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## ASAP Slates Fall Meeting At Army Mobility Command

The Army Scientific Advisory Panel (ASAP) will hold its fall meeting Oct. 21-22 at Headquarters, U.S. Army Mobility Command, Warren, Mich.

Maj Gen William W. Latsley, MOCOM commanding general, will be host to the ASAP personnel. Action officer for the meeting is Irving Appelblatt, director of Research and Development at the Command.

The featured speaker for the occasion will be Dr. Alexander H. Flax, Assistant Secretary of the Air Force (R&D), who will address Panel members and the Army staff at a banquet Oct. 21.

The meeting is designed to familiarize Panel members with activities of the Mobility Command and its subordinate elements (including the Army Tank-Automotive Center, the Army Aviation Materiel Command and the Army Mobility Equipment Center) together with their contributions in the areas of air and ground mobility.

A tentative agenda for the meeting includes a tour of the Army Tank-Automotive Center laboratories, a presentation of new air and ground mobility hardware for Viet Nam, and an airlift demonstration. Briefings are also planned on the Army armor

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## DD Form 1498 Data Bank Operational

The Army's data bank of research and technology resumes, covering more than 6,000 distinct scientific and technical efforts in progress at the work unit level, can now feed precise data to qualified requestors.

"Vaults" of the bank in the Scientific and Technical Information (STI) Division of the Army Research Office (ARO) are lined with punched cards and "hard copy" forms conforming to the Department of Defense Form 1498 reporting system.

Army's implementation of the DoD system met the July 1 schedule as set by the January 1965 DoD Instruction 7720.13.

A TAG letter announced that technical and management data covering work units in the research and exploratory development programs reported by Army, Navy and Air Force would be available Oct. 1.

The Defense Documentation Center (DDC) will provide data to all organizational levels to the exact specifications required, the letter stated. Requests for output data may include searches for individual technical efforts, reports on current status of programs, and tabulations and listings of data elements contained on the DD Form 1498.

Types of data needed, the desired formats, method of presentation, and any other pertinent factors should be specified in each request, according to the TAG letter. Requests from

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## ASAP Consultant Selected To Succeed Brown as DDRE

*(See story on page 4)*

**Dr. John S. Foster, Jr.**
*Director*
*Defense Research & Engineering*

## Col Kimball Succeeds Lotz as Director of Army Research

Col Robert E. Kimball, who formerly served as the first Assistant Director of Army Research, will report for duty in November as Director, succeeding Brig Gen Walter E. Lotz, Jr., who was recently assigned to the J-6 Office, U.S. Military Assistance Command, Viet Nam.

The newly assigned Director began his first tour of duty with the Office, Chief of Research and Development (OCRD) in June 1958, approximately four months after establishment of the Army Research Office.

Following his tour with OCRD, Col Kimball was assigned as director of the Systems Engineering Office, U.S.

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**Col Robert E. Kimball**

## Featured in This Issue . . .

Army R&D Newsmagazine

Vol. 6, No. 10 October 1965

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

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

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# Key Defense, Army Officials Address AFMA

General Earle G. Wheeler, chairman of the Joint Chiefs of Staff, was the principal speaker at the 12th National Conference of the Armed Forces Management Association in Washington, D.C., Aug. 31 to Sept. 2.

His address, which concerned the concept of military management in general, was delivered at the Association's awards banquet, climax to the 3-day meeting of Defense and industry management executives. Assistant Secretary of Defense (Administration) Solis Horwitz keynoted the gathering of nearly 500 with "Changing Patterns in Defense Management," theme of the conference.

He was followed by key officials from the DoD, Defense Supply Agency, the Military Services and industry. Principal U.S. Army speakers included:

General Frank S. Besson, Jr., U.S. Army Materiel Command (AMC) CG, who briefly reviewed "The Army Materiel Command Today"; Maj Gen William B. Bunker, Deputy CG, AMC, "Early Support of New Equipment"; Brig Gen W. C. Gribble, Jr., director of Research and Development for AMC, "Organization and Management of R&D in AMC"; and Edward J. Jordan, chief, Management Science and Data Systems Office, U.S. Army Munitions Command, and chairman, AMC Ad Hoc Committee on Commodity Management, "Commodity Management in the U.S. Army Materiel Command."

General Bunker attributed AMC success in streamlining the Army's logistics system to "aggressive use of project managers, intensive in-process reviews and increasingly better cost effectiveness analyses."

"The new contract definition feasibility criteria," he said, "insure that the maximum number of unknowns are eliminated before large-scale development is undertaken. And the establishment within AMC of an independent testing agency gives us the capability of intensive and impartial testing and 'debugging' of the new items before they are placed in the hands of our troops."

Early support of new equipment, however, is one aspect of the equipment life cycle which General Bunker said he feels most needs improvement. He observed that there is on occasion a disparity between reliability in test and laboratory situations and those of the field. He cited the need of a special reporting and analyzing system that insures prompt communication of accurate information to the project manager.

Worldwide maintenance statistics do not reach design engineers quickly enough to permit responsive action, General Bunker said. He proposed that qualified AMC technical representatives "live with our new equipment during its first two years of service."

Another problem which General Bunker described as needing "continuing management attention" lies in "the impossibility of exactly reproducing the development or prototype model in mass production."

He stated that sometimes when "minor changes are made for productibility, weight reduction or other manufacturing reasons" changes in reliability become visible after extensive field use.

"Obviously," General Bunker said, "we must be able to adjust our designs for economic manufacture yet we also must maintain the reliability established in the development program."

He suggested use of the new drafting computers for rapid and accurate drawing review and comparison and other routine engineering functions.

Computers also could be employed in the reduction of lead time required to prepare maintenance manuals and to translate engineering data to maintenance and serviceability standards, General Bunker said.

General Gribble reviewed the research and development organization in AMC and responsibilities of the commodity commands and Central Laboratories.

In discussing funding levels throughout the AMC organization, he pointed out that over half of the work accomplished in the Central Laboratories falls in the research and exploratory development categories and that about 85 percent of the total work is performed in-house.

In the commodity command laboratories and activities, General Gribble said, the main effort falls into the engineering development category and only 30 percent of the total effort is performed in-house. Total funding approximates $1 billion.

General Gribble discussed the Bell Report, prepared under auspices of the Bureau of the Budget and published by the Senate Committee on Government Operations after approval by the President in May 1962. One of the principal conclusions of the Bell Report was that the Federal Government, as a matter of national policy, should seek to enhance

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# ASAP Schedules Wide Range of Activities

In addition to the October meeting in Detroit, the fall schedule for members and consultants of the Army Scientific Advisory Panel (ASAP) lists a variety of other activities related to the Army R&D program.

Panel member Dr. Harwood S. Belding has performed consulting services in the Far East during a private trip to that area in September. He spent a day with the Army R&D Group (Far East), Tokyo, in early Septembr and a day in late September in Bangkok with the U. S. Component, SEATO Medical Research Laboratory. In addition to providing advice on the missions and programs of both offices, Dr. Belding was interested in the SEATO laboratory's program in environmental medicine.

ASAP consultant, Dr. John E. Vance, participated in a job validation survey of senior scientific personnel conducted by the Office of the Secretary of the Army during September. Dr. Vance's previous activitives in this area include chairmanship of a Panel ad hoc group on scientific personnel.

There is considerable activity scheduled for the Panel's ad hoc groups. Dr. Finn J. Larsen's Target Acquisition group has finished its report. Following final editing, this report will go to the Chief of R&D and the Assistant Secretary of the Army (R&D) for appropriate action.

Work continues on General Leslie E. Simon's ad hoc group final report on Barrier Research. General Simon is still recuperating from a series of operations at the Montefiore Hospital and Medical Center in the Bronx.

Dr. William C. Tinus' ad hoc group on Combat Vehicle Weapons Systems will hold its second meeting Oct. 7-8 at White Sands Missile Range, N.M.

New ad hoc groups still in the process of formation will be chaired by Dr. Lawrence H. O'Neill (Army Tactical Air Defense) and Dr. Allen E. Puckett (Design Criteria, Future Armored Vehicles).

ASAP members Dean Ralph E. Fadum and Eugene L. Vidal, together with consultant Maj Gen L. J. Sverdrup (Ret.) will participate in a mobility seminar at the Army Aviation Association meeting in Washington. The Panel continues to increase its competence to advise on Army aviation and related fields. Five members and consultants are directly concerned with aviation or aeronautical engineering.

The new Panel Secretariat reflects the current emphasis on air mobility. The executive secretary is Maj Donald E. Rosenblum, who came to the Secretariat from OCRD's Special Warfare Division and has served with airborne infantry units. Maj Arthur E. Dewey, recently promoted assistant executive secretary, is a senior Army aviator with a record of combat support time in Viet Nam and the 11th Air Assault Division (Test).

ASAP personnel share an interest in the activities of the Association of the U. S. Army which meets in Washington Oct. 25-26. The exhibits this year will feature an ASAP display including pictures of Panel members and background material.

## ASAP Slates Fall Meeting

*(Continued from page 1)*

**Dr. Alexander H. Flax**
*Assistant Secretary, AF (R&D)*

program, with presentations by the Army Materials Research Agency, the Army Tank-Automotive Center, the Army Aviation Materiel Command and the Natick Laboratories.

This meeting is one of the three scheduled each year for the Department of the Army's senior scientific advisors. Meetings are normally held at military installations where ASAP personnel are brought up to date on subjects of current interest to the Army's R&D program.

Maj Donald E. Rosenblum, executive secretary of the Panel, is making plans for 60-70 people to attend. Attendance at the fall and winter meetings is restricted to Panel members together with representatives of interested DA and DOD staff agencies. The Panel's 44 consultants are invited to join the meeting in June.

# Director of Laboratories Position Created for AMC

Creation of the position of U.S. Army Materiel Command (AMC) Director of Laboratories, with broad control over the AMC research program, was announced by the Department of the Army Sept. 1.

The Director of Laboratories, who must be an eminently qualified scientist or engineer, will be AMC deputy for research reporting to General Frank S. Besson, Jr., AMC CG.

The new director will be responsible for the Command's basic research program and will have vast control over the research and development programs conducted in the AMC laboratories.

His nationwide domain of laboratories falls into two categories—those belonging to AMC's six major subordinate commands (Missile, Weapons, Munitions, Mobility, Electronics and Test and Evaluation) and those known as Central Laboratories, which conduct general research programs not restricted to a specific commodity.

This realignment of functions is designed primarily to shorten and facilitate the lines of communication between the scientist and top management, to place greater command emphasis on laboratory operations thereby enhancing AMC mission effectiveness and to improve the stature of scientific and technical personnel in AMC.

**Dr. David T. Griggs**

*Dr. David T. Griggs recently accepted an invitation from the Secretary of the Army to become a member of the Army Scientific Advisory Panel (ASAP)*

*Dr. Griggs is a professor of geophysics, Institute of Geophysics, at the University of California. His special areas of interest include the deformation of rocks under high pressure and nuclear energy. His appointment brings the total Panel members to 19 of 25 authorized.*

*Dr. Griggs' previous service with the Government includes duty as civilian expert consultant, Office Secretary of War (1942-46); chief scientist, US Air Force (1951-52); consultant, Atomic Energy Commission (1958); and member of the Panel on Seismic Improvement, President's Scientific Advisory Committee (1959).*

# DD Form 1498 Data Bank Operational

*(Continued from page 1)*

DA elements for data should be forwarded to the Chief of Research and Development, ATTN: CRD/P, Headquarters, Department of the Army, Washington, D.C. 20310.

Many activities have carefully prepared the DD Form 1498 reports according to ARO. Included in this group are ARO-Durham; Limited War Laboratory; Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency; Army Missile Command; U.S. Army Human Engineering Laboratories; Harry Diamond Laboratories; and the ARO Human Factors and Operations Research Division.

Implementation of the Army's portion of the DOD reporting system was spurred early in April with the publication of AR 70-9, which prescribes policy, responsibilities and procedures for reporting technical and management data at the work unit level in the Research (6.11) and Exploratory Development (6.21) categories of the RDT&E Program.

The flow of DD Forms 1498 resumes and punched cards reached a peak in June. In order to meet the July 1 deadline, the STI Division of ARO gave machine support to those organizations which did not have card-punch capabilities.

The quality of scientific and technical data submitted on DD Form 1498 has not yet been fully evaluated, but it is apparent from early analysis that considerable variation in quality exists among the submitting activities. Many of the discrepancies are a natural occurrence in any newly instituted reporting system.

Preliminary analysis by ARO indicates that the quality of administrative data submitted is generally good. However, the type of funding data required in the resources estimate for each work unit was open to various interpretations.

Resource requirement estimates were expected to contain the reporting activity's best estimate of actual expenditures for the work unit in the current and prior fiscal year. The purpose of the resources estimate is basically to indicate the level of effort associated with the work unit in the year in question.

Another critical deficiency is that many reports are not retrievable due to the use of irrevelant and nondescriptive keywords, or were indexed by too few keywords.

Other discrepancies included the use of obsolete project and task numbers, work unit reports were not prepared for some bona fide tasks, identification of only one scientific and technical area when additional areas obviously were related, and contractor efforts were represented by too few reports.

The Automatic Data Processing (ADP) Support Branch of ARO is currently using for search and retrieval of data both conventional Punch Card Machine (PCM) equipment and the Termatrex system, based on the principal of optical coincidence for search and retrieval of information.

The ADP center has the capability of supplying copies of individual reports and machine printouts of specified information. Information can be supplied on a one-time basis, or periodic user requirements can be maintained in a suspense file.

Concurrent with the development of the DD Form 1498 reporting system, ARO has been active in structuring an Army thesaurus of technical descriptors based on the vocabulary from the old DD Form 1309-R reporting system, and new terminology generated by Form 1498 reports.

More than 10,000 technical descriptors had been structured by July 1965. After test and evaluation of the finished product, it is anticipated that the Army thesaurus will be delivered to the field for use, among others, in keyword indexing of reports generated under the DD Form 1498 reporting system.

The Army data bank of 1498 work unit information is one approach to the long-standing requirement for ready access to information on current RDT&E efforts.

To remain useful, the bank must be kept current, that is, updated reports must be forwarded to ARO within ten days of the action being reported.

# ASAP Consultant Selected to Succeed Brown as DDRE

Dr. John S. Foster, Jr., director of the Lawrence Radiation Laboratory, Livermore, Calif., has been selected by President Johnson as Director of Defense Research and Engineering (DDRE).

The 42-year-old scientist, consultant on the Army Scientific Advisory Panel (ASAP) since 1958, succeeds Dr. Harold Brown, who became Secretary of the Air Force Oct. 1.

The President also chose Dr. Robert A. Brooks, management consultant of Cambridge, Mass., to be Assistant Secretary of the Army for Installations and Logistics.

Dr. Brown's appointment and the resignation of Dr. Eugene G. Fubini as Deputy DDRE effective July 15 opened the two top DDRE positions. Dr. Fubini's successor had not been named as this *Army R&D Newsmagazine* went to press.

Dr. Foster, associated with the Lawrence Radiation Laboratory since 1952, has been director for four years. In 1960 he received the U.S. Atomic Energy Commission's Ernest O. Lawrence Award "for unique contributions, demanding unusual imagination and technical skill, to the development of atomic weapons."

One of the Nation's key scientists in design and development of nuclear explosives for peaceful and military purposes, Dr. Foster already has a distinguished career in scientific and administrative achievement.

At the time of his appointment as DDRE, Dr. Foster was a member of the Air Force Scientific Advisory Board, the ASAP, and served as panel consultant to the President's Science Advisory Committee.

He is a graduate of McGill University in Canada and was awarded his PhD in physics in 1952 by the University of California, Berkeley.

Dr. Brooks, 44, replaces Daniel M. Luevano who was recently appointed regional director of the Office of Economic Opportunity. Since 1951, the newly named Assistant Secretary of the Army has been associated with Harbridge House, Inc., Boston, Mass.

He has a background of extensive experience in design, development and testing of management systems for the Department of Defense. He is a Harvard University graduate, summa cum laude, and has a PhD degree in classical philology.

## OCRD Officer Authors Article For AUSA 'Army Magazine'

Col John L. Dibble, Jr., chief of the Air Mobility Division, Office of the Chief of Research and Development, is the author of an article in the September issue of *Army Magazine*.

The article, "Why Something New?", is an incisive analysis of the Army's aircraft problems, written for those impatient for innovation. *Army Magazine* is published by the Association of the United States Army.

Col Dibble authored an article on V/STOL aircraft for the September 1965 issue of the *Army R&D Newsmagazine*, preceded by a discussion of Army aerial vehicle development in the May 1964 issue of this publication.

# Lipscomb Assigned as Leonard Wood CO

Maj Gen Thomas H. Lipscomb reported for duty Sept. 1 as commanding general of the U.S. Army Training Center (Engineer) and post commander, Fort Leonard Wood, Mo.

General Lipscomb was promoted to his present rank in July 1962 following assignment as Deputy CG, Materiel Developments, U.S. Army Combat Developments Command, Fort Belvoir, Va. He served in this post until he assumed his new duties.

As a brigadier general in 1958-59, he was Engineer of the Eighth U.S. Army and U.S. Forces in Korea. He also served for three months as a member of the United Nations Military Armistice Commission.

For his direction of rescue work with the Eighth Army Engineers in flood rescue operations that saved hundreds of lives in 1958, the general was awarded the Ulchi Medal with Silver Star by the Korean Minister of National Defense.

From 1954 until he became a student at the National War College in 1957, he served with the Office of the Chief of Engineers in analyzing and evaluating effects of massive atomic attack and measures for rescue, relief and reconstruction.

Maj Gen T. H. Lipscomb

Graduated from the U.S. Military Academy in 1934, he earned an M.S. degree in engineering from Cornell University in 1938. He has completed courses at the Command and General Staff College, Air University, and the National War College.

Early in World War II, he was on the staff and faculty of the Engineer School at Fort Belvoir, Va., and later served as engineer combat commander and G-3 of the 86th Infantry Division. Subsequently, he commanded the 131st Engineer Combat Group and served with the XXI and XXII Corps in Central Europe campaign.

In 1947 General Lipscomb commanded the 937th Aviation Engineer Group in an expedition to Greenland, Labrador, and Baffin Island.

Under the Truman Doctrine, in the same year, he was assigned to the Joint Military Mission for Aid to Turkey. There he developed a program for a new system of modern airfields, established an engineer school for the Turkish Army, and supervised organization and training of the Turkish Corps of Engineers.

As head of the Portland, Oregon Engineer District (1951-54), General Lipscomb contributed to the initial design and completion of the first half of the $260 million Dallas Dam project on the Columbia River, which was completed at a cost of almost $90 million less than originally estimated.

# SATCOM's First CG, Brig Gen Johnston, Retires

Brig Gen J. Wilson Johnston, the U.S. Army Satellite Communications (SATCOM) Agency's first commander retired Sept. 30.

A specialist in the management of Army communications research and development programs, General Johnston took command of SATCOM in March 1962 when it was known as the Army Advent Management Agency.

In August 1962, he reorganized the Agency into the present SATCOM structure, and redirected the mission toward development, procurement, installation and testing of the ground facilities to be employed in the Defense Communications Satellite Program.

General Johnston was commissioned as an Infantry officer in 1932 following graduation from the University of Oregon with a BS degree in business administration. Called to active duty in 1941, he served in numerous security assignments including dtuy as deputy chief of the Army Security Agency, Pacific.

In 1949 he attended the Advanced Officers' Course of the U.S. Army Signal School, Fort Monmouth, N.J., and later attended the U.S. Army Command and General Staff College, Fort Leavenworth, Kans. Upon graduation he remained to serve on the staff and faculty. In 1954 he graduated from the Industrial College of the Armed Forces, Fort McNair, Washington, D.C.

From 1955 to 1958, General Johnston served as chief, Plans and Training Branch of the Signal Division, SHAPE, in Paris, and was then recalled to Washington, D.C. to serve as chief, Plans and Programs Branch of the Research and Development Division, Office of the Chief Signal Officer. He was later named deputy chief of the Research and Development Division, and served for a time as chief of the Division.

General Johnston's replacement had not been announced at the time this publication went to press.

Brig Gen J. W. Johnston

# Colonel Kimball to Report As Director, Army Research

*(Continued from page 1)*

Army Satellite Communications Agency (then known as the U.S. Army Advent Management Agency), where he served until June 1964.

The latest assignment of Colonel Kimball was with the J-6 Office, U.S. Military Assistance Command, Viet Nam. Prior to assuming duties in Washington, D.C., the new director plans to visit the Army research field offices in Korea and Japan.

A native of Philadelphia, Pa., Col Kimball received a BE degree in electrical engineering from Johns Hopkins University (1939); MS, electrical engineering, Massachusetts Institute of Technology (1948); and PhD in physics from the University of Virginia (1957).

He is also a graduate of the Command and General Staff College, Fort Leavenworth, Kans. (1952), and the U.S. Army War College (1958).

## DPG Chemist Gets R&D Award

**Dr. Richard L. Wilburn, a physical chemist at Dugway (Utah) Proving Ground, recently received the Army R&D Achievement award for technical achievement, as one of 12 persons honored at recent third annual U.S. Army Test and Evaluation Command Incentive Awards ceremonies at Aberdeen Proving Ground, Md.**

# 41 Mathematicians Assemble at MRC for 1965-66

Forty-one noted mathematicians —eight of them from foreign countries—are assembled at the U.S. Army's Mathematics Research Center (MRC), Madison, Wis., for the 1965-1966 academic year.

Under the direction of J. Barkley Rosser of MRC, they will consider advanced mathematical problems as they relate to military requirements. The MRC furnishes assistance and guidance in mathematical research as requested by Army facilities, and it performs research in applied areas of mathematics at the University of Wisconsin.

Educational opportunities to Army mathematicians and others are offered by the MRC through orientation lectures, symposia, advanced seminars and extended residences at the Center.

The MRC performs a function for which there is no parallel in operation for the Armed Forces.

Effectiveness and competence of the MRC is enhanced by the systematic use of a permanent and temporary staff. Permanent staff members provide the continuity of the MRC. Temporary members usually are on leave from other institutions of learning or research; their main purpose in association with the Center is to keep interests current with the newest mathematics trends.

Members of the MRC staff and their primary fields of interest are:

Arnold Arthurs, differential equations and quantum mechanics, U. of York, England; Djairo de Figueiredo, partial differential equations, U. de Brasilia; Masahiro Iwano, differential equations, Tokyo Metropolitan U.; A. S. Lodge, plastic flow, Manchester, England; Klaus Ritter, operations research, Kandelstrasse, Germany; Peter Werner, partial differential equations and acoustics, Institute for Angewandte Math. (Karlruhe, Ger.); Peter Wynn, numerical analysis, Stichting Foundation, Amsterdam; Koichi Yamamoto, combinatorial analysis and number theory, Kyushu U., Fukuoka, Japan.

Colin W. Cryer, partial differential equations, California Institute of Technology; James Thomas Day, numerical solution of differential equations, Michigan State University; Marvin Kastenbaum, design of experiments, Oak Ridge National Laboratory; P. R. Masani, stochastic processes, Indiana U.; D. K. Ray-Chaudhuri, coding theory, IBM, Yorktown Heights, N.Y.; Jan G. van der Corput, asymptotic expansions, U. of California (Berkeley); Stephen Wainger, Fourier analysis, Cornell U.

A. T. Bharuchua-Reid, stochastic processes and applied functional analysis, of Wayne State U. (Detroit, Wis.) will join MRC in June, 1966.

The following mathematicians are from the U. of Wisconsin:

Frederick Bagemihl (Milwaukee), function theory and set theory; Shun Cheng, stress analysis; Joshua Chover, functional analysis and stochastic processes; Charles Conley, differential equations and functional analysis; Howard Conner, analysis; Richard A. Gaggioli, thermodynamics; Hans Schneider, linear algebra and matrices; Robert E. L. Turner, functional analysis; Wolfgang Wasow, differential equations; H. Joe Wertz, electrical engineering; Helmut Wielandt, matrix theory, group theory; Laurence C. Young, calculus of variations.

In addition to Director Rosser, whose primary field is logic and numerical analysis, appointees from MRC are:

Assistant Director Louis B. Rall, numerical analysis, integral equations, functional analysis; Donald Greenspan, numerical solution of differential equations; Thomas N. E. Greville, approximation theory and actuarial mathematics; Bernard Harris, statistics; Herman Karreman, operations research and economics; Rudolph E. Langer, differential equations; Henry Mann, number theory and statistics; Ben Noble, integral equations and numerical analysis;

Also, Michael Papadopoulos, applied mathematics; J. Ben Rosen, nonlinear programing and optimal control theory; Isaac Schoenberg, analysis and approximation theory; and Calvin H. Wilcox, differential equations and wave motion.

## MICOM Appoints Lt Col Astor Chief of Development Division

Lt Col Raymond J. Astor, who served the past year as chief of the Future Missile Systems Division at the Army Missile Command, has been appointed head of the Development Division at Redstone Arsenal, Ala.

He replaces Col John T. O'Keefe, now a special assistant to Col E. D. Mohlere, Missile Command Chief of Staff. Lt Col Robert M. Peare, former Shillelagh project manager, has assumed the duties of chief of the Future Missile Systems Division.

Col Astor joined Redstone Arsenal in 1964 after serving for a year as commanding officer of the 15th Ordnance Battalion in Frankfurt, Germany. From 1961 to 1962, he was assigned to the European Research Office at Frankfurt.

A native of Chicago, he holds a BS degree in mechanical engineering from Chicago Technical College and a MS degree in engineering science from Purdue University.

Both the Development Division and the Future Missile Systems Division are in the Research and Development Directorate, headed by Col Stanton W. Josephson.

## Col Goldenthal Directs SATCOM Materiel Post

Supervision of the U.S. Army Satellite Communications Agency's (SATCOM) logistical missions in the Defense Communications Satellite Program recently was assigned to Col Mitchell Godenthal as director of the Materiel Department at Fort Monmouth, N.J.

A 1943 graduate of the U.S. Military Academy, Col Goldenthal was commissioned in the Corps of Engineers. In more recent years he has served as chief of the Construction Section, U.S. Army Europe, and as acting district engineer and deputy district engineer, Little Rock (Ark.) Engineer District.

Col M. Goldenthal

From 1955 to 1958, Col Goldenthal was an instructor at the Command and General Staff College, Fort Leavenworth, Kans., from which he graduated in 1954. He has an M.S. degree in engineering from Texas A&M and an M.S. degree in international affairs from George Washington University.

Transferred to the Signal Corps in 1962, he served for two years as deputy commander and chief of the Program Management Division, U.S. Army Electronic Research and Development Activity at Fort Huachuca, Ariz.

The colonel served with three Infantry Divisions in World War II and the Korean War. He was awarded the Legion of Merit, the Bronze Star Medal, the Purple Heart, and the Army Commendation Medal with Oak Leaf Cluster.

# Army Considers Ambush Detection Dogs

The feasibility of breeding a "superior dog" for ambush detection was explored during a recent meeting at the U.S. Army Research Office, Arlington, Va., sponsored jointly by its Life Sciences Division and Research Plans Office.

Thirty invited attendees, experts in genetics, animal behavior and related fields, presented opinions and viewpoints on the problem and reviewed past experiences of the military and metropolitan police forces with canine operations.

It was observed that dogs have been used by U.S. military forces since World War II but were not specifically bred or trained for ambush detection. General characteristics of the military ambush problem and environmental factors which could affect the dog and his handler were also presented.

One paper stressed the desirability of a dog to assist lookout guards during rest periods and at night, when vulnerability to ambush is highest. Additional presentations indicated that dogs have not been used by the military in night patrol work as extensively as they could be. Current studies were cited to demonstrate that dogs can detect intruders at considerably greater distances at night than during the day.

Life Sciences participants stated, in addition, that the potential of the science of heredity has not been fully exploited to produce military dogs with optimal desired characteristics. The practicality of breeding programs to achieve desired biological characteristics has been amply demonstrated in agricultural programs.

Another paper concerned canine detection of the lookout man who alerts the main body of ambushers. Successful detection of such an individual, it was contended, would enable U.S. forces to turn the tables on ambushers. Among the questions posed by the conferees were the following:

- Should the military assume responsibility for the breeding of its own ambush detection dogs?
- Can genetic selection be used to breed into a strain desirable behavior characteristics? What type of behavioral measures would determine qualities of dogs to be bred for successive generations?

To provide answers to these questions and determine the feasibility of a military-sponsored breeding program, the experts agreed that four to five years and three to four selected generations of the dogs would be required to produce conclusive evidence.

It was also agreed that the specific physical and behavioral characteristics of a superior ambush detection dog must be expressed in quanitative terms, required characteristics of the handler must be identified and the man-dog team concept must be recognized to insure proper use of the animal.

An ambush detection dog breeding program, according to one viewpoint expressed, would help improve general performance of military dogs and would decrease current high rejection rates of dogs offered to the military, averaging 95-98 percent.

To be operationally effective, it was agreed, an ambush detector dog system should be recognized and accepted as a tactical weapon at the highest levels in the Defense establishment and fully supported throughout the command structure.

Army Veterinary Corps experience was cited as adequate for insuring logistic and maintenance support.

Experts at the meeting observed that no weapons system has been designed that could replace a good dog and handler for the specific, unique missions they can perform.

The USARO Research Plans Office is collating ambush dog and handler desired characteristics to identify problems relating to the program.

# TECOM Agency Tests Plenum Air-Tread Amphibian

An experimental vehicle designed to provide mobility to combat troops operating on difficult terrain, the PATA (Plenum Air-Tread Amphibian), is undergoing design and military potential tests at Fort Lee, Va.

Conceived primarily as a cross-country carrier, the PATA is a rubber-tracked vehicle equipped with two air-cell treads that mold themselves around ground obstacles (absorbing the impact) and propel the vehicle on land and water.

Preliminary phases of the PATA tests are being conducted by the General Equipment Test Activity (GETA), a major element of the U.S. Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

Complete evaluations of the vehicle will be performed by GETA at Virginia test sites located at Fort Lee, Appomattox and Chickahominy Rivers, at Camp Wallace. Additionally, an Activity test team will accompany the PATA to Norco and Houma, La., where it will undergo tests in swampy and muddy terrain.

Capable of traveling 35 m.p.h. on level dry surfaces and 6 m.p.h. in calm water, the PATA has a rectangular configuration measuring 216 inches in length and 118 inches wide. Maximum height of the test vehicle is 118 inches; minimum reducible height is 99 inches.

Possible military applications of the vehicle, in addition to the proposed primary function of transporting troops and equipment, include use as support for assault bridges, amphibious resupply lighter, ambulance or litter carrier, or for a mobile item of rescue and firefighting.


GETA test drivers sit high above plenum air treads of PATA currently undergoing design and military potential tests at Fort Lee, Va.

# Submission Deadline Set For Symposium Papers

The 20th Annual Frequency Control Symposium is soliciting papers for presentation at the U.S. Army Electronics Command-sponsored meeting to be held Apr. 19-21, 1966, in Atlantic City, N.J.

Deadline for submission of summaries is Dec. 1, 1965. Authors will be notified of acceptance of papers about Feb. 1, 1966.

Papers should be based on research and development progress of quartz crystal devices and their application to frequency control and selection, piezoelectric resonators, oscillator and frequency synthesis circuits, fundamental properties of quartz, atomic and molecular resonance devices, and related subjects.

Four copies of a 500-word summary, together with the author's name, address, and telephone number should be sent to: Director, Electronics Components Laboratory, U.S. Army Electronics Command, Attention: AMSEL-KL-ST (M. F. Timm), Fort Monmouth, N.J. 07703.

# Quadripartite Ground Mobility Unit Meets

Statements summarizing ground mobility research efforts, presentation of technical papers and demonstrations of vehicles highlighted the fifth meeting of the Quadripartite Standing Working Group on Ground Mobility at Kingston, Ontario, Can.

The group consists of representatives of the United States, United Kingdom, Canada and Australia engaged in research on the interaction of ground vehicles and the environment in which they operate.

Established under provisions of the Basic Standardization Agreement between the four allied nations, the group meets about every two years. The last meeting was held in England during July 1963 and the next is scheduled for 1967.

The Quadripartite Standing Working Group on Ground Mobility (QSWG/GM) assembled at the Royal Military College, Kingston, where the 16 delegates (four from each country) and about an equal number of official observers were welcomed by Air Commodore L. J. Birchall, commandant of the college.

Principal speakers during the opening session included Brigadier D. A. G. Waldock, Deputy Quartermaster General, Canadian Forces Headquarters, Ottawa, and Dr. W. Petrie, chief scientist for Physics and Engineering, Canadian Defence Research Board.

Dr. Leonard S. Wilson, chief, Environmental Sciences Division, U.S. Army Research Office (USARO), Arlington, Va., head of the U.S. delegation, led the opening statements with the U.S. Army presentation.

Each statement concerned current ground mobility research being performed in the respective country. Dr. Wilson was accompanied by another member of the USARO Environmental Sciences Division, Merrill V. Kreipke, who serves as QSWG/GM permanent secretary.

Chairman of the conference was John S. Watson, Directorate of Weapons and Engineering Research, Defence Research Board. Maj John D. Young, U.S. Army Standardization Group in Ottawa, served on the secretariat for the meeting.

Additional U.S. participation was in the form of technical papers, presented by the following: Robert R. Philippe, chief, Environmental Sciences Branch, U.S. Army Materiel Command (AMC) headquarters, Washington, D.C., W. G. Shockley, chief, and Dr. Dean Freitag and Warren Grabau, Environmental and Mobility Division, U.S. Army Engineering Waterways Experiment Station, Vicksburg, Miss.; R. A. Liston, chief, and William Harrison, Land Locomotive Laboratory, U.S. Army Tank Automotive Center, Warren, Mich.

Robert Jackson, also of the AMC Environmental Sciences Branch, presented findings of a Special Working Party on Reference Test Areas, which he chaired. Moira Dunbar, geographer with the Defence Research Board, reported on activities of the Special Working Party on Terrain Evaluation for ground mobility.

On the fourth day of the conference, the entire working group was transported to Parry Sound to observe comparative demonstrations of commercial and U.S. Army amphibious, articulated tracked and wheeled vehicles on the muskeg-water-rock test course. Personnel of the Organic and Associated Terrain Research Unit, McMasters University, Hamilton, Ontario, presented papers on trafficability experiments in muskeg.

## Packaging Seminar Attracts Wide Military-Industry Group

Representatives of the three military services, the Defense Supply Agency and private industry attended a seminar on packaging, Sept. 28-29, at Aberdeen Proving Ground, Md.

The seminar was sponsored by the American Ordnance Association and the Joint Military Packaging Training Center (JMPTC). Discussion covered test requirements for extreme environments, current packaging projects, food packaging for space, food microbiology cleaning, and new developments in packaging in the military services and the National Aeronautics and Space Administration.

Maj Gen James W. Sutherland, CG, U.S. Army Test and Evaluation Command, and Brig Gen David W. Hiester, commander of the U.S. Army Ordnance Center and School, both at Aberdeen Proving Ground, Md., addressed the participants.

# Army Lets $1.6 Million for Hawk System Development

Greater mobility for the Hawk air defense guided missile, by mounting it on an XM548 full-tracked vehicle, is the aim of a $1.6 million contract awarded recently by the U.S. Army.

Research, development and limited production of a self-propelled Hawk missile system are specified in a contract issued to the Raytheon Co., Lexington, Mass.

Designed for use in the forward area of the combat zone, the new system's flexibility of use reportedly will require fewer vehicles in the platoon than Hawk units currently deployed in the U.S. and overseas.

A Hawk platoon will consist of three self-propelled launchers, each with three missiles aboard. Two pieces of ground support equipment, a continuous wave acquisition radar for target acquisition, and a high-powered illuminator for target tracking and illumination, will be towed by the launchers.

Self-Propelled Hawk Missile System

An assault fire command console for fire control of the platoon can be carried on one of the launchers or may be mounted on a trailer and towed by the third launcher.

In the present Hawk organization, a similar firing unit with the same number of missiles on the launchers as a self-propelled Hawk platoon, requires six 2½-ton trucks. The missiles are transported on pallets and placed on launchers at the firing site. The self-propelled Hawk will carry ready-to-fire missiles on the launcher.

The self-propelled Hawk has been tested in this new role for more than a year. In 1964, a self-propelled launcher with three missiles mounted on it was put through a series of feasibility trials over rough terrain at White Sands Missile Range, N.M.

A self-propelled Hawk unit recently went through combat suitability tests at Camp Roberts, Calif., where its military potential was compared with current Hawk assault fire units.

Hawk is a 16-foot, solid-fuel missile designed to search out and destroy high-performance aircraft or air-breathing guided missiles from treetop level to medium altitude. The first battalion was deployed in 1960.

The Army Missile Command at Redstone Arsenal, Ala., is responsible for technical supervision of the Hawk. Col George H. McBride is project manager.

# VE Task Force on Radiosondes Completes Study

A Value Engineering (VE) task force on radiosondes which began a series of program review meetings Aug. 9 at the Atmospheric Sciences Laboratories, Belmar, N.J., completed its studies Oct. 1. (A radiosonde is an electronic device attached to a balloon or rocket, dropped from an aircraft, or fired from a gun. It measures and transmits meteorological data to a ground or air terminal).

The task force was composed of representatives from the Army, Air Force, Navy, U.S. Department of Commerce and National Aeronautics and Space Administration. The force was divided into four working groups: general electronics, sensors, airborne electronics, and vehicles (balloons or rockets).

Objective of the task unit was to make a detailed cost analysis of all components of the radiosondes system, in an attempt to improve performance, reduce maintenance, and reduce overall procurement costs.

The task force reviewed radiosondes now in use and also the electronic packages of rocketsondes. Meteorological specialists studied the potential upper-air techniques in light of new technical developments.

Findings and recommendations were reported to the Management Action Board of the task force. After review and acceptance by the board, the Government agencies may adopt certain recommendations applicable to their own needs.

The Army R&D representative on the Management Action Board is Col John E. Craig, deputy chief of the Environmental Sciences Division, U.S. Army Research Office (USARO). Army members of the task unit's Technical Action Panel are Lt Col Martin O. F. Schroeder, USARO, and Okay R. Castner of the Army Materiel Command (AMC).

About 176,000 radiosondes are used throughout the U.S. each year, of which 105,000 originate in Department of Defense agencies. The Army uses about 9,000.

Radiosonde analysts said that with the number of radiosondes in use throughout the country, even a small unit-cost saving can mean considerable reduction of expenditures in this area of meteorology.

### International Symposium Draws Participants From 10 Countries

Scientists from nine foreign countries and the United States attended an international symposium of seminars in biophysics and physical chemistry of connective tissues at Stowe, Vt., Oct. 10-16.

Sponsors included the Life Sciences Division, U.S. Army Research Office (USARO); Rheumatism Research Unit, University of Vermont College of Medicine; Federation of American Societies for Experimental Biology; and the Geigy Chemical Corp. About 50 attended the symposium.

U.S. Army participants were Dr. Edward J. Baldes, Life Sciences Division, USARO, who chaired a session on rheology and lubrication, under the general subject area of viscosity, biological lubrication and biomechanics. Col William F. Macdonald, MD, chief, Orthopedic Service, William Beaumont General Hospital, El Paso, Tex., was a discussant in the session on biomechanics.

Other subject areas included pharmacology and endocrinology of connective tissues, osmotic pressure, membrane transport, mucopolysaccharides, interaction between ground substance and fibrallar elements of connective tissue, collagen, elastin, water nature, structure and binding, ice and melts, hydration and solution, and water in biological systems.

# USAEPG Group Evaluates PCM Mobile Unit

Specific configuration tests at Pulse Code Modulation (PCM) communications equipment were completed recently by a 22-man group from the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz.

The exercise involved 72 hours of tactical operations designed to determine the suitability of the PCM equipment for field Army use in the configuration of specially built mobile vans. Troop comfort was a major factor but the tests were conducted primarily to ascertain the suitability of the specific mobile shelters.

Equipment tested included the AN/TRC-108 radio terminal set and AN/TRC-109 radio repeater mounted on a ¾-ton truck; AN/TRC-110 radio relay and AN/TRC-117 radio terminal aboard 2½-ton vehicles. Also tested were two telephone terminals, the AN/TCC-60 and 61, transported by ¾-ton and 2½-ton trucks.

PCM equipment is transistorized, lightweight and almost distortion free. In the 12-channel equipment tested, a coder scans each circuit 8,000 times per second in converting the sound waves to binary values for transmission. Messages sent and received during the recent test traveled 70 air miles round trip.

The conventional 12-channel set now in use takes up 22 cubic feet and weighs nearly 750 pounds; the PCM consumes only 4.4 cubic feet and weighs 153 pounds.

# USATTC Tests Shelter Designed for Tropics

A novel variation of the tent shelter is being tested to determine its military potential in a humid, tropical environment at the U.S. Army Tropic Test Center, Fort Clayton, Canal Zone.

Developed by the U.S. Army Limited War Laboratory, Aberdeen Proving Ground, Md., the shelter was designed primarily as a maintenance facility for UH-1 helicopters in hot-wet and hot-dry climates. It can serve as a command post, mess tent, field workshop or chapel.

Two of the lightweight test shelters were erected, one at the Rio Hato Training Area in the Republic of Panama and the other in the Tropic Test Center's motor pool area. The shelter can be erected in 35 to 40 minutes and can be struck, disassembled and packed for transport in 15 minutes by a 6-man crew.

The church-like appearance of the shelter stems from its A-frame construction. To prevent the tent from being lifted by high winds, "spoilers" or short flaps of nylon are placed on edges of the "fly" or top portion.

The testing program will span one year, including a 6-month period in open storage to determine any effects attributable to tropical environment.

U.S. ARMY TROPIC TEST CENTER soldier adjusts A-frame tie-line of novel tent shelter undergoing controlled erecting and striking tests at Fort Clayton, Canal Zone.

Col Sven A. Bach

Lt Col H. Rowland, Jr.

Lt Col C. T. Anders

Lt Col F. F. Hickey, Jr.

Lt Col A. R. Wheelock

# OCRD Assignments Add 8 Officers to Staff

Col Sven A. Bach, a medical officer assigned to the Scientific Analysis Branch, Life Sciences Division, U.S. Army Research Office, heads the list of new personnel recently assigned to the Office of the Chief of Research and Development (OCRD).

He spent the last six years at the U.S. Army Medical Research Laboratory, Fort Knox, Ky., serving as chief of the Microwave Branch, chief of the Division of Medicine and commanding officer of the Laboratory.

He received his BS and medical degrees from the University of Nebraska and interned at Montreal General Hospital in Canada. During World War II, he served in France and Germany. Postwar assignments took him to Japan, Chicago, San Antonio, Tex. and Italy. He is the author of numerous publications.

LT COL HAMPTON ROWLAND, JR., the new executive officer for the U.S. Army Personnel Research Office, was a battalion commander at Fort Gordon, Ga., after four years' service in Panama and four years as an instructor at the Infantry School, Fort Benning, Ga. A graduate of the Infantry School Advanced Course and the Command and General Staff College, he holds a BS in education from the University of Georgia. His decorations include the Bronze Star Medal and the Army Commendation Medal.

LT COL CHARLES T. ANDERS, assigned to the Review and Analysis Division, OCRD, served subsequently as plans officer, aviation officer and chief of the Operations Division with the Test, Evaluation and Control Group( Project TEAM), Fort Benning, Ga. 1964-65.

Previous assignments included battalion commander, 5th Missile Battalion, 41st Artillery, Fort Sill, Okla., 1962-63; aviation officer, 7th Infantry Division, Korea, 1961-62 and service with the Office of The Adjutant General, Washington, D.C. and the 7th U.S. Army, Stuttgart, Germany.

His educational qualifications include BA in biology and BSc in education, Ohio State University, Artillery Advanced Course, Command and General Staff College and the Armed Forces Staff College. He wears the Air Medal with four oak leaf clusters, the Purple Heart and the Army Commendation Medal.

LT COL FREDERICK F. HICKEY, JR., who reported to the Air Defense and Missiles Division, OCRD, came to Washington from an assignment as arms advisor to V Corps, Republic of Korea Army. Previous service included tours with the North American Air Defense Command, the U.S. Army Artillery Board and several assignments with field artillery units.

His education includes AB, Dartmouth College, BS from the U.S. Military Academy and an MS in electrical engineering from Georgia Institute of Technology, the Artillery School Advanced Course and the Command and General Staff College.

LT COL ALTON R. WHEELOCK, assigned to the Programs Branch, Programs and Budget Division, OCRD, holds a BS degree from the Teacher's College of the State University of New York and an MBA from Harvard University. He is a

Lt Col W. C. Abernathy

Lt Col A. T. Sylvester, II

Capt Diane Dicke

# Dr. Hayes Joins Army Research Office STI Division

Dr. John C. Hayes has joined the staff of the U.S. Army Research Office, Arlington, Va., as chief of the Programs and Concepts Branch, Scientific and Technical Information Division.

Chief of the Technical Information Division at Dugway Proving Ground, Utah since 1962, he first joined Dugway as chief of the Chemistry Laboratory Branch in 1962, after teaching chemistry at Hamline University for 10 years. He is the author of a textbook on analytical chemistry and several articles published in chemical professional journals.

Dr. John C. Hayes

Dr. Hayes served on the Army Ad Hoc Committee for Scientific and Technical Information (STI) and also was U.S. Army Test and Evaluation Command representative for STI 1962-65. An AB degree graduate of Wabash College, he received his MS and PhD degrees in chemistry from Vanderbilt University. He is a member of the American Chemical Society, the American Association for the Advancement of Science, Sigma Xi and Phi Lambda Upsilon.

graduate of the Command and General Staff College, and the Armed Forces Staff College.

His most recent assignments have been assistant chief, Programs Branch, R&D Directorate, U.S. Army Materiel Command (USAMC), preceded by two years as chief, Review and Analysis Branch, R&D Division, Office of the Chief Signal Officer. Previously he was chief of the Programs and Budget Branch, Eighth U.S. Army Signal Office in Korea and assistant professor of military science and tactics at Worcester Polytechnic Institute.

LT COL WILLIAM C. ABERNATHY reported to the Mid-Range Plans Branch, Plans Division, after tours as chief, Organization and Training, G-3, Allied Land Forces, Southeastern Europe, Izmir, Turkey; CO, 1st Battalion, 2nd Infantry, 5th Infantry Division, Fort Devans, Mass.; plans officer, G-3, Headquarters, Eighth U.S. Army, Korea; and technical operations officer, Division of Military Application, U.S. Atomic Energy Commission.

He attended the University of Southern California and is a graduate of the Command and General Staff College and the Army War College. He wears the Bronze Star with Oak Leaf Cluster, Purple Heart and Army Commendation Medal, OLC.

LT COL ALLAN T. SYLVESTER II, staff officer with the Operations Research Branch, Human Factors and Operations Research Division, U.S. Army Research Office has earned a BS degree from Virginia Military Institute an MS from Stanford University and wears the Army Commendation Medal with Oak Leaf Cluster. His most recent assignments include tours with the III Army Corps, the First U.S. Army, as a company and battalion commander at Fort Knox, Ky. and with the Military Assistance Advisory Group in Saudi Arabia.

CAPT DIANE DICKE, also assigned to the Human Factors and Operations Research Division, USARO, received her AB from Lindenwood College, St. Charles, Mo. and MBA from the University of Washington.

Since joining the U.S. Army in 1961, she has served as assistant chief of the Reception and Processing Division, U.S. Women's Army Corps Center, Lt. Louis, Mo. and WAC selection officer, USARMS, St. Louis. In civilian life, Capt Dicke was an accountant, a psychiatric aide, a graduate assistant in human relations at the University of Washington, assistant dean of women and lecturer, Lawrence College, Appleton, Wis., and dean of women at Westminster College, Salt Lake City, Utah. She wears the Army Commendation Medal and is listed in Who's Who in American Women (1965).

## EXTERRA Adopts Metric As System of Measurement

The Extraterrestrial Research Agency (EXTERRA), Office of the Chief of Army Engineers, has converted from the British System to the metric system of weights and measures for all of its investigations and analytical studies.

Currently conducting engineering studies related to construction on the surface of the moon, EXTERRA switched from the British system of pounds, yards and feet because most fundamental physical measurements are given in terms of the metric system's meters, kilograms and seconds.

Metric system units will be used by the agency primarily, but British system units may be included when considered desirable.

The metric system is being used increasingly by elements of the Corps of Engineers. For many years the Army Map Service, the Corps' Geodesy, Intelligence and Mapping Research and Development Agency, the Waterways Experiment Station and other Corps agencies have been using the metric system.

### 65 Generator Units Ordered

The U.S. Army Engineer R&D Laboratories, Fort Belvoir, Va., recently awarded $1,925,000 to Allis-Chalmers Co. for 65 200-kilowatt diesel engine-driven generator sets. Portable, skid-mounted and liquid-cooled, the 50/60 cycle generator set weighs about 10,000 pounds and will provide AC power under climatic and altitude extremes for electronic equipment or general purposes.

## STRATCOM Appoints Col James Plans-Operations Director

Appointment of Col Joyce B. James as director of Plans and Operations, Headquarters Army Strategic Communications Command, Washington, D.C., was announced recently by Maj Gen R. J. Meyer, STRATCOM commander.

A Signal Corps officer with more than 30 years service, Col James is a recent graduate of the Army War College and former chief of the Allocations Division, Defense Communications Systems.

Col Joyce B. James

In the Asiatic-Pacific Theater during World War II, he also is credited with six campaigns in Korea. Other overseas assignments have included assistant signal officer, U.S. Army Pacific, in Hawaii, and a tour in Ethiopia as CO of STRATCOM's Middle East Regional Communications Command.

Following graduation from the Command and General Staff College, he served as chief of Operations Branch, Plans and Operations Division in the former Office of the Chief Signal Officer.

He succeeds Col Kenneth E. Shiflet, who held the position since October 1962 and is a student in the fall class of the Industrial College of the Armed Forces in Washington, D.C.

## Lt Col Baen Assigned as Shillelagh Project Manager at Redstone

Lt Col Spencer R. Baen, a former chief of the Ballistic Missiles Branch, Missiles Division, Office of the Chief of Research and Development (November 1959-June 1963), recently took over duties as Shillelagh project manager at Redstone Arsenal, Ala.

One of the Army's newest weapon systems under development, Shillelagh is a direct-fire weapon designed as the main armament for combat vehicles.

Adaptation of the Shillelagh system to the M-60 tank is currently being undertaken, under Army contract, by the Aeronutronic Div., Philco Corp., Newport Beach, Calif.

Lt Col S. R. Baen

The new project manager is a graduate of Texas A&M and holds MS and PhD degrees in electrical engineering from California Institute of Technology. Prior to assignment to Redstone Arsenal in July, Col Baen attended the Industrial College of the Armed Forces.

He also attended the Air Defense School at Fort Bliss, Tex., Advanced Artillery School at Fort Sill, Okla., and the Command and General Staff College, Fort Leavenworth, Kans.

In other assignments the colonel served in Korea; the Armor Test Board at Fort Knox, Ky.; and the Air Defense School, Fort Bliss.

# Top R&D Leaders Address Reservists at Seattle

Chief of Research and Development Lt Gen William W. Dick, Jr., and Dr. Finn J. Larsen, chairman of the Army Scientific Advisory Panel (ASAP), were featured speakers at the Sixth U.S. Army R&D Seminar at Seattle, Wash.

Other opening day speakers included Maj Gen William C. Garrison, CG, X U.S. Army Corp; Brig Gen Howard S. McGee, Adjutant General of the State of Washington; Dr. Frederick P. Thieme, vice president, University of Washington; and Col Walter H. Schaeffer, CO, 6155th U.S. Army Reserve R&D Unit, which assisted the Sixth U.S. Army sponsor and host the seminar for Army R&D Reservists.

Held at the University of Washington, Aug. 15-27, the seminar's theme was "Horizons for Military R&D From Now to 2000 A.D." The purpose of the seminar was to inform R&D Reservists of current and future research and development programs and the Army's changing role in light of technological advances.

Dr. Larsen elaborated on the theme of the conference, stressing future military research and development, while Lt Gen Dick made a classified Army R&D program presentation.

Additional speakers included: Lt Gen William J. Ely, Deputy Director (Administration and Management), Office of the Director of Defense Research and Engineering, "Technical Data System"; Brig Gen Tobias R. Philbin, Deputy Director, R&D, USAMC, "Army Materiel Command—Its Organization, Mission and Functions"; Brig Gen George B. Pickett, Jr., Chief of Staff, USACDC, "Combat Developments Command—Its Organization, Mission, Functions and Methodology"; Col James I. Erickson, Deputy Chief, Army Reserve, "The U.S. Army Reserve Program"; Lt Col Steven L. Conner, Jr., Review and Analysis Division, OCRD, "Office of the Chief of Research and Development—Its Organization, Mission and Functions"; Dr. Edward K. Kaprelian, director, U.S. Army Limited War Laboratory, a review of work being performed at the laboratory:

Presentations also were made by officials of the University of Washington, Pacific Car and Foundry Co., Boeing Co., U.S. Navy and Air Force research organizations and the Atomic Energy Commission.

Of special interest to the seminar participants was use of a simulated research project to exemplify operations of Army RDTE organizations from statement of the initial requirement through research, exploratory development, engineering development, testing and evaluation and finally type classification. Procurement and production aspects also were examined.

The R&D Reservists also made field trips to Boeing Research Laboratories and Pacific Car and Foundry Co. Technical papers by Government scientists and presentations on active duty assignments in R&D by USAR R&D personnel were additional highlights of the seminar.

# Col Cooper Directs Army Engineer Reactors Group

Recent Army War College graduate Col Kenneth B. Cooper is the new director of the U.S. Army Engineer Reactors Group (USAERG), Fort Belvoir, Va. He succeeds Col Robert B. Burlin, selected for the National War College, Washington, D.C.

The USAERG mission includes a program of research and development on nuclear power plants in conjunction with the U.S. Atomic Energy Commission, training of military reactor plant personnel, and technical support to users of land-based nuclear power plants. In addition, USAERG provides assistance in matters concerning nuclear reactors to the Department of the Army General Staff and Commands.

A 1944 graduate from the U.S. Military Academy, Col Cooper received a master's degree in civil engineering from Massachusetts Institute of Technology in 1951. He was graduated from the Command and General Staff College in 1959.

From 1944 to 1946, he served in the Pacific Theater of Operations. In October, 1945, at the age of 21, he commanded the 46th Engineer Battalion (Construction) in Japan.

Later, he served with the Manhattan Engineer District and the Armed Forces Special Weapons Project; the Atomic Energy Commission; SHAPE in Paris; the Advanced Research Project Agency; and in Korea where he commanded the 76th Engineer Battalion. His awards and decorations include the Legion of Merit and the Army Commendation Medal.

Col Kenneth B. Cooper

# Brig Gen Lilly Commands New Combined Organization

Brig Gen Roger M. Lilly now commands a new organization which combines two elements of the U.S. Army Combat Developments Command (USACDC) and the U.S. Army Materiel Command (USAMC).

The Automatic Data Field Systems Command, located at Fort Belvoir, Va., replaces the USACDC Command Control Information System Group and the USAMC Command Control Information System 70 (CCIS-70) program.

General Lilly, will report to the commanding generals of both USAMC and USACDC. He previously commanded the CCIS Group of the USACDC at Fort Belvoir.

A veteran of 26 years of Army Service, General Lilly is enrolled in the Research and Development Officer Specialist Program and recently served a 3-year tour in the Office of Chief of Research and Development.

The mission of the new organization is to command and manage the efforts and resources set forth in the Department of the Army Implementation Plan for "Automatic Data Systems within the Army in the Field."

The new command also includes an Army Augmentation Element at the U.S. Air Force Joint Systems Program Office, Wright-Patterson Air Force Base, the Automatic Data Field Systems Design Agency at Fort Huachuca, Ariz., as well as off-shore activities which will be responsible for introduction of new equipment and assisting in systems design and experimentation in overseas areas.

## Documentation Center Provides Microfiche Technical Documents

**Scientific and technical documents are now available from the Defense Documentation Center (DDC), Cameron Station, Va., in microfiche, a new miniature form of film reproduction complementing the microfilm documentation system.**

**Processed on 4x6-inch sheet film, documentary reproductions on microfiche can be stored and retrieved with all the convenience of file cards, and can be mailed in ordinary envelopes. More than 100 documents on microfiche can be stored in the space one average full-sized copy would occupy, and 50 documents on microfiche can be stored in the space required for 12 documents in cassettes of microfilm.**

# Army Awards $184,387,252 in Contracts

U.S. Army contracts totaling $184,387,252 have been awarded in recent weeks for research, development and materiel. The Boeing Co., with contracts totaling $25,327,594, tops more than 40 firms.

The Aerospace Division of Boeing, Seattle, Wash., was awarded a $2,000,000 supplemental R&D contract on the HIBEX program. Boeing's Vertol Division, Morton, Pa., five contracts totaling $23,327,594 for Chinook helicopter parts.

Dynamics Corporation of America, Bridgeport, Conn., $12,423,929 for generator sets; Bowen-McLaughlin-York, Inc., York, Pa., $11,983,784 for 8-inch howitzers (M110) and recovery vehicles (M578). The Raytheon Co., Lexington, Mass., $8,018,000 for development and parts; Model Engineering and Manufacturing Corp., Huntington, Ind., $6,837,321 for radio equipment; Remington Arms Co., Inc., Bridgeport, Conn., a $6,804,210 supplement for ammunition.

Holston Defense Corporation division of Eastman Kodak Co., $5,942,288 for propellants and explosives; U.S. Rubber Co., N.Y., $5,900,834 for work at Joliet Army Ammunition Plant, Ill.; Hughes Aircraft Co., Culver City, Calif., $5,837,378 for R&D on TOW system.

Sperry Rand Corp., N.Y., $5,448,941 for ammunition; Bristol Electronics Corp., New Bedford, Mass., $5,417,759 for radio equipment.

Dynalectron Corp., Washington, D.C., $4,542,538 for data collection at White Sands Missile Range, N. Mex.; Radio Corporation of America, Camden, N.J., $4,909,515 for radio equipment; $4,574,574 to Olin Mathieson Chemical Corp., Lexington, Ky., for ammunition and maintenance; Colt's Inc., Hartford, Conn., $4,182,304 for M16 rifles; $4,202,563 for 2½-ton trucks to White Motor Co., Mich.

General Electric Co., $3,517,717 for aircraft ordnance and power plants; Goodyear Tire and Rubber Co., Akron, Ohio, $3,372,163 for truck tires and M113 vehicle parts.

Chrysler Motors Corp., Detroit, Mich., cargo truck contract for $3,078,815; Hercules Powder Co., Wilmington, Del., for support services, $3,443,844; R. G. Le Tourneau, Inc., Long View, Tex., $3,299,877 for ordnance items.

Honeywell, Inc., Hopkins, Minn., for ordnance, $3,573,864; Schiller-Pfeiffer Machine Works, Inc., Southampton, Pa., $2,990,000 for cartridge assemblies.

A contract for $2,282,458 for grenade launchers to Thompson Ramo Wooldridge, Inc., Cleveland, Ohio. The Hol Gar Manufacturing Co., Primos, Pa., for generator sets, $2,246,862.

General Motors Corp., Detroit, Mich., $2,242,000 for battle tank engine development; the Sperry Phoenix, Ariz., $2,020,002 for amplifiers and radio indicators.

Ling-Temco-Vought, LTV Aerospace Corp., Warren, Mich., $1,947,000 for Lance missile-items; $1,801,597 for helicopter parts to Chandler Evans, Inc., W. Hartford, Conn.; L. F. E. Electronics Division of Laboratories for Electronics, Inc., Boston, Mass., $1,672,375 for DECCA airborne receivers.

Union Carbide Corp., N.Y., $1,639,603 for radio bateries; Institute for Defense Analyses, Arlington, Va., $1,590,000 for analyses; Packard Bell Electronics Corp., Newberry Park, Calif., $1,551,416 for transport test sets. Teletype Corp., Skokie, Ill., $1,500,000 for electronics equipment.

Otis Elevator Co., Brooklyn, N.Y., $1,491,452 for technical evaluation and production of M60 tank computers; Amron Corp., Waukesha, Wis., a $1,463,851 ordnance contract; Highway Products, Inc., Kent, Ohio, $1,448,960 for Hawk launcher; Hercules Engine Division of Hupp Corp., Canton, Ohio, $1,430,871 for truck engine assemblies and containers.

Grumman Aircraft Engineering Corp., Bethpage, L.I., N.Y., $1,400,000 for Mohawk aircraft modernization; California Electric Manufacturing and Service Co., Wilmington, Calif., $1,328,490 for cargo trailers; Stewart Warner Corp., Indianapolis, Ind., $1,331,894 for bomb parts; $1,284,674 for XM674 semitrailers to Fruehauf Corp., Detroit, Mich.

Raytheon Co., Lexington, Mass., $1,250,000 for Hawk missile system items; Philco Corp., Newport Beach, Calif., $1,224,800 for engineering services for Shillelagh missile; Kanarr Corp., Kingston, Pa., for grenade-launchers, $1,221,116; AVCO Corp., Richmond, Ind., $1,179,193 for ordnance items.

Magnavox Co., Fort Wayne, Ind., radio equipment $1,119,366; a $1,090,000 contract to Ryan Aeronautical Co., San Diego, Calif., for design and development of a precision-drop glider system.

# Army Contracts for XM-656 Engineering Work

Advanced production engineering work on the XM-656, a new 5-ton, 8x8 cargo truck will be performed by the Ford Motor Co. under a $3,418,440 contract awarded by the U.S. Army Aug. 30.

Work on the contract, which will continue at Dearborn, Mich., involves additional testing and converting the research and development package into a quantity production package. The XM-656 is intended, ultimately, to replace present Army 5-ton and general purpose 2½-ton trucks. Its primary function will be to haul troops and cargo and tow the 155mm. howitzer. With special bodies it will serve as a tank truck, dump truck or wrecker.

The XM-656 offers increased range and is amphibious. It is air droppable and weighs about 4,000 pounds less than the present 5-ton truck.

During the research and development phase of engineering, the XM-656 was exposed to 200,000 miles of Army testing over all types of terrain in extreme temperatures of heat and freezing under simulated battlefield conditions. It was operated for 20,000 miles without replacement of major assemblies.

The XM-656 is equipped with automatic transmission, power steering and braking. Power is supplied by a 210 h.p. Continental multi-fuel LDS-465-2 military engine which burns diesel oil, gasoline and other fuels interchangeably without any adjustments to the engine.

XM-656, 5-ton Cargo Truck

## R&D Conference Postponed

**The third Commanders and Technical Directors Conference, scheduled for September, was postponed until sometime later this fall.**

**The dates and location of the annual meeting, initiated in 1963 as the successor to the Army Key Scientists meetings, are undecided.**

# WRAIR Reactor Enters Fourth Year as Biomedical Research Tool

The nuclear reactor at Walter Reed Army Institute of Research (WRAIR) this month enters its fourth year of providing neutrons and electromagnetic radiation beams for biomedical research.

Generation of electronic excitations from this versatile 50 kw radiation source permits WRAIR investigators to study the interactions of radiations with living material, opening a new door to knowledge of profound potential significance in medical progress.

The west wing at WRAIR was dedicated in 1962, providing new laboratories for WRAIR and facilities for radiobiological research with the research reactor. The historic, 72-year old Walter Reed Army Institute of Research in Washington, D.C., today has a Nuclear Age research complex. The following report is the first program-review type article this publication has carried since the reactor was activated.

The 70-member Nuclear Medicine Division, with its departments of Radiation Biology, Radioisotope Metabolism, Biophysics, and Medical Operational Studies, is a composit team of scientists representing many disciplines. Their common goals are the application of nuclear sciences to military medicine, and to gain an understanding of the nature of ionizing radiation injury and its impact on military medical operations.

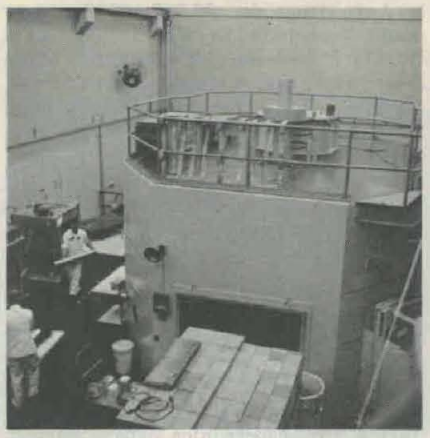
In the Biophysics Department, the research reactor is operated and maintained by seven licensed reactor operators and two supervisors. Late in the evening of Sept. 22, 1962, after 17 hours of transferring the uranium fuel, the reactor reached criticality.

Then four months were involved in defining operational characteristics and in obtaining dosimetry measurements for biological experiments.

Specialists from the Nuclear Defense Laboratory (NDL), Army Chemical Center, Edgewood, Md., applied nuclear techniques to determine neutron energies and gamma-neutron fluxes obtainable at various regions within the reactor and at multiple exposure ports.

By January 1963, experimental animals had been used in sodium activation experiments to determine the depths of penetration of neutrons in tissue. This led to radioactivation analytic techniques for the determination of trace elements in biological samples of metabolic significance.

For example, microgram quantities of manganese have been measured nondestructively in the living mosquito by neutron radioactivation. Significant differences in manganese content of various disease-carrying strains are known, as well as differences between male and female mosquitoes.



**NUCLEAR REACTOR TEAM members at WRAIR replace special beam coliminator with standard shield plug in this view of the north face of the reactor. Twelve-feet tall, the reactor is mounted in a room 25-feet high by 65-feet long and 35-feet wide.**

The chemical nature of very small foreign bodies removed from vital organs has been identified (sand versus metallic shell fragment). Findings have been of importance to clinician and patient for therapy and prognosis.

In radiobiological studies, it is important to identify the earliest physico-chemical events which are inflicted on the irradiated tissue. Ionizing radiation produces free radicals—highly reactive oxidizers with unpaired electrons—which are detected with electron spin resonance (ESR) spectrometers.

Free radical measurements at WRAIR are an intriguing aspect of research studies. Free radicals have been seen to persist for many hours after irradiation, particularly in highly organized structures like bone, teeth and hair.

Neutrons from the research reactor deposit considerably more energy per path length in tissues than electromagnetic radiations. Because of this more densely ionizing potential, neutrons have long been considered to produce cellular damage which is poorly repaired or repaired at a very slow rate.

WRAIR researchers have turned to the microscopic chromosome which undergoes visible structural change after irradiation; radiation hits can be scored and quantitated.

Chromosomes also manifest repair potentials and afford exception possibilities for exploring neutron injuries and kinetic data on repair processes in the material responsible for hereditary characteristics of the cell.

In experiments with mice, the reactor researchers use various genetic strains. For example, animal breeders provide mice that have had as many as 35 years of selective inbreeding. Such genetically inbred mice enable large homogeneous populations to be exposed and examined for uniformity of response to radiation injury.

Many consequences of radiation exposure are most sensitive to genetic strain. Particularly so is the very life span of the animal and consequently the cause of death, whether from tumor induction, leukemia, or infection.

Not only is the genetic strain of concern to the mammalian radiobiologist, but to the microbiologist as well. A mutant strain of bacteria, E. coli (TAU), has been used at WRAIR to elucidate the biochemical consequences of radiation injury and repair. This unique organism requires the addition of three specific metabolites or building blocks to synthesize DNA for reproduction.

When identical metabolites (except tagged with isotopes) are supplied to the cultures, metabolic defects induced by irradiation are isolated by high-speed centrifugation techniques and subsequently identified.

To balance the capabilities of the research reactor with the hematological, biochemical, behavioral, and pathological examinations required after radiation exposures are completed is a matter of careful scheduling and frequent adjustments in programing.

WRAIR scientists are acutely aware of the requirements for automating laboratory procedures. Many procedures have been automated and demand improved systems for analog signal to digital data conversion and increased capabilities for data handlin gand analysis. Researchers are eagerly looking forward to the installation of WRAIR's new Data Systems and Computer Center to handle the ever-increasing research data.

A program well along at WRAIR is the antiradiation drug program. The acquisition, synthesis and testing of antiradiation compounds is under the management of the Division of Medicinal Chemistry. After successful testing in rodents, other animals are used, including primates, to determine the effectiveness of radiation

modifiers in a broad spectrum of the animal kingdom.

Effectiveness tests are also carried out against the potent neutrons from the research reactor. These compounds afford investigators with a small arsenal of compounds which strikingly modify radiation injury and give new insight into the mechanisms of radiation damage and subsequent repair processes.

The liquid fuel core of the Atomics International L-54 reactor contained in a 15¾-inch stainless steel sphere, is apposed by an 8-foot long thermal column of machined graphite. The graphite slows down neutrons and serves as a reflector for the fission neutrons. With sections of graphite removed, direct access to the core permits fission spectrum irradiations. Other access ports are arranged around the reactor core to accommodate a range of sample sizes and radiation fluxes.

In-house ingenuity has added practical devices to the 12-foot-tall nuclear generator to facilitate biological exposure. Shields of aluminum and paraffin, or "beam catchers," can be "loaded" with an animal positioned against a radiation port for exposures outside of the reactor. In this way, partial body irradiation is accomplished with collimated beams.

The "breech loader," a precision-machined auto loader, designed to simplify the placing of samples near the reactor core while at power, projects from one of the reactor portals. These devices were constructed in-house by the Instrumentation Division.

A third major addition is the "cave," a series of 19-inch-thick concrete slabs, or shields, providing a shielded inclosure for whole-body exposures of large experimental animals the size of a pig.

Directing the complex Division of Nuclear Medicine at WRAIR is Lt Col Kent T. Woodward, MC, who, as a major and chief of the Department of Biophysics (1956-60), was on the ground-floor planning and construction of the reactor and the wing in which it is housed.

The present deputy director of the Division of Nuclear Medicine at WRAIR, Lt Col Dan Hightower, VC, with an MS degree in applied physics from North Carolina State College at Raleigh, also had an important planning role in the construction of the atomic reactor complex. Chief of the Reactor Section and Department of Biophysics is Lt Col Ernest O. Jones, MSC, who last year received his doctorate in nuclear engineering from N. C. State College.

Supervisor of Reactor Operations is

*(Continued on page 16)*

# WRAIR CO, Col Tigertt, Earns Legion of Merit

Extensive Army medical research in the Far East, particularly in infectious diseases, has won the Legion of Merit for Col William D. Tigertt, MC, Director and Commandant of the Walter Reed Army Institute of Research (WRAIR).

The distinguished award was presented to Col Tigertt recently by Maj Gen Henry S. Murphey, commanding general, Walter Reed Army Medical Center, in ceremonies at WRAIR.

Col Tigertt has attained internationally recognized stature in the field of infectious diseases and presently serves as consultant to The Surgeon General of the Army in the Washington, D.C., area.

The citation accompanying the award reads:

"With perseverance, dedication to military medicine, and objectivity, he personally pioneered an extensive research effort to resolve the urgent medical problems peculiar to the Far East. Displaying great vision and a vast knowledge of infectious diseases, he conceived, initiated and developed the Army Medical Research Plan for Southeast Asia to benefit the United States Army soldier and reduce the logistical burden to support troops in combat.

"Through his professional skill, foresight, and profound concern for the health of mankind, he insured the progress of a medical research program of great significance to the health and capability of the Armed Forces and to the defense effort of his country."

Col Tigertt became director and commandant of WRAIR Mar. 1, 1963, relieving colonel, now Brig Gen Conn L. Milburn, Jr., commandant of Brooke General Hospital, Fort Sam Houston, Tex.

Before assuming command at WRAIR, Col Tigertt was director of field teams in Southeast Asia and was a member of the Military Assistance Advisory Group (MAAG) in Teheran, Iran.

Col Tigertt was appointed to The Army Research Council in 1964. He is still an active member.

Born in Wilmer, Tex., May 22, 1915, the WRAIR director received an MD degree from Baylor University College of Medicine, Tex. He interned and served at the university as a Fellow and instructor in pathology, entered U.S. Army as a pathologist at Brooke General Hospital in 1940.

He served as commanding officer of the 26th Army Medical Laboratory in New Guinea, the Philippines and Japan from 1944-1946, and then was commanding officer of the 406th Medical General Laboratory in the Far East until 1949.

Col Tigertt was assistant commandant of the Army Medical Service Graduate School from 1949 to 1954. He was chief of the Special Operations Branch, WRAIR, from 1954-1956 and director of the Special Operations Division there from 1956 to 1961.

He was commanding officer of the U.S. Army Medical Unit, Fort Detrick, Md., from 1956 to 1961 and then served with the MAAG in Southeast Asia before returning to WRAIR as director and commandant.

**LEGION OF MERIT is presented to Col William D. Tigertt by Maj Gen Henry S. Murphy, WRAMC CG.**

Col Tigertt is a Diplomate of the American Board of Pathology (1942). His eminence in this specialty was recognized by The Surgeon General awarding the prefix "A" to the colonel's Military Occupational Specialty (MOS).

The WRAIR director also has served as Consultant on Parasitic Diseases to the World Health Organization.

Col Tigertt's interests and studies, while primarily focused on problems posed by the infectious and parasitic diseases, encompass virtually the whole of military medicine. He has contributed extensively to medical literature.

Particularly noteworthy are Col Tigertt's definitive investigations of Japanese B. encephalitis, typhoid fever, tularemia, Q-fever, anthrax and Venezuelan equine encephalomyelitis virus infections. A major effort during his Southeast Asia work was his attack on the problem of drug refractory malaria in that area.

# WRAIR Reactor Aids Biology's Search for Why?

*(Continued from page 15)*

James B. Smathers, a former Army lieutenant who has an MS degree in nuclear engineering from N. C. State College, and is working toward his doctorate at the University of Maryland. He and Lt Philip W. Morton, MSC, senior reactor operator, head the Reactor Team.

The team includes seven enlisted men, all graduates of the Army Nuclear Power Plant Operators Course (NPPOC), Ft. Belvoir, Va. Team members are further trained from 6 to 12 months at WRAIR before licensing by the AEC, a requirement of all reactor operators.

Col Hightower, also a licensed senior operator, praises highly the teamwork of the reactor crew which mans the reactor efficiently to execute smoothly, and safely, the current animal irradiation studies in process since the first live animal exposure more than two years ago.

"Teamwork," the WRAIR officer said, "concerns not only the immediate reactor crew but nuclear engineers, radiation physicists, and radiation biologists. The primary concern of nuclear researchers," he emphasized, "is the biological consequences of radiation while nuclear safety . . . lies with the operating staff."

"All of our experiments," Col Hightower explained, "are attempts to explore life processes in animal tissue and cell when subjected to radiation, and what can be done about it." He termed radiation as a "tool" to study biological phenomena within a living animal.

The Reactor Section is considered by its members to be fortunate in having the Health Physics Office of Walter Reed Army Medical Center, headed by Lt Col Willis D. Holland, MSC, responsible for radiation safety.

A nuclear-trained Health Physics Team works closely with the Reactor Section to monitor for radiation fields and radioactive contaminations. There is a Reactor Safeguards Committee as well as a Reactor Advisory Committee backing up the unit.

Complete check lists on each operation are carefully used to avoid deviation from a proven procedure. The Reactor Team maintains tight internal communications and each individual knows each operation step by step. If there is the slightest doubt on procedures for an experiment, "dry runs" are made and written procedures developed which are then followed to the letter when the process is considered correct.

Progressive research with the WRAIR reactor is an epochal advance in the history of one of the world's greatest medical research centers, in the opinion of Col William D. Tigertt, who has served as director of WRAIR since Mar. 1, 1963.

Though affectionately dubbed "the beast" by those associated with it, the WRAIR reactor silently and safely works to produce nuclear radiation that in years of research yet to come will yield biophysical and biochemical knowledge of vast importance to Army medical scientists concerned with continuing contributions to the progress of Man.

**REACTOR "CAVE" is shown prior to assembly. The WRAIR reactor's 20-ton thermal-column shield door will move out on rails. Waiting to prepare cave are Lt Philip Morton, Sp/6 William Crebs, MSgt Lowell Lilly.**

**NUCLEAR "BEAM CATCHER" at WRAIR is readied by Lt Philip Morton, senior reactor operator. MSgt Lowell Lilly sets viewing aperture of fiber optic tube. Beam colliminator protrudes from reactor port at left.**

# E-Command Designates Doxey as R&D Director

Twenty-two years of Federal Civil Service support the educational and professional qualifications of Willie L. Doxey for his new assignment as head of the U.S. Army Electronics Command R&D Directorate. The appointment is subject to approval by the Secretary of the Army.

Assigned to the Fort Monmouth, N.J., installation since his return from military service in 1946, he has held progressively responsible positions and has been accorded various honors for his research achievements.

In his new duties, he will have the benefit of knowledge gained as technical director of the Electronics Laboratories until their recent restructuring along functional-area lines. He will report directly to Maj Gen F. W. Moorman, CG of the Electronics Command, and will assist in formulating research, development, test and evaluation policy and plans.

The R&D Directorate has responsibility for engineering, logistic and staff support to six laboratories, established largely as a result of a study by a working group on which he served as chairman. They are: Institute for Exploratory Research; Avionics; Communications-ADP; Atmospheric Sciences; Electronic Components; Combat Surveillance-Target Acquisition.

During his career at Fort Monmouth, Mr. Doxey served as director of the Frequency Control Division, Power Sources Division, and the Electronics Components Department before he was appointed technical director of the former Electronics Laboratories.

W. L. Doxey

A native of Montgomery, La., he received a B.S. degree from Northwestern State College, Natichitoches, La., and an M.S. degree in physics and mathematics from Louisiana State University. During World War II, he served as an officer in both the Army and the Air Force.

In 1964 he was elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and has served as national chairman of the IEEE. He is known also for his service on numerous professional and Federal Government panels concerned with electronics.

# HumRRO Summarizes Work of 2 Tasks

Improved training for electronics troubleshooters and armored calvary platoon personnel are described in technical reports prepared for the U.S. Army by the Human Resources Research Office, (HumRRO), Alexandria, Va.

Two reports summarize work performed by HumRRO on Subtask V of Task MAINTRAIN and Task RECON. HumRRO is a U.S. Army contract agency of George Washington University, Washington, D. C.

*The Development and Evaluation of an Improved Electronics Troubleshooting Manual,* by James P. Rogers and H. Walter Thorne, describes how scientists and technicians at HumRRO Division No. 5 (Air Defense), Fort Bliss, Tex., tackled the problem. The resultant new format for maintenance manuals reportedly enables trained mechanics to locate trouble in complex electronic equipment and repair it substantially faster and more accurately than can be done with current manuals.

To evaluate the experimental manual developed by HumRRO, the U.S. Army Air Defense School constructed, administered and scored a performance test using two matched groups of inexperienced technicians. The group using the experimental manual found 37 percent more malfunctions in 41 to 75 percent less time than the group using the conventional manual.

The product of Task RECON is a report by William L. Warnick and Robert A. Baker entitled *Determination of Combat Job Requirements for Armored Cavalry Platoon Personnel.* It contains 14 lists of job requirements covering all duty positions in the armored cavalry platoon, the Army's smallest combined arms team.

HumRRO researchers discovered that there are 14 types of jobs covered by 16 different MOSs included in the platoon's table of organization. The specific job duties, knowledges, skills, traits and abilities which are essential for effective combat performance by armored cavalry plattoon personnel were inventoried and catalogued.

Senior platoon, squad and section leaders in armored cavalry squadrons then checked the revised lists for accuracy and each job requirement for its combat importance.

# Argentine Scientist Reports Findings to ARO

Argentine scientist Dr. Horacio E. Bosch recently visited the U.S. Army Research Office (USARO) and reported on an aerospace program being conducted by the Instituto de Investigacion Aeronautica y Espacial in Buenos Aires.

In his association with the Institute, Dr. Bosch has been receiving support through a U.S. Army grant for "Studies on the Properties and Systematics of Nuclear Structure Effects." The Institute is a part of DINFIA (Direccion Nacional de Investigaciones y Fabricaciones Aeronauticas).

In briefing the USARO Physical Sciences Division, Dr. Bosch related how the aerospace program, in the Antarctic Circle has produced several rockets which were fired to altitudes reaching 60 miles to measure space radiation within the southern hemisphere. He reported rocket flights as far south as 70° latitude.

The work of the Institute, which has departments in aerospace research, metallurgy, aeronautics, mechanics and radiation, is largely supported by the Argentine Government.

The program is being carried out in the Institute with the cooperation of the Argentine National Research Council, Atomic Energy, and Faculty of Sciences of the University of Buenos Aires.

Assigned to the Institute's Laboratorio de Radiaciones, Dr. Bosch has studied and worked in the United States at the Radiation Laboratory, Berkeley, Calif. He has also studied in France under Madame Joliot Curie, one of the world's leading nuclear scientists.

During his visit to the United States, Dr. Bosch also presented a paper before the American Physical Society at the University of Hawaii.

# ERDL Sponsors Course for Career Development

Fifty Army employees, selected from grades GS-12 and above for potential as supervisors at branch division or department level, attended a recent career development seminar sponsored by the Army Engineer R&D Laboratories and the Civilian Personnel Office at Fort Belvoir, Va.

Participants assembled at the Airlie House, Warrenton, Va., for management training sessions from Aug. 29 through Sept. 4. The group included 30 scientists and engineers from the Laboratories, 5 each from the U.S. Army Engineer Geodesy, Intelligence and Mapping R&D Agency and the Nuclear Power Field Office, also at Fort Belvoir, and 10 from other Army installations.

Col Frank Milner, CO of USAERDL, was the opening speaker and Dr. Ralph G. H. Siu, scientific director, Research Division, U.S. Army Materiel Command, presented the keynote address.

Other speakers well-known in the field of management of creative scientists and engineers included: Dr. Derek Castle, president of Napoleon Hill Academy; Prof. Ross L. Mooney, Ohio State University; George A. Whittington, editor of *Research and Development;* Bertram Strauss, a consultant; Dr. Seymour Rabinowitz, training officer for residents in psychiatry, St. Elizabeth's Hospital; Prof. James N. Mosel, George Washington University; Robert J. Gillespie, Sylvania Electric Products; E. Van Krugel, General Services Administration; Col H. F. Sykes, USA (Ret.), a former CO of USAERDL; and Dr. George W. Howard, technical director of USAERDL.

## Col Fraser Becomes CO Of Dugway Proving Ground

Col J. J. Fraser, Jr.

In change of command ceremonies at Dugway (Utah) Proving Ground, Aug. 27, Col William W. Stone turned the post colors over to Col Joseph J. Fraser, Jr., who served as deputy commander under Col Stone.

Col Stone, who served as CO since August 1964, was assigned to Munitions Command headquarters at Picatinny Arsenal, Dover, N.J., where he is now serving as director of Research and Development.

Commissioned in the Army in 1940, the new post commander is a chemical engineering graduate of the University of Nebraska. He served as post commander of the U.S. Army Chemical Center, Md., in 1955.

# Army Cold Regions Laboratory Provides Global Assistance

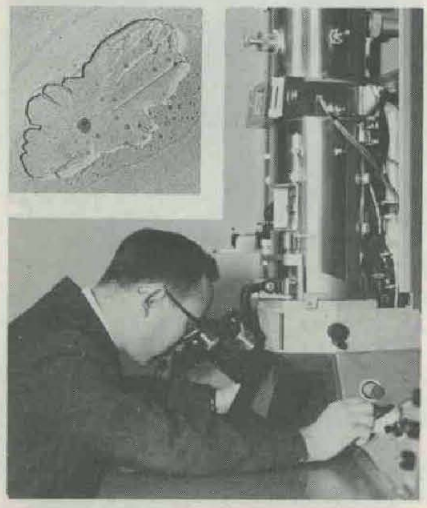
When the U.S. Army tried to build airfields, roads and buildings in Alaska during World War II, the engineering specifications long standard in the Continental United States were pressed into service—with results that were nearly disastrous.

The reason quickly became apparent. This was a land of snow, ice and perennially frozen ground, or in some instances, a deep layer of spongy vegetation called muskeg.

It was also obvious that the climate and the geological conditions of the Alaskan arctic and subarctic must undergo detailed study if the area were ever to be defended, let alone developed.

Much had to be learned about the cold regions—how to utilize and cope with the frozen materials and to solve the problems associated with freezing and thawing. For example, up to then, little was known in this country about the 90 properties of snow. Yet science has discovered and analyzed the properties and characteristics of most other elements, both common and rare, found on the surface of the earth or in its crust.

Born, thus, of a World War II necessity, the Army's cold regions research and engineering studies began, with activity centered in two Corps of Engineers agencies, the Arctic Construction and Frost Effects Laboratory (ACFEL) and the Snow, Ice and Permafrost Research Establishment (SIPRE). These two were merged in 1960 into the present U.S. Army Cold Regions Research and Engineering Laboratory (USA CRREL) and a new laboratory was built in Hanover, N.H.



**UNDER ELECTRON MICROSCOPE capable of magnifying 300,000 times, foreign particles (inset) that help cause ice fog are studied by USA CRREL scientists in research and development of dispersal techniques. Ice fog and whiteout cause hazardous conditions in environments where temperatures get below minus 35° F.**

Scientists and engineers, many of whom had already gained international recognition in the study of snow, ice and frozen ground, teamed up in the two predecessor organizations of USA CRREL. Before World War II ended, they were able to provide data for the successful design and construction of airfields and military structures in northern Canada and in Greenland. Techniques developed are now in general use by the Air Force in the building of compacted snow runways for the landing and take-off of heavy, wheeled aircraft.

In 1962, with the reorganization of the Army, jurisdiction of USA CRREL passed to the Army Materiel Command although a large amount of work is still carried on for and with the Corps of Engineers, chiefly through the Military Construction Investigations program.

Within the past two years, the Hanover Laboratory has developed an ice chipping machine, designed to smooth hummock-ridden ice to make ice runways.

"Ice," says a CRREL engineer, provides a very smooth landing."

Plans call for operational test of the ice chipper in the Antarctic, aiding the Navy in building roads and runways.

Aircraft landing on ice is nothing new, but too often it has been in the "flying by the seat of his pants" category. At least one instance has been reported where an aircraft was signalled in for a landing after the ice had been adjudged thick enough by a mere stomp of the foot. The airplane came in, the ice gave way and the pilot nearly drowned.

Other cold regions construction accomplishments were made possible by the cold regions laboratory, notably the location, design and construction of the DEW (Distant Early Warning) line stations and the BEMEWS (Ballistic Missile Early Warning System) stations which stretch strategically across the northern regions.

Although USA CRREL's research and engineering efforts are primarily in support of the Army's main mission—combat—the Cold Regions Laboratory provides assistance to numerous other defense and non-defense Government agencies.

**Col Philip G. Krueger**
*CO, U.S. Army CRREL*

The U.S. Coast Guard last year asked CRREL for help in snow and ice removal problems at its LORAN station at Cape Christian, Baffin Island, and the Army Laboratory's competence in the action of frost in soils is being put to use by the Department of Agriculture in attempts to combat the springtime erosion of soil due to thawing in the vast wheat growing region of the northwest.

The results of more than two decades of cold region engineering studies are made available to the Air Force in a course held regularly at the Hanover Laboratory for Air Force personnel being assigned to arctic and subarctic bases. Members of the Laboratory's technical staff serve as instructors. The same course, with emphasis on the Antarctic, has been extended to the Navy for personnel concerned with South Polar region activities. The first week-long course for the Navy was presented in August of this year.

**ICE MINER, developed by CRREL, is used for burrowing into ice and snow in the construction of under-surface living and working quarters.**

USA CRREL also has trained U.S. Army engineers and Korean Army personnel in the technique of ice strengthening, for river and lake crossing by heavy equipment during the Korean winter.

Assistance given by USA CRREL is global in scope. A USA CRREL staff member spent some time in India a short time ago, advising the Indian Government on snow and ice removal techniques for keeping supply roads open in the Himalaya Mountains in severe winter conditions.

The Cold Regions Laboratory has achieved an unique competence in aerial sensing techniques, which are vital in sub-surface target detection, and in terrain analysis. The techniques have application in all environments—the polar regions, the desert, and the tropics as well as in the mid-latitudes. USA CRREL, utilizing the remote sensing techniques, has been participating in the Mobility Environment Research Study (MERS) of the Advanced Research Projects Agency. The Laboratory's task is to provide terrain mobility factor maps covering seven selected areas of Thailand. The overlay maps, for mobility purposes, will provide mobility analysts with information on soils, vegetation, surface and hydrology geometry of those Thailand areas.

Closer to home, so to speak, USA CRREL has provided helpful data to the National Research Council of Canada which was studying the hazard created by birds cluttering airfield runways.

Snow, ice, frozen ground, and freezing and thawing pose many a problem not only for the military but for local and state governments, and for private industry such as water supply and hydro-electric plants. A quick glance at a map will show how

**STRENGTH TESTS of permafrost, permacrete samples are conducted in USA CRREL cold rooms, to provide data on construction in cold regions.**

**W. K. Boyd**
*CRREL Technical Director*

widespread the problems can be, since two-thirds of the entire northern hemisphere may be considered a cold region, having at least a seasonal encounter with wintry conditions and consequences.

The help of USA CRREL has been sought recently in the concern of Mississippi over the flood-breeding river ice jams. The northern New Hampshire town of Colebrook was advised on ways of easing spring ice jams, and almost right at the Laboratory's front door, the usually languid White River, in March 1964, became clogged with ice, smashing the one central vehicular bridge and threatening to cut off all traffic between Vermont and New Hampshire. USA CRREL's advice was used to good advantage in keeping further damage to a minimum. The State of Idaho turned to the AMC laboratory with its problem of shrinkage cracking in flexible pavement.

Frequently, USA CRREL hears from city park departments interested in utilizing local lakes or rivers for winter sports. Such instances, of course, are individual community problems, depending on climatic conditions and other factors, including the kind of winter programs to be held.

State highway departments in many states are using USA CRREL-developed snow and ice removal and snow drift control techniques.

Commercial airlines are interested in USA CRREL's weather modification studies which include Arctic whitebut dispersal and the cause of the hazardous ice fogs that roll in quickly in temperatures of minus 35°F.

The AMC laboratory in Hanover has contributed in large measure to the development of Alaska. At present, the USA CRREL has more than 20 studies under way in the 50th state.

As an example, the need for data and criteria was recognized early in the state's development for the construction and maintenance of overland transportation systems. In answer to that need, USA CRREL has joined with the Alaska Department of Highways and the U.S. Bureau of Public Roads, pooling their resources to find ways of building highways quickly and economically.

The Alaska Native Health Office encountered foundation problems at its Kotzebue hospital, located in an area of perennially frozen ground (permafrost). A thorough exploration in construction of the hospital is now under way, prior to corrective measures, as a result of USA CRREL's advice.

USA CRREL is unique in the free world, in its mission, its facilities, equipment and staff. Within the Laboratory structure located on the edge of the Dartmouth College Campus, 24 cold rooms have been built where the cold regions literally have been brought indoors for continued research and investigation.

Some of the cold rooms, which range in size up to a 24 x 24-foot "two-story" chamber, can maintain a temperature to minus 58°. The ice cores, for example, extracted from deep in the Greenland and Antarctic ice sheets, are stored at a temperature of minus 35° awaiting microscopic analysis and thorough testing.

The deep ice cores provide vertical profiles of polar history. Physical and chemical tests and measurements on the cores define the accumulation of layers of snow from which climatic inferences can be made.

Often, in its research and engineering studies, USA CRREL has had to develop its own equipment, or at

*(Continued on page 20)*

**ICE CORES, taken from far beneath the icecap in Greenland and the Antartic undergo analysis in the cold rooms of CRREL to provide data on the climatic history of cold regions.**

# U.S. Army CRREL Provides Global Aid

*(Continued from page 19)*

least modify existing equipment. The thermal drill has been developed for USA CRREL'S deep-core drilling program by which it is planned to drill 10,000 to 12,000 feet through the Greenland ice cap.

The thrmal drill employs an electrically heated, hollow drill head that literally melts its way down through the ice, around an ice core which is retained within a core barrel.

An ice miner has been developed for burrowing into ice and snow to build under-surfacing camps without the restriction imposed in building such camps by the "cut and cover" method, using a rotary snow blower. Coal mining machinery has been modified in USA CRREL studies centering on excavations in permafrost.

Staff capabilities encompass a wide range of technical subject fields, the principal ones of which are civil, mechanical, electrical and chemical engineering, physics, geology, geography, and meteorology. Forty or more enlisted men with scientific or engineering training participate in the technical program. Further assistance is obtained by contracts with consultants and experts and by grants to colleges, universities, and scientific organizations.

Technical reports are published regularly and a limited distribution is made to government agencies, educational or scientific institutions, and private agencies engaged in activities related to those conducted by the Laboratory.

A major contribution to the knowledge of snow, ice and frozen ground has been USA CRREL's bibliographical project. The Library of Congress, for USA CRREL, reviews the world's literature in the subject field and prepares and issues abstract cards containing pertinent information. To date, some 22,000 abstracts have been prepared under this arrangement, and are continuing at the rate of about 100 a month.

USA CRREL, in November 1965, will note completion of its second year since official acceptance of the laboratory building and equipment. As the location and the mission become known more throughout the general scientific community, more individual queries are received. The most common inquiries are:

"If the ice of Greenland melts, how much water would be added to the ocean level of the world?"

"Is it true that no two snowflakes are alike?"

"Will we have another ice age, and when?"

As USA CRREL's competence continues to gain in recognition, the number of requests for assistance in its field grows correspondingly.

Col Philip G. Krueger, commanding officer of USA CRREL, notes: "The Laboratory is working on parallel tasks—to put the vast amount of knowledge gained to work, and to continue, through research and test, to add to that knowledge."

"We are guided foremost," Col Kruger said, "by the needs of the military, in its ceaseless efforts to keep this country strong."

**No More 'Hot' Ice Cream for Navy**

# Natick Experts 'Licking' Submariners' Plea

"Hot" ice cream is no treat to anyone, least of all to the Navy's submariners who have turned to the U.S. Army Materiel Command's Natick (Mass.) Laboratories to "lick" the problem.

What Navy sub crews want is an ice cream that will remain more than 80 percent unmelted for 15 minutes even when served with other foods on a hot metal mess tray (about 100° F.) The frozen dessert must also resist 80° room temperatures and high humidity.

The Army's civilian and military food experts at Natick report progress and anticipate eventual solution to the problem presented by the sister service.

Using additives, and by modifying the basic ice cream formula, the Army already has developed an ice cream that melted only 30 percent at 90° during the test period.

The Navy specified that the ice cream must look like, taste like, and be as refreshing as the shore-dispensed product; and it must not have the insulating outer coat of confection that is customary in shipboard-made ice cream.

A dairy product specialist, Dr. Joseph Tobias, professor of dairy technology at the University of Illinois, assisted with the hot ice cream project during two weeks active duty at Natick. He is an Army Reserve lieutenant colonel and commanding officer of the 5000th R&D Training Unit, Urbana, Ill. The Army-Navy ice cream project is directed by Dr. Charles C. Walts of the Natick Laboratories Food Division.

**LOW-MELT ICE CREAM for Navy submariners is being developed at Army Materiel Command's Natick (Mass.) Labs. Dr. Charles Walts of Natick's Food Division (left) checks fresh batch. Assisting is Lt Col Joseph Tobias, USAR, Illinois dairy professor on two-weeks active duty.**

# AOA Plans Conference At Springfield Armory

Civilian executives of the nationwide American Ordnance Association (AOA) are holding their annual meeting at Springfield (Mass.) Armory this month to see some of the Army's latest weaponry in action.

Springfield's Quabbin Test Firing Range is the site for the Armory's array of mission activity weapons to be fired—from rifles and other ground armament to helicopter and fixed-wing aircraft guns.

More than 120 members of AOA are enrolled for the Oct. 13-14 sessions. The Springfield Armory guest list also includes representatives from Frankford (Pa.) Arsenal.

Col William J. Durrenberger, Springfield Armory's CO, has arranged for static displays of all types of hardware in the AOA conference area to highlight the Armory's current mission actvities.

While Springfield Armory's mission is research, engineering, development and pilot production of light armament, the AOA is composed of private citizens dedicated" to scientific and industrial preparedness for the common defense of this nation."

The AOA maintains liaison with all of the Armed Forces to "keep alive" the knowledge of ordnance design and production, with an overall goal of maintaining a skilled group of scientific and technical capability for the advancement of national defense.

# Key Defense, Army Officials Address AFMA

*(Continued from page 2)*

the capability of in-house laboratories.

General Gribble then discussed other provisions of the report relating to more effective management of research and development and increasing motivation of scientific and technical personnel. After a year of intensive consolidated effort, AMC is now formulating a command-wide management policy designed to attain the objectives of these proposals, General Gribble said.

Mr. Jordan, representing Maj Gen Floyd A. Hansen, CG of the U.S. Army Munitions Command, stated that commodity commands serve as the focal point of the life-cycle management of hardware systems and equipment.

They represent 45 percent of the 162,000 personnel strength of AMC and execute 81 percent of the AMC annual $9 million program, Jordan said. He then discussed major findings of a survey of AMC commodity management practices conducted last fall and presented to General Besson.

Among those which Jordan stressed were the following:

- Major items which are not under project management and items which no longer require project management should be reassigned to a commodity manager.

- Commodity managers should be assigned to major items early in the life cycle and should retain this assignment until the item is fully fielded with no significant problems remaining.

- Commodity managers should have the right to secure timely and accurate status information; authority to initiate plans and corrective action when indicated but should not receive or control funds; a major voice in the development of plans on "fixes" to problems, but not line authority to direct what functional personnel should do; and support of information systems and standard documentation procedures.

- Commodity managers should be located at, and report to, the commander of a commodity center. In the absence of such a center, each should report to the CG or Deputy CG of the commodity command. The number of major items assigned to a commodity manager should be tailored to the size, scope and complexity of the management task. Commodity offices should be austerely staffed, with emphasis on quality rather than quantity.

Acting upon the recommendations of the survey, General Besson ordered establishment of pilot commodity management offices, which were operational in all commodity commands and centers by June 15, 1965.

Jordan said that by about the first of October, the AMC Ad Hoc Committee on Commodity Management is expected to have completed a draft AMC regulation which will form the basis for extension of the commodity management concept to other commodities and systems.

"The commodity manager," Jordan stated, "acts as the focal point in the management process and is an extension of the authority of the commander of the commodity center or command who appoints him. His job is to see to it that all elements engaged in the common effort agree on a commodity master plan—and carry it out. He monitors the decision-making process with respect to his particular item to make sure it moves at a pace consistent with the requirement of the item and without time-consuming delays.

"What the commodity manager provides," Jordan continued, "is a total view of the entire major item effort as it crosses all functional lines but does not replace the functional manager or the project manager, who is concerned with bigger, more complex efforts which require 4-star authority."

The project manager may be assigned to work either out of AMC headquarters or out of the headquarters of a major commodity command. Jordan said, "our experience demonstrates that when a commodity command or center is working with a project manager, the responsiveness of both the commodity commander and the project manager is enhanced by the use of commodity managers" because "project and commodity management meshes together into a cohesive operation."

And, he continued, "as the time comes to scale-down project management and the need for 4-star authority ceases to exist, it can be achieved smoothly by passing the ball back down to commodity managers."

The Armed Forces Management Association convention also featured an outstanding display of data processing equipment, office machines and other "tools of management."

### Foam, Foil Tested as Liner

Polyurethane foam and aluminum foil insulation to help control humidity in metal shipping containers are being tested by the U. S. Army Materiel Command Engineer Research and Development Laboratories, Fort Belvoir, Va. Tests being made on 1,500-pound, 6x8-foot steel encasements are to be completed in mid-1966.

# MICOM Appoints New Chaparral Commodity Manager

Lt Col William Smith has been appointed manager of the newly created Commodity Office to supervise development of the Chaparral air defense guided missile system at the Army Missile Command, Redstone Arsenal, Ala.

The new office is under the jurisdiction of Brig Gen C. C. Harvey, deputy commanding general for Air Defense Systems. The Chaparral missile system mounts a heat-seeking missile on a manned turret containing four launch rails. The unit is carried on a standard Army vehicle adapted for use as a firing platform. The missile is an Army modification of the Navy-developed Sidewinder, adapted for ground-to-air rather than air-to-air launch as now used by the Navy and Air Force.

Chaparral is being developed to meet Army requirements for a forward area air defense system and early versions have been undergoing tests at the Naval Ordnance Test Station, China Lake, Calif., where the Sidewinder was developed.

Lt Col W. Smith

Col Smith, who came to the Missile Command in July 1964, moved to his new job from assignment in the Research and Development Directorate. He is a 1947 graduate of the U.S. Military Academy, and has a master's degree in electronics from Purdue University. He attended the University of Pittsburgh before entering the Academy, and is a member of the Tau Beta Pi honorary engineering fraternity.

The colonel has completed courses at the Armor School, the Ordnance School, and the Command and General Staff College. He came to the Missile Command after duty in Korea, preceded by assignments in Germany, at White Sands Missile Range, N. Mex., and with the Satellite Communications Agency, Fort Monmouth, N.J.

# Kudos

Col Frank Milner, CO of the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., has been awarded the Legion of Merit, the Army's second highest merit award, for distinguished service in his previous assignment as technical liaison officer for the Army's Chief of Engineers.

Col and Mrs. Frank Milner

The award to Col Milner was presented by Maj Gen W. B. Bunker, deputy CG of the U.S. Army Materiel Command, the Laboratories' parent organization, in ceremonies attended by Lt Gen William F. Cassidy, Chief of Engineers.

Col Milner, who was chief of the Technical Liaison Office of the Chief of Engineers from August 1963 to June 1965 was cited for accomplishments in public relations which produced new heights of public understanding and support of the military and civil missions of the Army Corps of Engineers.

Another recent Legion of Merit winner is CWO Jack L. Clark, U.S. Army Air Defense Board, Fort Bliss, Tex.

CWO Clark received his award for exceptionally meritorious service while serving as fire control test officer with the Air Defense Board (ADB) in an advanced service test of the Nike Hercules missile system.

CWO Clark is now stationed at White Sands Missile Range, N. Mex., where he serves as an ADB member of the team conducting the Engineering/Service Test of the Nike X Antimissile System.

Presenting the Legion of Merit to CWO Clark was Col W. W. Saunders, president of the Air Defense Board.

Three civilian employees of the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz., received the Army's Meritorious Civilian Service Award, the Army's second highest civilian award, at Test and Evaluation Command headquarters (TECOM), Aberdeen Proving Ground.

ARMY CHIEF of R&D Lt Gen William W. Dick, assisted by Mrs. Arthur E. Dewey, pins new leaves on Maj Arthur E. Dewey, who was recently assigned as assistant secretary to the Army Scientific Advisory Panel.

During the same ceremony, Fort Huachuca received a special plaque citing the proving ground for the most outstanding achievements in the Department of the Army's Incentive Awards Program for the past fiscal year.

Receiving the awards from Maj Gen James W. Sutherland, TECOM commander, were Leo Blumberg, Miss Alice P. Chancellor and Marvin A. Jantz.

Two lieutenant colonels and a major of Walter Reed Army Medical Center recently received Army Commendation Medals. Commendation medals also were awarded to a new captain of M.I.T. Lincoln Laboratory and to a master sergeant of the Nuclear Power Field Office, Fort Belvoir, Va.

Lt Col Paul E. Teschan, MC, was commended for meritorious service from November 1963 to November 1964 while serving as chief of the U.S. Army Medical Research Team (Walter Reed Army Institute of Research) to Viet Nam. He presently serves as chief of the Department of Surgical Physiology and deputy director of the Division of Surgery at the Institute in Washington.

The medal was accompanied by a citation which read in part, as follows: "During this period, Col Teschan demonstrated such unusual leadership ability, versatility and ingenuity as to materially enhance the effectiveness of medical research activities in Viet Nam. He established a medical research laboratory, conducted field studies in infectious diseases, and provided significantly timely advice to the Commanding General, Military Assistance Command, Viet Nam, based on data acquired under his professional guidance.

In addition to the Army Commendation Medal, Col Teschan holds the

## OTSG Lauds Noted Cardiovascular Surgeon

Army Surgeon General (Lt Gen) Leonard D. Heaton praised Dr. Edward J. Jahnke as a "nationally known cardiovascular surgeon who enjoys a reputation attained by few others in this country" at ceremonies marking his promotion to full colonel.

Maj Gen Henry S. Murphy, CG of Walter Reed Army Medical Center (WRAMC) and commander of Walter Reed General Hospital (WRGH), joined in honoring Col Jahnke, who has been assigned to WRGH since January 1961.

In February 1963, Col Jahnke was awarded the coveted "A" prefix for "professional superiority indicating a very dependable degree of clinical maturity and medical resourcefulness, technical skill, approbation of his colleagues and the ability to impart one's knowledge to others."

Col Jahnke is also a recipient of the Certificate of Achievement covering assignments in Europe. He served in the late 1950s as chief of the 97th General Hospital's Thoracic and Cardiovascular Service, Frankford, Germany. During this period he was also a consultant to the U.S. Army Surgeon in Europe.

A native of Pittsburgh, Pa., he graduated from Jefferson Medical College in Philadelphia (1948). He had his internship and residences in general surgery and thoracic surgery at Walter Reed General Hospital.

PROMOTION HANDSHAKE is passed from Army Surgeon General Heaton (right) to Dr. Edward J. Jahnke as he becomes full colonel.

Bronze Star Medal and the Royal Order of the Crown of Thailand, Third Class. The Thai medal was awarded in recognition of distinguished service to Thailand's Minister Thanarat in 1963.

Lt Col Larry Warren Coker, chief, Department of Medical Operational Studies, Division of Nuclear Medicine, Walter Reed Army Institute of Research, Washington, D. C., received his Army Commendation Medal for meritorious service from July 10, 1959 to June 18, 1965.

During that period Col Coker served as instructor and chief of staff and Logistics Branch, Department of Military Science, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Tex.

According to the citation, "Lt Col Coker's knowledge, teaching ability, and classroom presentations made him an outstanding instructor. His dynamic leadership, dedication, and professional competence were distinct assets to the School. . . ."

Captain's bars and the Army Commendation Medal greeted Lt Richard L. Nickelson when he arrived on a liaison visit to the U.S. Army Satellite Communications (SATCOM) Agency at Fort Monmouth, N.J., from his duty station at M.I.T.'s Lincoln Laboratory.

Brig Gen J. Wilson Johnston, former commanding general of the SATCOM Agency, made the presentation to Capt Nickelson who has been assigned to the Agency since 1963 with a SATCOM duty station at the Lincoln Laboratory since last April.

Capt Nickelson received the Army Commendation Medal for distinguished service as chief assistant test controller of the SATCOM Agency's Test Operations Center from September 1963 to April 1965.

The citation accompanying his medal stated "He was instrumental in accomplishing the U.S. Army Satellite Communications Agency's role to provide timely data to NASA's Goddard Space Flight Center for all phases of the program for Project SYNCOM."

MSgt Jesse A. Bowden, of the Nuclear Power Field Office (NPFO), Fort Belvoir, Va., was presented the Army Commendation Medal by Lt Col Kermit O. Lindell, chief of NPFO. Bowden was cited for Meritorious service while serving as a crew member, and later, as training noncommissioned officer of the SM-1A Nuclear Power Plant at Fort Greeley, Alaska, from June 1963 until June of this year. Sgt Bowden's effective cross training program permitted the centralized control of all power sources by the plant's shift supervisor. His conscientious efforts were also instrumental in the proper handling, storage and delivery of the reactor's core, which was shipped to Fort Greely on schedule.

## Scientific Calendar

Industrial Static Power Conversion Technical Conference, Philadelphia, Pa., Nov. 1-3.

International Space Electronics Symposium, sponsored by IEEE and AIAA, Miami Beach, Fla., 2-4.

International Biological Program, Paris, France, Nov. 2-5.

V/STOL Symposium, sponsored by the American Helicopter Society, Wright-Patterson Air Force Base, Ohio, Nov. 3-4.

Northeast Electronic Research and Engineering Meeting, Boston, Mass., Nov. 3-5.

21st Interagency Solid Propulsion Meeting, sponsored by AMCRD-RC, Navy, Air Force, ARPA and NASA, San Francisco, Calif., Nov. 9-11.

18th Annual Conference on Engineering in Medicine and Biology, sponsored by IEEE and ISA, Philadelphia, Pa., Nov. 10-12.

4th Hypervelocity Techniques Symposium, sponsored by Arnold Engineering Development Center, ARO Inc. and Denver Research Institute, Arnold Air Force Station, Tenn., Nov. 15-16.

4th Annual Symposium on Physics of Failure in Electronics, sponsored by Rome Air Development Center and the Illinois Institute of Technology Research, Chicago, Ill., Nov. 16-18.

11th Annual Conference on Magnetism and Magnetic Materials, sponsored by IEEE and AIP, San Francisco, Calif., Nov. 16-19.

Mid-America Electronics Conference, Kansas City, Mo., Nov. 18-19.

AFIPS Fall Joint Computer Conference, Las Vegas, Nev., Nov. 30-Dec. 2.

### Electronics Engineer Heads USAEPG Range Development

Aruthur H. Mudgett has succeeded Col James L. Burke as chief of the Instrumentation and Range Development Office, U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz.

Maj Gen Benjamin H. Pochyla, commanding general of the Proving Ground, presented the Army Commendation Medal to Col Burke prior to his departure for a new assignment in Korea. During his tour of duty at the USAEPG, Col Burke served also as aviation officer and as chief of the Test Plans and Evaluation Department.

Mudgett has served 21 years in the Army as an electronics engineer, including duty as a supervisor in the Instrumentation and Range Development Office, USAEPG, before he assumed his present duties. He was graduated from Northeastern University, Boston, Mass., with a BS degree in electrical engineering in 1942.

## Huachuca Technician Reaps Patents A'Plenty

Creative members of the Army R&D community might profit from a Fort Huachuca, Ariz., technician's accomplishments which show that losing fruits of an invention by pessimistically failing to seek a patent is unjustifiable.

Curtis L. Wilson, an electronics technician in the electro-magnetic division of Fort Huachuca's Test Directorate, remarked "I always hear the story that 'the odds are overwhelmingly against me, it takes a pro to get a patent' but it really only takes a creative idea—if it works, the patent office will do the rest."

He should know! Last year, he submitted over 20 devices to the U.S. Patent Office, 11 of which already received prelminiary clearance. Only one was turned down as being already patented. The Department of the Army has awarded him over $400 in incentive awards and he expects another $800 pending final issuance of the patents.

Wilson points out that one does not have to be a lawyer to comply with the patent filing procedures, nor an engineer to draw the plans. An uncomplicated, even handwritten, description of the invention and its function, plus a simple sketch, is sufficient. The Patent Office definitely does not want working models. A legal assistance office can provide the forms and handle the actual patent submission.

Living up to his belief that "there's a better way to do anything, if you reach for it," he has attacked a range of problems and produced a carburetor that vaporizes almost all fuel before it reaches the engine; a dependable, inexpensive, light-weight but powerful rotary turbine engine; a shaftless, sealess water pump; a weapon firing mechanism that eliminates a cause of misfires; and a permanent filter vacuum cleaner for contaminated areas.

Also, a flint ignition mechanism; an ammunition case trimmer; an electro-filter that "zeros in" on an exact frequency; trailer brakes that reduce stopping distance by more than one half; and a weapons holster requiring a variable sequence of actions to be opened.

Curtis Wilson

# NSF-I Winners Lauded in Army Laboratories

Today's youths are often stigmatized "the restless generation," but if restlessness motivated those who visited or worked this summer in Army laboratories around the nation, the laboratories will welcome more of such restlessness.

A look at three of those younger citizens; mentioned here not because they stand out from their group, but because they represent it, indicates why the Army is proud of its student scientists.

William A. Voelkle, a 17-year-old Texan, won the Army's Certificate of Achievement at the 16th National Science Fair-International held in St. Louis, Mo., in May of this year. He exhibited an iron electrostatic thruster, which uses electrically charged atoms accelerated to high velocities to provide rocket power.

He was invited to tour the facilities of the Army Missile Command, Redstone Arsenal, Ala., by Maj Gen A. W. Betts, Deputy Chief of Research and Development for the Army, in a letter which read, in part "The project you exhibited . . . deeply impressed the Army judges with the serious effort you have put forth in pursuit of your scientific studies."

Voelkle, who entered the University of Houston this fall to earn a physics degree, matter-of-factly stated that he began "toying around with ideas for high velocity propulsion systems" about five years ago.

Samuel W. Houston, III, a 17-year-old Oklahoman, was one of the top 20 Superior Award Winners at the St. Louis Fair, after selection from 424 regional winners by a panel of Army judges. His presentation was entitled, "Effect of Brain Experiments on the Development of the Cockroach."

For his award, Houston chose an all-expense-paid, one-week visit to Fort Detrick, Md., where he talked with scientists in the various divisions and directorates.

Houston plans to become an insect physiologist and entered Langston (Okla.) University this fall.

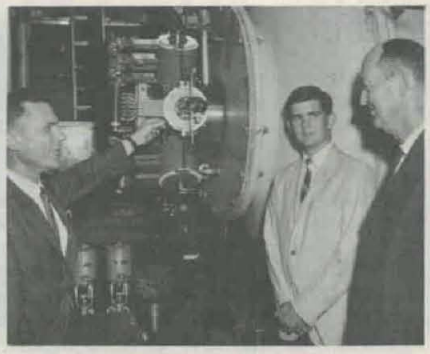
Robert F. deBettencourt, a 16-year-old Marylander, presented "The Effect of Lincomycin on L-Forms of Proteus Mirabilis" and won top honors among 125 science project contestants at his high school, honorable mention in the Washington Regional Science Fair last April, and a commendation from the District of Columbia Medical Society.

He spent this summer continuing his work on Lincomycin in the Pathology Laboratory of the Walter Reed General Hospital, Walter Reed Army Medical Center, Washington, D. C., under a fellowship awarded by the drug's manufacturer—the only such fellowship in the Washington area.

Lincomycin, new on the market this year, is currently used to treat Gram positive bacilli, but may be used against Gram negative bacilli because of deBettencourt's work.

He realized that certain bacilli form protoplasts, or "L-forms," when exposed to certain antibiotics, including penicillin, and he postulated that the Y-form would be resistant to the antibiotic which stimulated the facteria to become an L-form. When the antibiotic is discontinued, the L-form can revert to its original bacterial form.

Knowing also that Lincomycin is totally ineffective against the bacterial forms of most Gram negative bacilli, he conceived the idea of exposing the L-forms of such bacteria to Lincomycin, which proved to be very effective against the particular organism used in his studies.



**YOUNG SCIENTISTS LOOK AHEAD—Top left, Samuel Houston, III (center) listens to entmology discussion by Dr. Charles Graham, U.S. Army Biological Labs, Fort Detrick, Md. At the left is Dr. Robert Goodlow, director of Biological Research at the labs. Top right, William Voelkle listens as Norman Shapiro (left) acting director, Physical Sciences Laboratory at Redstone Arsenal, Ala., explains operation of the plasma jet. Looking on is John McDaniel, technical director, R&D Directorate. In the photo at right, Robert deBettencourt studies a specimen at the Walter Reed General Hospital, Washington, D.C. Pictured with deBettencourt are the Rev. Raymond Lelii, S.J., science instructor at Gonzaga; and Robert Walker, Upjohn Pharmaceutical Co.**

## USAMRNL Biochemist Cited For Poultry Science Research

Dr. Gilbert A. Leveille, biochemist at the U.S. Army Medical Research and Nutrition Laboratory, Denver, Colo., recently received the 1965 Poultry Science Research Award.

The honor is accorded annually to a member of the Poultry Science Association who in the previous calendar year as sole or senior author, published a report on outstanding research. Nominees for the award must be under 40 years of age.

Dr. Leveille was cited for a series of papers published on the effects of dietary lithocholic acid in the chick. Lithocholic acid caused a proliferation of bile ducts in the liver as well as certain biochemical changes, all of which were reversible. This discovery of basic research in nutrition reportedly may well provide a useful lead in the study of liver diseases.

## Army Engineers Aid Commission

**The U.S. Army Corps of Engineers, in coordination with the Atomic Energy Commission and other agencies, will collect and evaluate information to be used by a 5-man Atlantic-Pacific Interoceanic Canal Study Commission appointed recently by President Johnson. Commission members are former Secretary of the Treasury Robert B. Anderson, Dean Robert Story, Dr. Milton Eisenhower, Raymond Hill and Kenneth Fields.**

## 12 Trainees Cited at HDL Summer Student Technical Symposium

TWELVE COLLEGE STUDENT TRAINEES received awards at the recent 6th Annual Harry Diamond Laboratories (HDL) Summer Student Technical Symposium recognizing outstanding work on project assignments at the Laboratories. Shown above (flanked by HDL officials who presented the awards) are ten of the award winners. Left to right are: back row—Billy M. Horton, HDL technical director; Daniel J. Lanigan, Georgetown U.; Kenneth J. Lutz, Johns Hopkins U.; Warren L. G. Koontz, Maryland U.; Peter H. Michael, Maryland U.; Warren E. Shufeldt, U. of Illinois; and Dr. Maurice Apstein, HDL associate director and chairman of the Staff Development Committee. Front row—Dr. Henry O. Kalmus, HDL chief scientist; James D. Penar, Maryland U.; Donald U. Gubser, U. of Illinois; David L. Rodkey, Johns Hopkins U.; Bruce M. Fonoroff, Case Institute of Technology; J. Kent Haspert, Maryland U.; and Lt Col M. S. Hochmuth, HDL CO. Not shown in photo are George F. Smoot, M.I.T.; and Art Ostdiek, U. of Nebraska. First place awards of $50 each and Department of the Army Certificates of Achievement went to undergraduates Fonoroff and Smooth, and graduate student Haspert. All others received Army Certificates of Achievement or Commendation Certificates.

## Contractor Developing Ultrasonic Burner

Under contract for development of a prototype, the U.S. Army Electronics Command, Fort Monmouth, N.J., is considering use of an ultrasonic burner as the key component in a lightweight, portable thermoelectric generator.

The burner being developed at Battelle Memorial Institute, Columbus, Ohio, will be designed to operate on a variety of distillate fuels, including aviation gasoline, jet fuel, kerosene, diesel oil, or heating oil.

Intended for a number of special Army requirements, the generator in which the ultrasonic burner is to be used will be capable of producing 100 watts of electrical power.

The burner unit consists of a fuel tank with a manual air pump to provide pressure for metering the fuel flow; a fuel-metering system; an ultrasonic atomizer and transistorized power supply; a burner assembly to stabilize the flame; a small, low-pressure fan for combustion air; and an ignition system.

In operation, the fuel tank is pressurized by the hand pump and the fuel flows, at the rate of one pound per hour, through a metering valve to form a film on the surface of the ultrasonic atomizer. Vibrating at 100,000 cycles per second, the atomizer breaks the fuel into a fine mist. The burner mixes combustion air with the fuel mist, and the mixture is ignited by a glowing wire.

In the generator under study by the Army, the burner chamber would be lined with thermocouples that would convert the heat from the burning fuel directly into electricity, without any moving parts.

The atomizer, ignition system and fan would be powered at starting by a small, rechargeable battery. The low-voltage output of the battery would be converted by a transistorized driver to the high voltage required to operate the transducer at a high frequency.

Once the generator has been in operation for about three minutes, the battery unit would begin to recharge and the generator would supply the electrical power for its continued operation—about 10 watts.

## ICAF Schedules National Security Seminars

The National Security Seminar, a 2-week series of lectures on topics and problems which have a direct bearing on the survival of the United States as a Nation, will be presented in 14 American cities from October through May.

The seminar is staged by two briefing teams from the Industrial College of the Armed Forces (ICAF), Fort Lesley J. McNair, Washington, D.C.

The seminar seeks to "foster a better understanding of the many national and international problems associated with national security, a stronger appreciation of the inseparable nature of the civilian-military team, and a clear recognition of the limitations and capabilities of both halves of this team," according to an ICAF statement of purpose.

Individual lectures concern such topics as techniques of communism, geopolitics, energy resources, civil defense, military forces, international relations, public opinion, counterinsurgency, science and technology, exploration of space and discussions on various regions and individual countries.

Civilian participants enroll locally through the civilian sponsor, often the chamber of commerce. Members of military Reserve units who wish to attend apply through their appropriate channels.

The schedule of presentations includes: Oklahoma City, Okla., Oct. 4-15; Terre Haute, Ind., Oct. 11-22; La Crosse, Wis., Nov. 1-12; Duluth, Minn., 8-19; Cheyenne, Wyo., Jan. 10-21; Durham, N.C., Jan. 17-28; Stockton, Calif., Feb. 14-25; Little Rock, Ark., Feb. 21-Mar. 4; Salem, Ore., Mar. 14-25; Carbondale, Ill., Mar. 21-Ap. 1; Springfield, Mass., Apr. 18-29; Dallas, Tex., Apr. 25-May 6; Pittsburgh, Pa., May 9-20; and Helena, Mont., May 16-27.

# Probing the Heart of the Polar Icecaps

**By Lt Col E. F. Clark (USA-Ret.)**

An icecap or massive glacier is, in a sense, a time capsule which contains locked in its frozen bosom secrets of ages long since past.

Air bubbles which have been entrapped in the ice are the only existing samples of the earth's atmosphere as it existed when the ice was formed thousands of years ago. Volcanic dust, pollen, and microorganisms, which were airborne and deposited on the surface of these glaciers in centuries past, are sealed and preserved in the ice. Meteors and micrometeorites lie engulfed in its frigid heart. Further, the glacier contains a geologic clock which dates the precise time of formation of its various strata through the carbon 14 content in the entrapped air.

For many years physical scientists have been interested in probing the polar caps and extracting this information. However, they lacked means for obtaining samples deeper than those which could be obtained with hand operated ice coring augers or from hand-dug pits. Generally such samples were limited to depths not greater than 50 feet below the surface and in most cases consisted of ice formed during this century.

During the International Geophysical Year (IGY) the U.S. Army Snow, Ice, and Permafrost Research Establishment (USASIPRE), contributed to the effort by attempting deep core drilling in the Greenland Icecap. (USASIPRE has since been redesignated the U.S. Army Cold Regions Research and Engineering Laboratory.) A standard oil field type of drill rig (Failing Drill, Model 1500), equipped with a coring bit, was used.

In 1965 a hole slightly more than 1,000 feet deep was drilled at Site 11, a station on the icecap, about 220 miles east of Thule Air Base. In 1957 a new hole was drilled at Site 11 to a depth of 1,346 feet with the same equipment. The 1956 core recovery was more than 50 percent.

However, owing to the experience gained in 1956 and a substantial improvement in drilling techniques in 1957, core recovery was almost continuous down to about 1,000 feet, with some recovery of usable cores down to about 1,300 feet.

In drilling through any material, frozen or unfrozen, proper selection of a drilling fluid is of extreme importance since this fluid must remove the cuttings from the hole, stabilize the hole wall, and remove the heat generated by the bit.

In probing permafrost or ice, the drilling fluid must also maintain both the core and the wall of the hole in a frozen state, and to accomplish this it must remain in a fluid state. Hence, salt brines, diesel oil, and ethylene glycol have been used. For the icecap drilling, USASIPRE chose to use air cooled to within 10° F. or less of ambient air temperature, as a drilling fluid. A 315 c.f.m. air compressor, coupled to an air-to-air heat exchanger, was used to satisfy this requirement.

**THE ARMED SERVICES were brought together recently for a course in cold regions engineering at the U.S. Army Cold Regions Research and Engineering Laboratory (USA CRREL), Hanover, N.H. Reviewing program presentations above (l. to r.) are Col P. G. Krueger, CO, USA CRREL; Capt H. M. Kosciusko, U.S. Navy Antarctic Support Activities; and Lt Col F. M. Holstrom, USAF Aerospace Medical Division. The course covers fog and whiteout dispersal techniques, excavation, foundations, construction and maintenance, oversnow transportation, heat transfer, snow and ice roads and runways, and other phases of cold regions research related to military operations.**

In 1957 a second drill and the necessary auxiliary equipment were shipped to Antarctica for the purpose of drilling two holes, one at Byrd Station and one at Little America V. The drilling at Byrd Station was started in December 1957 and was completed in January 1958. Excellent cores were obtained down to a depth of approximately 1,000 feet. The drilling equipment was then returned to Little America V, where, during the period October-December of 1958, a hole was drilled to a depth of 1,013 feet. Core recovery amounted to 98 percent of the total footage drilled.

The Failing Drill, which has been in use for many years in oil fields, is a mechanical drill which applies torque to the cutting bit by means of a steel shaft. Hence its limitations are obvious since this shaft has to be raised and disassembled, section by section, each time a core is recovered, and then reassembled as it is lowered again into the drill hole. Because of these limitations, the USASIPRE drilling team considered that core drilling in ice much deeper than 1,300 feet was impracticable. This led to consideration of other possible types of drills which might be more suitable for deep drilling in ice.

One of the most attractive ideas considered was that of a cable-suspended, electrically-heated drill, which would melt its way down through the ice. Not only would such a drill overcome the limitations of the Failing Drill but it would also reduce drastically the weight and cost of equipment.

In pursuing this idea of the "electro-thermal drill" as it was called, B. Lyle Hansen, USASIPRE, conducted a feasibility study and determined that the development of such a drill was feasible and within the state-of-the-art. As a result of Hansen's study, in 1957 USASIPRE obtained NSF sponsorship and started development of the electro-thermal drill.

The concept called for an electrically heated annulus attached to a cable-suspended coring barrel, which could be lowered and raised in the drill hole by means of an electric winch. Ice cores were to be recovered by raising the coring barrel each time it was filled. Plastic closure of the drill hole was to be prevented by filling it with a fluid which possessed a specific gravity equal to that of the ice removed (a mixture of diesel fuel and either trichloroethylene or ethylene glycol has since proved to be satisfactory for this purpose).

During preliminary testing of the first breadboard model of the thermal drill in Greenland in 1959 and 1960,

several minor technical problems developed, involving both materials deficiencies and operating techniques. These were solved without difficulty and the 1961 plans were to attempt to drill through the icecap at Camp Century (6,500 feet?). However, the thermal tool was lost at a depth of approximately 650 feet.

Loss of the tool resulted mainly from two design inadequacies. One was the choice of a means for removing the melted water from the thermal ring tip. It was pumped into a tank above the core barrel, where it was emulsified in oil so that it could flow out and refreeze on the drill hole wall. However, this greatly increased the force required to raise the coring assembly. The other was a weakness in attaching the core barrel to the cable. It had withstood dry testing, but failed in the oil-filled hole.

The deficiency was eliminated in a redesigned assembly by placing a piston in the cylindrical water tank. The piston rod rested on top of the core, and, since the pump had eliminated the water, it was retained and not permitted to flow up into the drill hole above the coring assembly.

During the summer of 1964 the thermal drill reached a depth of approximately 1,800 feet at the Camp Century site. The only serious difficulty encountered resulted from the use of a rust inhibitor compound on the suspension cable. This compound continued to flake and fall from the cable to the bottom of the drill hole, forming a layer through which the thermal ring could not melt. The problem was solved by replacement of the cable which had been treated with the rust inhibitor.

In 1965 the thermal drill was used to deepen the Camp Century drill hole to about 2,000 feet. No difficulties were experienced, and accordingly, the drill is now considered a fully developed and proven research tool.

Deep-core drilling in ice with an electrically heated annulus was chosen originally in preference to a cable suspended mechanical corer because development promised to be faster and cheaper. However, after nearly all development work had been done on the thermal drill, it was learned that a small-diameter, cable-suspended, electrically powered mechanical drill had been developed commercially and was being used successfully in rock.

Currently, a modified version of this electro-mechanical drill is undergoing test at Camp Century. It was installed in the drill hole made by the thermal drill, and is reported to have reached a depth of about 3,000 feet, with recovery of excellent ice cores.

Although the mechanical drill has a capability to core faster than the thermal drill, this is no great advantage, since at the deeper levels much of the drilling time involved is in raising and lowering the coring assembly to retrieve the ice cores. The thermal drill can core at the rate of about 1.5"/min vs 6"/min for the mechanical drill. The chief advantage of the mechanical drill is that coring can be continued below the bottom of the clean ice into the boundary layer (perhaps debris-laden ice), into the basal moraine, if any, and into the bedrock.

Currently, it is planned to attempt to drill through the Greenland Icecap at Camp Century next summer and, if successful, to drill through the Antarctic ice at both the Byrd and Pole Stations in the near future. There is no reason to suspect that insurmountable difficulties will be encountered in achieving these objectives.

Though controversy has arisen among physical scientists concerning the state of matter ($H_20$) at the earth-ice interface, whether it is liquid (water) or solid (ice) should present no serious difficulties. Bader, in his discussion of the problems, pointed out that since wet ice is thermally nonconductive, if water is present, it will be the product of geothermal heating ± frictional heating of ice, and nothing should happen beyond a lowering of the liquid level to establish pressure equilibrium at the bottom of the hole.

A somewhat more dramatic speculation was presented by a Russian scientist, Igor Alekseyevich Zotikov, who participated on the Fourth Antarctice Expedition. He hypothesized that in Antarctica, the ice is continually thawing at the bottom, and that this thawing is pronounced at the center of the continent, whereas it does not occur near the coast. He reasoned that the thawing is caused by the heat flux from the earth's interior, and that beneath the thick mantle of ice the surface contains many basins and depressions which are filled with water. He speculated further that the ice of the central Antarctic is porous and at certain depths the pores become closed air bubbles. At depths of three kilometers, the overburden pressure becomes 300 atmospheres; hence, the stores of energy of the compressed air which has accumulated during existence of the icecap is tremendous and could turn the turbines of a great power station for many thousands of years.

Should this be the case, a drilling crew would have to be ready to seal the hole to prevent development of a gusher. In any event, if current plans are implemented we should know the answer to these and many other perplexing questions in the near future when we have actually drilled through the Greenland and Antarctic icecaps.

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## Army Researcher Chairs U.S.-Canada Aero Session

John Beebe of the Research Division, Army Materiel Command, represented U.S. Army R&D and chaired a major session at the recent annual Canada-U.S. aeronautical meeting in Montreal.

The Canadian Aeronautical Sciences Institute (CASI) hosted the American Institute of Aeronautics and Astronautics (AIAA) at the discussions on "Low-Speed Flight." The AIAA, with its general aviation and space-interest combination, has a national membership of more than 250,000.

The "Undercarriage Design" session was chaired by Mr. Beebe. Other main topics included "Stability and Control," "Power Lift," and "Flight Research."

*Lt Col Elmer F. Clark, the author, before retiring from active duty with the Army, was in command of the U.S. Army Arctic Task Force and the Army's research and development in Greenland from 1955-1957. In this capacity, he was involved in the R&D efforts described in the article and the development of concepts which led to the construction of Camp Century and the use of modular-type and semiportable nuclear power plants in remote areas. Since his retirement, after more than 20 years active service in 1958, he has served (first with the Corps of Engineers, and since reorganization of the Army with the Army Materiel Command) as staff action officer for cold regions R&D.*

Lt Col E. F. Clark

# Newly Launched SECOR Aids Mapping

An Army geodetic satellite that can be viewed simultaneously from the west coast of the United States and Hawaii is now in elliptical orbit with an apogee more than twice that of its predecessors.

Developed by the U.S. Army Engineer Geodesy, Intelligence and Mapping R&D Agency (GIMRADA), Ft. Belvoir, Va., the latest SECOR satellite (launched Aug. 10) joins another launched early last March to give geodesists two fully operational mapping aids in space.

A third successfully launched SECOR (Sequential Collation of Range) satellite put aloft in January 1964 has faded electronically to a point where it is no longer considered operational.

The new SECOR was placed in orbit from Wallops Island, Va., by a National Aeronautics and Space Administration SCOUT rocket. It was a NASA test of SCOUT and the satellite "rode "piggy-back."

Its apogee is 1,310 nautical miles, perigee 611. Its inclination is 69 degrees to the equator and it completes one orbit every 122 minutes. Officially known as EGRS-5 (Engineers Satellite), Type I, the GIMRADA satellite is a sphere. Previously launched Type IIs have been square in design.

The March-launched satellite, EGRS-3 is in a 500-nautical-mile-high circular orbit. The satellite launched last year was EGRS-1. The EGRS-2, also launched in March, did not separate properly from its launch vehicle, and EGRS-4, lofted early in April, developed transponder failure. Neither of these two satellites is considered operational.

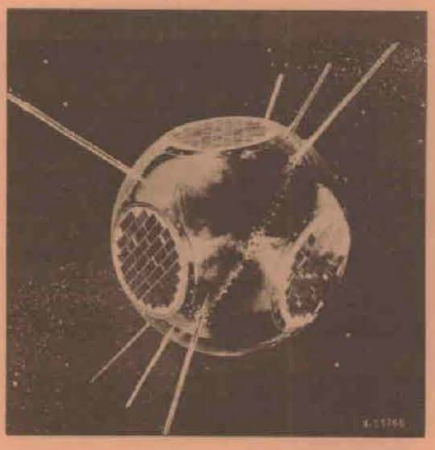
GIMRADA is continuing development of the geodetic SECOR system for accurately locating widely spaced positions on earth to improve mapping and to add to scientific knowledge of this planet's size and shape.

Capable of being tracked optically and electronically, the EGRS-5 is a 20-inch, highly polished aluminum sphere. It contains a SECOR transponder, an 8-channel telemetry subsystem, a power subsystem consisting of a battery and six solar cell plaques, de-spin and attitude control devices, and three sets of antennas.

The Army Map Service (AMS) operations in the Southwest Pacific area, where SECOR tracking stations are collecting data from the EGRS-1, will be provided additional capability by the elliptical pattern of rotation.

The height of the new satellite is expected to enable AMS to establish geodetic ties for distances greater than 2,000 miles while establishing a worldwide geodetic control net.

Radio signals between three SECOR stations in a known position, a fourth station in an unknown position and the satellites, provide ranging data used to compute accurately the position of islands separated by broad expanses of water from the stations on known positions.



## MICOM Saves $106 Million

**Cost reduction savings of $106 million during Fiscal Year 1965 were reported by the U.S. Army Missile Command or nearly three times the goal of $35.9 million.**

**Largest savings in Missile Command elements were as follows: equipment and supplies, $39.5 million; procurement and management of secondary items, $4.2 million; major items, $4.1 million; value engineering practices, $18.9 million.**

# GIMRADA Relocates 4 SECOR Tracking Stations

The August 1965 launch of a Type I SECOR geodetic satellite has precipitated the relocation of four tracking stations along the west coast and in Hawaii for a new experiment combining electronic and optical tracking.

Originating with the Army Corps of Engineers' Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA), Fort Belvoir, Va., the short-term experiment has been coordinated with the Smithsonian Astrophysical Observatory and its precise Baker-Nunn Tracking cameras.

One of the Army Map Service (AMS) sequential collation of range (SECOR) stations in its South Pacific geodetic operations was airlifted from Iwo Jima to the Hawaiian island of Maui.

Other stations trucked to new locations are those from Herndon, Va.; Charleston, Ind.; and Fort Stewart, Ga. (near Savannah). These were installed for the test period at Larson Air Force Base, north of Walla-Walla, Wash.; Fort Ord, near Monterey, Calif.; and in the San Diego, Calif., area near Cubic Corporation. Cubic is the manufacturer of the newest SECOR satellite.

At the conclusion of the optical-electronic tracking experiment next month, the four stations will be returned to their regular sites. Movement operations are controlled by the Electronic Satellite Tracking Division of Army Map Service at Herndon.

A Smithsonian Nunn-Baker camera is installed at Maui. A second camera is at Organ Pass (Las Cruces), N. Mex., serving as a double check on the accuracy of the satellite's position.

The elliptically orbiting Type I spherical satellite's highly polished aluminum surface makes it a perfect subject for the revolutionary Baker-Nunn cameras. These concrete-emplaced satellite-tracking instruments, about eight feet high, simultaneously track and photograph small objects at great distances. The Baker-Nunn photographed the 6-inch Vanguard satellite sphere at 4,000 miles.

Research and development people at GIMRADA gave this experiment the hybrid term "angulateration." It combines the triangulation of optical tracking with the trilateration of electronic tracking.

By using the combined ranging (measured distances) and optical data obtained at Maui, together with ranging data from the new west coast-located SECOR stations, a Hawaii-United States data link is established.

When current geodetic satellite tests have been completed, the Army Map Service will deploy SECOR ground stations overseas to give Department of Defense geodesists more expanded and accurate data for use by military map makers.

It is reported by GIMRADA that the angulateration experiment is being followed closely by investigators from other Federal agencies. It is held likely that additional participation is in the future.

Each of the four SECOR tracking stations moved consists of three shelters housing radio transmitter and receiver, data handling, and a storage shelter for test equipment and communications gear.