison officer in Bonn, Germany. Col Cartland also keeps General Burba in communication with the Augsburg suboffice of the JEA, where Lt Col Elmer L. Birk is chief of the U.S. Element.

By statement of policy, "The project management concept of the U.S. Army Materiel Command is based upon vesting in a single individual the sole line authority for all planning, direction, control of tasks, and associated resources involved in the development, production, and fielding of a weapon equipment system. . . . " Yet, the implementation of this concept in "double image," and without the complete dilution of management authority through negotiated decision making has presented a formidable challenge for all concerned.

The result of these collective efforts will shortly assume the form of the Main Battle Tank for the Seventies, but more than, that, it will be a mobile, mechanical monument to patience and perserverance.

"The MBT is the first major weapon system of the Army, to be designed and developed based on an extensive study of needs," asserts General Burba, concluding: "We have conformed to all Army and DoD regulations, we have stayed within the normal development cycle, and are about to test an unequaled combination of firepower, mobility and protection. It would have been an impossible task without project management."

### DSA Gains Compliance Office

**Effective July 1, the Defense Contracts Compliance Office became part of the Defense Supply Agency's Defense Contract Administration Services. The Compliance Office is responsible for assuring equal opportunity of employment on Defense contracts, currently valued at $48 billion annually.**

# Col Ellis Assumes Command of Harry Diamond Labs

Continuous research and development assignments since 1959 — except for a year as a student at the Air War College — and 25 years as an Army Ordnance officer are among Col Vincent H. Ellis' qualifications for his new assignment as CO of the Harry Diamond Laboratories, Washington, D.C.

Col Ellis succeded Col Melvin S. Hochmuth, who commanded HDL since 1964 and has been reassigned to Headquarters 29th Support Group, U.S. Army in Vietnam.

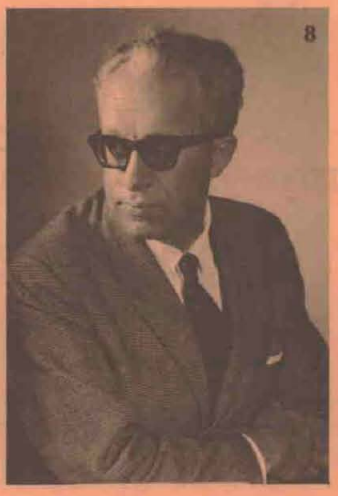
Chief of the Weapons Branch, Development Division, U.S. Army Materiel Command from 1964 until he assumed his new duties, Col Ellis is a second generation Army officer. His father is Col Murray H. Ellis, retired.

**Col Vincent H. Ellis**

Educational qualifications of the new HDL commander include a BS degree in mechanical engineering from Kansas State University in 1935 and an MS degree in the same field from Cornell University in 1956. From 1953 to 1956, he was an instructor in the Department of Mechanics, United States Military Academy, West Point, N.Y. He then attended the Command and General Staff College, Fort Leavenworth, Kans.

After serving in Ankara as a member of the U.S. Army Section, U.S. Mission for Aid to Turkey from 1957 to 1959, he was assigned to the Research and Development Division, Office of the Chief of Ordnance for three years. He was project manager and a staff officer for combat vehicles prior to leaving in 1963 to attend the Air War College.






# R&D Achievement Awards Recognize 38 Scientists

*(Continued from Page 3)*

*(For photos of other winners and the laboratories with which they are associated, see page 36. Story begins on page 1.)*

JOHN JOHNSON, U.S. Army Engineer Research and Development Laboratory, Fort Belvoir, Va., developed the concept of the night-vision simulator which will permit development of the science of visionics. Application of the principles and techniques he established at the Night-Vision Laboratory is expected to result in significantly improved night-vision devices of optimum design featuring low cost and weight factors.

Drs. Gunther F. Bahr and Elmer H. Zeitler, Armed Forces Institute of Pathology, Washing on, D.C., developed a new method for individually weighing large numbers of objects as small as a billion-billionth of a gram.

These particles are weighed by using an automated integrating denisitometer on the photographic image of the object taken with an electron microscope. The technique has been used for studies of the malarial parasite which has proven a troublesome problem in Vietnam.

Three employes of the Deseret Test Center, Fort Douglas, Utah, shared an award for a new and novel concept for measuring the concentrations of toxic aerosolized materials released into the atmosphere.

Dr. C. Grant Ash, Earl Bachtell, and Ernest Buhlman were cited for the method which involves the development and construction of prototype citadels equipped with modified sampling equipment wherein personnel could safely work without the use of additional protective devices.

The system reportedly permits an immediate analysis of samples taken from the air, and provides a more accurate result than any previous sampling system.

*(Continued on Page 36)*







**Fourteen of 38 R&D Achievement Award Winners for 1967 are pictured on this page. The remaining photos appear on page 36. (1) *Picatinny Arsenal*—Front row, left to right: Sidney S. Jacobson, Elie L. Barrieres. Back row: Ralph F. Campoli, Joseph Hegedus. (2) *U.S. Army Limited War Laboratory*—John C. Ackerman. (3) *U.S. Army Engineer R&D Laboratories*—John Johnson. (4, 5, 6) *Deseret Test Center*—Dr. C. Grant Ash, Ernest Buhlman, Earl Bachtell. (7, 8) *Armed Forces Institute of Pathology*—Dr. Elmer H. Zeitler, Dr. Gunther F. Bahr. (9) *Picatinny Arsenal*—Left to right: Joseph H. Severini, Robert W. Heinemann, Maurice Baer.**

# R&D Achievement Awards

*(For photos of other winners and the laboratories with which they are associated, see page 35. Story begins on page 1.)*

DR. JOHN N. MRGUDICH, U.S. Army Electronics Command, Fort Monmouth, N.Y., planned and conducted research in the field of ionic conductivity, particularly that phase which is concerned with the conduction mechanism, energy storage, and the energy transfer in ionic solids.

He made significant achievements by providing basic data on the ionic conduction phenomenon in bulk and thin-film silver iodide materials; establishing a new concept of an all-thin-film rechargeable solid electrolyte battery; and discovering a piezovoltaic effect in ionic conductors such as silver iodide.

**(1) *Harry Diamond Laboratories*—Front row, left to right: Murray Ressler, Howard Bilbrough, Maurice Apstein, Paul E. Landis, Robert W. Tucker. Back row: Morton A. Barron, Harold L. Hines, George R. Yetter, David Williams, Quentin C. Kaiser. Not shown: William Marroletti, Lawrence R. Davis, and Clifton L. Massey. (2) *Frankford Arsenal*—Clement A. Dock. (3) U.S. Army Electronics Command—Dr. John N. Mrgudich. (4) *Picatinny Arsenal*—Donald E. Costa. (5) *U.S. Army Engineer Geodesy, Intelligence and Mapping R&D Agency*—Morton Stromberg, John D. Mayer, Edward R. DeMeter, Kent T. Yoritomo and Edward F. Burzynski. (6) *U.S. Army Cold Regions Research and Engineering Laboratory (CRREL)*—Dr. Wilford F. Weeks. (7) *CRREL*—B. Lyle Hansen. (8) *U.S. Army Human Engineering Laboratories*—*James P. Torre Jr.***