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Federal Agencies Weigh New DoD Form 1498 for Standard Tech Reports

Federal agencies wrestling with the knotty problem of adopting a standardized form for reporting scientific and technical information, as a basis for high-speed automatic processing and dissemination, are taking a hard look at the new Defense Department Form 1498.

DD Form 1498, titled *Research and Technology Resume*, is the gainful product of many months of intensive effort to resolve conflicting viewpoints on the type of information and the manner in which it should be presented.

Director of Defense Research and Engineering, Dr. Harold Brown, in memoranda dated Oct. 2, transmitted the final adopted version of DD Form 1498 to Assistant Secretaries of the Army, Navy and Air Force.

Simultaneously, the form was transmitted to the directors of the Advanced Research Projects Agency, Defense Atomic Support Agency, Defense Communications Agency, Defense Intelligence Agency, Defense Supply Agency and the National Security Agency.

The two memoranda provide for utilization of DD Form 1498 for two

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Concept of CIDS Exploratory Development Project Reviewed by Representatives of 48 Organizations

The concept of CIDS (Chemical Information Data System), an Army exploratory development project time-phased to build the basis for a decision on an operational network by 1967, was reviewed at a major conference Nov. 18-21.

Walter Reed Army Institute of Research, Washington, D.C., was host to 108 representatives of 24 Army organizations and 24 industrial, academic, Department of Defense and other Federal agencies. The meeting was the first CIDS general progress review since March.

Defense Director of Technical Information Walter M. Carlson keynoted the meeting by speaking on "Chemical Information Handling—Local and National Concepts." Much of his presentation was devoted to an off-the-record discussion of the Auerbach On-Site Survey, conducted during a period of nearly a year, to acquire user profile information as a basis for system design.

The survey report covered findings from 1,400 scientists, engineers and

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Statisticians Present Views On Design of Experiments

The Tenth Conference on Design of Experiments in Army Research, Development and Testing in Washington, D.C., Nov. 4–6, provided the setting for presentation of the initial Samuel S. Wilks Award to a noted Army mathematician and statistician.

The award to Dr. Frank E. Grubbs, now associate director of the U.S. Army Ballistic Research Laboratories and former chief of the Weapon Systems Laboratory at Aberdeen Proving Ground, Md., recognizes his distinguished achievements in ballistics research and in mathematical statistics.

More than 275 conference attendees, representative of Federal Government agencies and academic institutions, included a record number of internationally known statisticians who

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Samuel S. Wilks Award Presented at Design Parley

INITIAL SAMUEL S. WILKS AWARD WINNER Dr. Frank E. Grubbs (second from left), Mrs. Grubbs and their daughter Glenda pose with Deputy Chief of Research and Development Austin W. Betts and Dr. Ivan R. Hershner, Jr., chief, Physical Sciences Division, U.S. Army Research Office.

Featured in This Issue...

Explanation of 24-Page Edition

When the Army Research and Development Newsmagazine was expanded to 52 pages in July for a special issue on the biennial Army Science Conference and the 1964 R&D Achievement Awards, the result was a necessary reduction to 24 pages for this edition.

Under limitations imposed by Army Publications Board approval for publication, the Newsmagazine is restricted to 432 pages annually.

Army R&D Newsmagazine

Vol. 5, No. 12 December 1964

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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 the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; 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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By-lined Articles: Accuracy and relevancy of contents of this publication to accomplishment of the Army R&D mission are of constant concern to the editors. Primary responsibility for opinions of by-lined authors rests with them; their views do not necessarily reflect the official policy or position of the Department of the Army.

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Distribution requirements for the Office of the Secretary of the Army, Under Secretary of the Army, Assistant Secretary of the Army (R&D), Chief of Staff, Chief of Research and Development, and Chief of Information will be submitted by the Office of the Chief of Research and Development.

All other Department of the Army agencies should submit their requirements through channels to the Army Publications Distribution Center servicing them.

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U.S. Science Students Display Talent at Tokyo Fair

Three American high school science students showed their talents at the Eighth Japan Student Science Awards and Fair in Tokyo, Nov. 2-8, through U.S. Army, Navy and Air Force sponsorship in cooperation with promoters of the National Science Fair-International.

Japanese officials extended the invitation for a 10-day visit termed "Operation Cherry Blossom" through Science Service, Inc., an American non-profit organization which has administered the NSF-I for 15 years.

Support by the Army, Air Force and Navy, each of which selected its representative from the 15th NSF-I in Baltimore, Md., in May 1964, made it possible to accept the invitation. The three Services also supported United States representation at the Japan Student Science Awards for the first time in 1963.

Nancy Lee Williamson, 18, Bryan, Ohio, was the choice of the Army this year. Robert J. Brock, 17, Fort Worth, Tex., was selected by the Navy and Kevin J. Glading, Albany, Calif., was sent as the Air Force alternate when H. Grady Rylander III was unable to attend. They were escorted by Mrs. Dorothy Schriver, assistant director of Science Service, Inc., and Maj John B. Weber, Office, Chief of Information, Department of the Army.

The Japanese exhibition was sponsored by the Yomiuri Shimbun, one of Japan's leading newspapers, which also sponsors the sending of Japanese students to participate each year in the NSF-I in the United States.

During their visit to Tokyo the students resided with U.S. Air Force families at Fuchu Air Station as well as with Japanese families. In addition to showing their prize-winning exhibits at the Japan Student Science Awards, they also displayed and discussed them at the new Tokyo Science Museum.

"Immunological and Serological Studies of Plant Lectins as Related to Blood Grouping," shown by Nancy Lee Williamson, is a study that proves that extracts from seeds of certain plants can be used as a blood typing serum.

"Nuclear Quadrupole Resonance Effects," by Kevin Glading, showed that distorted nuclei can be made to absorb radio frequency energy under certain conditions. "Determination of Suppressor Gene Loci in E. Coli K-12," by Robert J. Brock, reported on the isolation of three suppressed auxotrophic mutants in bacteria.

While in Tokyo the students visited the Imperial Palace grounds, participated in discussion groups with Japanese students, visited Olympic Games facilities, and toured major manufacturing plants.

At the U.S. Embassy they chatted with the U.S. Ambassador to Japan, the Hon. Edwin O. Reischauer, Mr. John K. Emerson, Deputy Chief of Mission, and Dr. Carl Tolman, Science Attache. They also visited Headquarters, U.S. Army Japan, the Army's 406th Medical Laboratory near Camp Zama, and the American high school.

WINNERS OF 15th NSF-I, held in the United States in May, show newly acquired Japan Student Science Awards medals to Maj Gen Chester W. Clark, CG, U.S. Army, Japan. Left to right are Robert Brock, Navy representative; Nancy Lee Williamson, Army representative; General Clark; and Kevin J. Glading, Air Force alternate for Grady Rylander, III, who could not attend.

Federal Agencies Weigh New DoD Reporting Form

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separate and distinct purposes. One is that of program planning at project and task level; the other is for exchange of scientific and technical information at the work unit level, that is, reporting progress of on-going work.

The Department of the Army has initiated implementation of the new form to serve both purposes.

Dr. Chalmers W. Sherwin, Deputy Director of Defense Research and Engineering (Research and Technology), has termed implementation of DD Form 1498 one of the most important changes in technical information processing in more than a decade. Potential significance is considered far-reaching.

Indicative of the potentialities of the new form as a document for cooperative interagency effort in minimizing overlapping and duplication of research, development, testing and evaluation activities is a recent agreement between the National Aeronautics and Space Administration and the Department of Defense.

As reported in the September 1964 issue of this publication, page 1, "DoD, NASA Agree on Information Policy," certain common data elements of the new reporting system will be used to provide an interchange of information between these agencies at work unit level.

The Army's position of reporting On-Going Work at the Work Unit Level will be implemented in three phases:

- **Submission to DDR&E (through the Defense Documentation Center) of reports on all work units in RDT&E Research and Exploratory Development Categories on DD Form 1498 (hard copy) and in form of punched cards.**
- **Step-by-step testing evaluation of proposed computer-linked networks for automatic transmission and processing of DD Form 1498 data.**
- **Full implementation of electronic computer-linked networks and of the automated reporting program.**

All work unit reports are scheduled to be submitted to DDR&E in the new machine language form by July 1, 1965. The new work unit reporting system is expected to be fully operational by that date. A limited exchange of Army information with NASA in mutually agreed subjects is scheduled to begin Feb. 1, 1965.

A change to Army Regulation 705–12 is being published for dissemination to Army field activities to implement the use of the 1498 as a document for program planning purposes. The change rescinds all reporting requirements applicable to DD Form 613 (superseded by DD Form 1498) and substitutes instructions for using the new form.

In the program planning area within the Department of the Army research and development management effort, the new form will be the backup document associated with the annual budget and apportionment requests, beginning with the data submitted in support of the FY 1966 apportionment requests.

In the research category, Form 1498 will be used for describing planned programs at the project and task area level. In the management and support category, the form will be completed for all projects which were reported on the DD Form 613.

For projects in the Exploratory Engineering Development, and Operational Systems Development Categories for which the requirement for a Technical Development Plan has been waived, the DD Form 1498 will be completed for all projects and their associated task areas formerly reported on DD Form 613.

DASA Appoints Dr. Taylor Scientific Deputy Director

The Defense Atomic Support Agency has announced appointment of Dr. Theodore B. Taylor as a top assistant to DASA Director Lt Gen H. C. Donnelly.

As Deputy Director (Scientific) he will have prime responsibility in the field of nuclear weapon effects research and tests, including planning and management. He carries line and staff authority which was not the responsibility of the chief scientist, a position that was abolished.

Formerly he was senior research adviser and chairman of the High Energy Fluid Dynamics Department, General Atomic Division, General Dynamics Corp.

DASA is the joint services organization assigned primary responsibility for the logistical, technical and management aspects of Department of Defense nuclear weapons programs. Advice on nuclear matters is provided to the Secretary of Defense, Joint Chiefs of Staff and the military services.

Dr. Taylor, 39, received his B.S. degree in physics from the California Institute of Technology in 1945 and a Ph. D. in theoretical physics from Cornell University in 1954 after graduate work at the University of California (1946-49).

From 1949-56 he was on the staff of the Los Alamos (N. Mex.) Scientific Laboratory. There he was engaged in nuclear weapons design and interpretation of nuclear tests.

Joining the staff of General Atomic in 1956, he concentrated on conception of the TRIGA family of research reactors and Project ORION, which involved a series of nuclear explosions for the propulsion of space vehicles. He also served as a consultant to the Air Force Space Study Commission and the Air Force Disarmament Administration Panel on Outer Space.

Dr. Theodore B. Taylor

Army STINFO Briefing Given For Major Federal Agencies

Officials of the Department of State, Bureau of the Budget, Interstate Commerce Commission, Agency for International Development, U.S. Information Agency and the Arms Control and Disarmament Agency were briefed Nov. 24 on the Army STINFO Program.

Army Director of Technical Information Col Dale L. Vincent conducted the briefing at U.S. Army Research Office Headquarters, Arlington, Va. The purpose was to explain the Army Scientific and Technical Information Program, with emphasis on IDEEA (Information Development Experimental Exchange Activities).

Will Fazar and Bernard Urban expressed great interest in the Army program and in continuing contact to insure maximum use of progress as it may be applied to their project officer responsibilities for two BoB studies: "Operations Research Investigation of Decision-Making Processes in all Federal Regulatory Agencies" and "How to Improve Processing of Foreign Affairs Information."

Included in the latter category is information handled by the Department of State, Agency for International Development, U.S. Information Agency and the Arms Control and Disarmament Agency.

Deputy Assistant Secretary of State for Management Ralph Roberts headed a State Department group that included Curtis Fritz, Ed Harding, N. Spencer Barnes and Wesley Heraldson. Deputy Managing Director Ernest Weiss represented the Interstate Commerce Commission. John D. Wilde, director, Foreign Affairs Information Staff, headed the International Development Agency group.

CIDS Project Reviewed by Representatives of 48 Organizations

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administrators, out of a total of about 35,000 in the Department of Defense, regarding informational needs and methods of meeting them for research, development, test and evaluation. Since analysis and evaluation of the report is still in a preliminary phase, Mr. Carlson stressed that the findings cannot now be regarded as validated.

In designing a national network for chemical information and data acquisition, storage, processing and dissemination by high-speed automated methods, Mr. Carlson contended that the basic consideration must be the utilitarian value of the system with respect to cost. "If cost was excessive, would some people have the courage to say so?" he asked. "I would," he stated.

Army Director of Technical Information Col Dale L. Vincent also emphasized the need of taking a hard-headed practical approach to design of either an Army or a national network in speaking on "CIDS objectives." When user requirements can be reliably determined with respect to how well users are being served by traditional information processes, he said, network design considerations must be focused on effectiveness and economy.

Both Mr. Carlson and Col Vincent dwelt on the need of utilizing available scientific and technical information in general, and particularly in the field of chemistry, as a valuable commodity to facilitate the work of bench level scientists as well as planning and programing administrators.

"One viable CIDS concept," Mr. Carlson said, "is one that utilizes a central switching system to give users direct access to information sources. A systems analysis approach is basic to determination of precisely what is needed by way of system development." As currently conceived, the network would be centrally controlled and decentrally operated, built around available resources.

Peppino N. Vlannes, deputy to Col Vincent, was introduced by chairman Paul Olejar, the Army CIDS project officer, as one of the men most responsible for developing the current Army scientific and technical information program and the CIDS concept.

In discussing "CIDS in Review," Mr. Vlannes said that the concept of CIDS is that it should be a user-oriented cooperative network of specialized chemical information and data sources, connected by communication linkages and designed to provide maximum data resources and capabilities for the rapid exchange of information in a variety of forms as may be required.

A major consideration stated by Mr. Vlannes and later discussed at length by other speakers is the view that "the basic validity for establishing a CIDS network is not in the automation for automation's sake but, rather, to provide the ability to accomplish data correlations that cannot be done by any other means."

U.S. Army Materiel Command scientific and technical information activities in coordination with Department of Defense and other Services activities were discussed by Col C. T. Campbell, chief of the AMC Technical Data Office. His subject was "The AMC Integrated Technical Data Program."

The Materiel Command, he said, is working on a TDP (Technical Data Package) system utilizing DARE (Documentation Automated Retrieval Equipment) as well as on AVIS (Audio-Visual Information System) and is cooperating with the Department of Defense standardization program for information handling.

STINFO (Scientific and Technical Information), Col Campbell said, must be recognized with TLDI (Technical Logistics Data Information) as "one continuous program" for integrated development in the standardization program.

Materiel Command interest in more effective utilization of available scientific and technical information, the colonel stated, is backed by AMC's major contribution to the Army's overall effort—"about 80 percent of the total current funding and 77 percent of personnel engaged in the program."

Applause indicative of a cordial reception to the findings as reported was given to Miss Charlotte Smith of Frankford Arsenal when she told about the survey she conducted personally at 23 Army installations to determine information requirements and how well present sources are serving.

Like the Auerbach survey, her study was based on in-depth (two to four hours each) interviews of scientists and engineers. Findings, however, were based on questions directed to 82 employees, all in grade GS–11 or above. The report will be published and made available soon to selected Army sources.

Presentations on chemical information interests and activities were given by Charles DeVore, Office of Naval Research in Washington, D.C.,

Army R&D Leaders Briefed on ONR Activities

Objectives and operational procedures for the Office of Naval Research were explained to Director of Army Research Brig Gen Walter E. Lotz, Jr., and 11 other Army research officials Nov. 10 during a visit to the Office of Naval Research, Washington, D.C.

The orientation briefing was one of a series of meetings during recent months that have brought together Army, Air Force and Navy research leaders in the interest of better understanding, and with a view to improved coordination and integration of planning and programing of basic research.

Air Force and Navy research leaders have visited the U.S. Army Research Office in the Highland Building, 3045 Columbia Pike, Arlington, Va., for similar briefings on planning and conducting the Army research program. The Services have agreed that similar briefings will be held on a continuing basis as necessary.

Similarly, Chief of Army Research and Development Lt Gen William W. Dick, Jr., has engaged in a series of meetings with the Deputy Chief of Naval Operations (Development) and the Air Force Deputy Chief of Staff for Research and Development. Discussions on coordination of effort have probed ways and means to improve lateral communication and to achieve the most efficient use of available resources.

Rear Adm J. K. Leydon, Chief of Naval Research, was the principal speaker during the Nov. 10 briefing at the Office of Naval Research. "Research Coordination" was discussed by Dr. M. H. Schrenk, ONR Research Coordinator, and Dr. F. J. Weyl, Deputy and Chief Scientist, spoke on "ONR Objectives and Philosophy."

Army research leaders who accompanied General Lotz included Deputy and Scientific Director Dr. Richard A. Weiss, Assistant Director of Army Research Col W. L. Clement, Col John A. Ord, chief of the Research Division, R&D Directorate, U.S. Army Materiel Command, and Dr. John W. Dawson, chief scientist of the Army Research Office, Durham, N.C. Chiefs of each of the Army Research Office divisions and major offices were included in the group.

and Edward Dugger, Research and Technology Division, Wright-Patterson AFB, Dayton, Ohio. Maj Louis J. Zeleznikar, Computer Systems Directorate, Strategic Communications Command, explained the AUTOVON and AUTODIN worldwide networks being established and certain aspects of how they may be used for technical information needs.

Highlights of the concluding general session included a major address by Dr. George P. Hager, dean of the College of Pharmacy, University of Minnesota, on "The Value of Modern Methods in Chemical Information Handling."

A properly constructed automated network, Dr. Hager pointed out, can accomplish chemical information requirements by high-speed computer search techniques that cannot be met by traditional methods no matter how prodigious an effort may be made.

For example, he cited how, by permutation, a search of 13,000 possible sources of bits of information needed to solve a critical structure-activity relationship problem could be rapidly and comprehensively accomplished in an efficiently designed CIDS network.

Also at the final session, Alfred Weissberg, Department of Health, Education and Welfare, explained Food and Drug Administration chemical information activities and interest in the possibilities of a national CIDS network.

Dr. Franc A. Landee, Dow Chemical Co., reported on "Results of Wiswesser Notation Encoding Tests" and Tad Murray of Redstone Arsenal, Ala., presented a "Review of Systems." Kenneth Zabriskie, director of research for Chemical Abstracts Service, discussed "Some Statisical Studies on the size of the Backlog File to Permit Design of Required Machine Storage.

Demonstration of the Army Chemical Typewriter (ACT) at Sol Herner and Co., Washington, D.C., where ACT is being used to put into a file the diagrams of 65,000 structures of compounds, impressed conference participants with the potentialities of the machine for the CIDS network. The work is being done with files of the Chemical, Biological and Coordinating Committee of the National Academy of Sciences.

The ACT, it was pointed out, has the capability of being the basic device for encoding requirements using the Wiswesser, the International Union of Pure and Applied Chemistry (Dyson cipher) and the U.S. Patent Office (Haward cipher) encoding systems.

Reports on certain "leap frog advances" in automated processing of chemical data were made at the conference, such as machine checking of input ciphers and notations and the development of matrix or connection tables which could be used to relate a variety of input-structural diagrams, ciphers and notations, and manually devised tables.

Consideration was given to requirements of low-volume users in relation to large-scale network operation as envisioned for the Army CIDS. The relationships of all users to mission-oriented information centers were discussed at technical sessions.

Progress reports on the five phases of activities into which the CIDS exploratory development project is organized were made by chairmen of each of the groups. Col Ernest A. Nagy, STINFO project officer for The Surgeon General, who also was in charge of arrangements for the excellent accommodations provided at WRAIR for the conference, reported on Phase I.

Phase II was discussed by James P. Mitchell, director of technical services at the Chemical R&D Laboratories, Edgewood Arsenal, Md. The Phase III report was given by Scott Schriver, Army Electronics R&D Laboratory, Fort Monmouth, N.J. Howard (Tad) Murray of Redstone Arsenal, Ala., told of the progress on Phase IV and Sylvan Eisman of Frankford Arsenal, Philadelphia, Pa., gave an accounting on Phase V.

Dr. David Jacobus of Walter Reed Army Institute of Research, a leader of the team that developed the Army Chemical Typewriter, presided at a panel discussion on user requirements as a basis for consideration of the CIDS network design. The major contributions to this session were made in presentations by Dr. Bernard P. McNamara, chief, Toxicology Division, Chemical R&D Laboratories, Dr. Eli Freedman of the Ballistics Research Laboratories, Aberdeen Proving Ground, Md., and Dr. E. A. Metcalf, Industrial Liaison officer, Edgewood Arsenal.

A common format for supplying chemical structures to the processing centers for an experimental network was established at technical sessions led by James Mitchell. The first steps also were taken toward definition and possible codification of "hard Core" and information center data categories at a session led by Glenn Bryce of Edgewood Arsenal.

The relationships and concepts of several approaches in development of tables of nodes and connectors describing chemical structure diagrams in computer storage were explained in discussion led by Dr. Jacobus.

Other technical topics included algorithms for searching chemical compound structural analogs and descriptions of chemical holdings at various Army activities that would provide the nucleus for chemical information centers in the CIDS net.

Representatives of the Director of Defense Research and Engineering, the Office of Naval Research, the Air Force and Defense Documentation Center attended the conference. Present also were high-ranking officials of numerous other agencies, including Assistant Commissioner Ezra Glaser of the U.S. Patent Office.

Among the major Federal agencies represented were the National Bureau of Standards, National Academy of Sciences, National Science Foundation, U.S. Public Health Service, Department of Health, Education and Welfare, Department of Agriculture, National Aeronautics and Space Administration, and Food and Drug Administration.

Army Medical Research and Development Command leaders who attended included Brig Gen Robert E. Blount, CG; Col Colin F. Vorder Bruegge, deputy commander, who extended the welcome of The Surgeon General and the Medical R&D Command; and Col William Tigertt, director of Walter Reed Army Institute of Research.

Mrs. Hector R. Skifter receives Department of the Army Outstanding Civilian Service Award honoring her late husband. Until his death July 25, 1964, Dr. Skifter was a distinguished member of the Army Scientific Advisory Panel, headed the Skifter Committee and its Report on Army In-House Laboratories, which had a profound impact on Army research management, and distinguished himself in many other ways during his 22-year Federal career. Lt Gen William W. Dick, Chief of Research and Development, made the presentation, which was witnessed by ASA (R&D) Willis M. Hawkins and other prominent Army and Defense officials.

Army Floating Nuclear Power Plant Over 60 Percent Completed

The U.S. Army-developed floating nuclear power plant, expected to be the first of its kind in the world when it becomes operational late in 1965, over 60 percent completed.

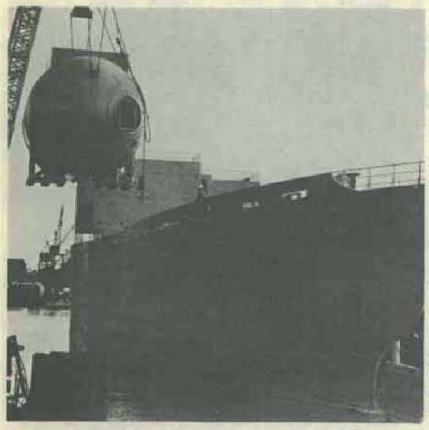
Announcement that rapid progress is being made on construction came in mid-November from the Office of the Chief of Engineers. Designated the MH–1A, the floating plant is designed to produce 10,000 kilowatts of electricity in support of forces operating in port, on shore, or in waterways.

Emergency support of military installations or civilian communities in time of disaster also will be possible with the MH–1A. It will be capable of supplying enough electrical power for a city of 20,000 population.

The MH–1A represents the current state-of-the-art for nuclear power plants. It is the newest in the family of plants developed by the U.S. Army Nuclear Power Program, in coordination with the U.S. Atomic Energy Commission, to meet a broad variety of military requirements, particularly for remote areas.

Consisting of a pressurized water nuclear reactor and associated power generating equipment mounted in a modified Liberty Ship, the *S.S. Charles H. Cugle*, the MH–1A is the first to join nuclear power components with a floating mount to provide a mobile unit of great flexibility.

Construction of the MH–1A began in February 1963, following award of a $15,837,643 contract to Martin-Marietta, parent organization of the Martin Co., of Baltimore, Md., prime contractor on the MH–1A, in December 1962. Shipyard work is being performed by the Alabama Dry Dock and Shipbuilding Co., Mobile, Ala.



WORLD's FIRST floating nuclear power plant is moved into position under a massive 350-ton steel container designed to house a nuclear reactor. The container—the largest ever completely fabricated in a shop or factory—was lowered into the hold of a reconditioned Liberty Ship at Avondale Shipyards, Inc., New Orleans, La.

To modify the Liberty Ship hull for adequate protection of nuclear components in the event of collision or grounding, a new mid-body, 212 feet long, was fabricated and joined to the bow and stern sections. This new section will house the reactor and generating equipment.

The original superstructure was removed and a new superstructure installed to provide limited berthing, messing, sanitary, laundry and recreational facilities for 10 persons, who will have custody of the vessel while in transit. Normally, the MH–1A will require a crew of 48 when operating.

The ship's propulsion machinery was also removed. A pilot house will be furnished complete with all equipment for control of the vessel when it is being towed.

Installation of the nuclear component containment vessel was the next major step in construction. For this operation, it was necessary to tow the completed hull from the shipyard in Mobile to New Orleans, where a 500-ton crane was available for lifting the containment vessel aboard.

The containment vessel (43 feet long, 31 feet in diameter, and weighing approximately 300 tons) was fabricated in Baton Rouge, La., and floated down the Mississippi River to New Orleans, where it was lifted aboard and installed in the Liberty Ship hull.

The MH–1A was returned to Mobile for installation of ships fittings, power components, and the reactor. The reactor core being fabricated in the Martin Co. plant in Baltimore, Md. is about 55 percent complete.

Deck transmission line towers will be provided for connection to aerial transmission lines leading to the shore installation requiring service. The hull will also accommodate attachments for an underwater transmission cable.

Following completion of the MH–1A in the summer of 1965, it will be towed to a test site to be prepared at Fort Belvoir, Va., where it will undergo approximately six months of intensive testing under the direction of the contractor.

Testing will be monitored and controlled by the Army Nuclear Power Program's Nuclear Power Field Office, which will assist the Philadelphia Army Engineer District in the evaluation and acceptance of the plant.

In the background of the MH–1A are several conventional oil-fired floating power plants, four of which were built during World War II. These were the RESISTANCE, IMPEDANCE, INDUCTANCE and the SEA POWER, all 30,000 plants. The first of these plants was completed and ready for testing in July 1943.

After the war, the Navy built the YFP–10, a 35,000 power plant converted from a surplus CI–M–AVI cargo vessel. This plant is presently operating at Thule, Greenland.

In the mid-1950's the Army Corps of Engineers, as part of its overall Nuclear Power Program, conducted engineering studies into the feasibility, economic, logistic and practicable, of building a floating power plant having, as its principal energy source, a nuclear reactor.

LAG Holds First Meeting To Establish Procedures

The U.S. Army Materiel Command Laser Advisory Group (LAG) held its first meeting recently to establish administrative and operating procedures and discuss means of developing a more effective Laser R&D program.

Consisting of representatives from the AMC's major commands and laboratories, the LAG is responsible for providing advice, planning and executing various parts of the Army's overall Laser Program.

Brig Gen Tobias R. Philbin, Jr., AMC deputy director for Research and Development, emphasized the important role the group is expected to take in furnishing advice and recommendations on the program.

Formation of working groups to achieve the best possible technical excellence in carrying out LAG's functions was discussed. Groups will consist of Army specialists in Laser effects, propagation, materiels, high energy, countermeasures, devices, techniques and applications.

Methods of acheiving a more complete and timely interchange of technical information among Army laboratories were studied, and plans for a consolidated Army-wide Laser program report were completed. The report is expected to be ready for distribution to all Army R&D establishments by January 1965.

Harold G. Blodgett of Headquarters, Army Materiel Command is chairman of LAG and Bernard Louis of the U.S. Army Electronics Command is executive secretary.

STRATCOM Establishes Subordinate Commands, USASCC Europe, Pacific

The U.S. Army Strategic Communications Command (STRATCOM) announced in mid-November the establishment of two subordinate commands—USASCC–Europe, headquartered in Neue Kaserne, Schwetzingen, Germany, and USASCC–Pacific, headquartered at Schofield Barracks, Oahu, Hawaii.

Under the command of Col Irving R. Obenchain, USASCC–Europe executes the Command's strategic communications mission in Europe. It provides unified and Army commanders with strategic communications, engineering, installation and maintenance support.

A 1942 graduate of the U.S. Military Academy, Col Obenchain was formerly assigned to the Army's Test and Evaluation Command as director of Electronic Testing at Aberdeen Proving Ground, Md.

His military schooling includes the Signal School at Fort Monmouth, N.J., the Command and General Staff College, and the Industrial College of the Armed Forces. He earned his master's degree in electrical engineering from Massachusetts Institute of Technology (MIT) in 1951.

USASCC–Europe includes the former European Field Office at Heidelberg and the 22nd Signal Group at Mannheim, Germany; the 106th Signal Group at Camp Des Loges, France; and three major STARCOM relay centers located at Pirmasens, Germany, Saran, France, and Leghorn, Italy.

USASCC–Pacific, whose mission is similar to its counterpart in Europe, is commanded by Col Latimer W. MacMillan, former chief of the Signal Branch, Office of Personnel Operations, Department of the Army Headquarters.

The subcommand includes STRATCOM's former Pacific Field Office and personnel who operate the Army Satellite Commmunications Agency's test stations in the Philippines, Hawaii and Saigon.

Other elements include the Strategic Army Command (STARCOM) relay centers located in Hawaii, Okinawa, Taiwan, Saigon and Viet Nam. The relay centers at Bangkok and Udorn in Thailand were transferred, with the Pacific ionospheric scatter system, from U.S. Army, Pacific (USARPAC) control to STRATCOM on Nov. 3. At a later date, the STARCOM facilities in Korea will be transferred to STRATCOM.

Col Latimer W. MacMillan

Col Irving R. Obenchain

Col MacMillan is a 1939 electrical engineering graduate of MIT, received a master's degree in personnel management from George Washington University in 1959, and is a graduate of the Command and General Staff College and the Naval War College.

Established in March of this year as the Army's newest major field command, STRATCOM held its first annual Commander's Conference, Nov. 6, at headquarters in Washington, D.C.

The meeting was attended by the new commanders as well as the commanders and representatives of the Middle East, Central America and the Continental United States.

STRATCOM's commanding general, Maj Gen Richard J. Meyer, who presided at the meeting, pointed out that strategic communications is becoming "an ever more decisive factor in the conduct of military affairs," adding that "success in global communications . . . results from determined leadership, adaptiveness to change and teamwork."

DoD Publishes Coding Manual for MILSTAAD

A coding manual for the Military Standard Activity Address Directory (MILSTAAD) to improve logistics operations of the Military Services was published in November by the Department of Defense.

The MILSTAAD code system will permit rapid determination, through automated processes, of the activity and location from which the order came, who will pay for the material, and which airport or water port is best equipped to receive the shipment if the point of delivery is overseas.

Computers will be used to determine the nearest point having the material available, to effect maximum consolidation of orders, and to minimize transportation costs.

MILSTAAD is scheduled to be put into use July 1, 1965 by the Defense Supply Agency, Army, Navy, Air Force, Coast Guard, Marine Corps, General Services Administration, and other Defense agencies. Initially 22,000 Department of Defense and contractor activities will be listed.

The Directory was prepared in both printed form and in machine-processable formats (punched card or magnetic tape containing codes, clear text addresses and related address information. The coding manual is the work of a joint Ad Hoc group, headed by the Defense Supply Agency.

Under MILSTAAD, lengthy addresses will be coded for automated requisition transmission and inventory processing. The address codes will be instantly translated back to clear text addresses for shipping labels.

The standard address codes furnished by MILSTAAD will play an important part in augmenting existing standard logistic documentation procedures such as MILSTRIP (Military Standard Requisition Issue Procedure) and MILSTAMP (Military Standard Transportation and Movement Procedure).

Col Johnston Named Acting Chief Biological Agent Defense Division

Col George W. Johnston, MSC, has been assigned acting chief, Chemical and Biological Agent Defense Division, U.S. Army Research and Development Command, Washington, D.C.

Awarded a bachelor's degree in chemistry from Marshall University, Huntington, W. Va., and an M.S. degree in biochemistry from the State University of Iowa, he followed with three years of graduate study at the University of Iowa. He is backed by more than 22 years with the Army Medical Service.

U.S. Army Medical Corps Personnel Win 6 of 9 ASM Awards

U.S. Army Medical Corps personnel won six of the nine major awards made to Federal Government personnel for outstanding contributions to advancement of medical science at the recent 71st Annual Meeting of the Association of Military Surgeons in Washington, D.C.

More than 3,000 participants witnessed the awards ceremonies and listened to presentations on a variety of subjects based on the general theme of the conference, "Military Progress Through Scientific Achievement." (See October issue, p. 13, for schedule of speakers.)

DR. HENRY D. PRATT, a medical entomologist at the Communicable Disease Center, U.S. Public Health Service, Atlanta, Ga., received the *Gorgas Medal* in recognition of his outstanding contributions to preventive medicine.

Consisting of a silver medal, citation and an honorarium of $500, the award is given by Wyeth Laboratories of Philadelphia in memory of Maj Gen William Crawford Gorgas, an Army doctor whose work in preventive medicine made possible the construction of the Panama Canal.

Dr. Pratt achieved national and international recognition for his research work in the development of a Medical Entomology Museum and the production of teaching literature and training aids dealing with the control of vector-borne diseases. Of special importance were the pictorial keys used to help workers identify insects precisely and safely.

DR. RICHARD M. FOLLIS, Jr., chief of the Nutritional Pathology Branch, Armed Forces Institute of Pathology (AFIP), was presented the *McLester Award* for outstanding work in the field of nutrition and dietetics.

Given by the J. B. Roerig Co. Div., Charles Pfizer and Co., of Brooklyn, the award honors the memory of Col James Somerville McLester, who gained special recognition during World War I as nutritional consultant to the Surgeon, American Expeditionary Forces. It consists of a bronze plaque and an honorarium of $500.

Dr. Follis served on a U.S. Army nutritional survey in Viet Nam (1959) and Thailand (1960) and has been active on a number of National Research Council committees and subcommittees. He is the author of two textbooks and numerous papers on nutritional diseases.

In World War II he served with the Medical Corps of the Army Air Force. Certified by the American Board of Pathology, he has served as an assistant professor of pathology at Duke University and Johns Hopkins, and professor of pathology at the University of Utah. He joined the AFIP in 1955.

COL ERNEST A BRAV, U.S. Army Medical Corps, who retired as chief of the Orthopedic Service, Walter Reed General Hospital (WRGH) at the end of April, received the *Sir Henry Wellcome Medal and Prize.* Col Brav is now on the staff of the Student Health Service, University of Maryland.

The award was established in 1916 by Sir Henry Wellcome for the best essay on a military medical subject submitted in a competitive contest. Col Brav's article on "The End Results of Fractures of the Os Calcis" will be published in the Association's Journal, *Military Medicine.* The award consists of a silver medal, scroll and honorarium of $500.

During World War II, Col Brav served in the China-Burma-India Theater. After two years at the Veterans Administration Hospital in Louisville, Ky., he returned to the Army in 1948 as chief of the Orthopedic Service, Tripler General Hospital, Hawaii. In addition to orthopedic assignments in Europe, Letterman in San Francisco, and Madigan in Tacoma, Wash., he was at Walter Reed from 1953–56, and again from 1962 until he retired.

COL WILLIAM H. CROSBY, director of the Department of Medicine, Walter Reed Army Institute of Research (WRAIR), received the *Stitt Award* for his development of the biopsy capsule for diagnosis of intestinal mucosal lesions and for his

Dr. Bushey Named AMC Assistant Chief Scientist

U.S. Army Materiel Command Chief Scientist Dr. C. M. Crenshaw has announced the appointment of Dr. Gordon Lake Bushey as assistant chief scientist.

Activities of Dr. Bushey to improve the "already high quality" of AMC professional personnel, as explained by Dr. Crenshaw, will include frequent conferences with commanders, chief scientists and technical directors of each of AMC's commodity commands and laboratories to consider key problems. Evaluation of AMC's project managership system is another objective.

Dr. Bushey formerly was assistant for scientific affairs in the Office of the Defense Adviser, United States delegation to NATO, and chemical-biological-radiological adviser to the U.S. Defense Representative, North Atlantic and Mediterranean Areas.

As a physical science administrator, he served as assistant to the Deputy Chief Chemical Officer for Scientific Activities. Before the 1962 Army reorganization, he was deputy chief, Research and Development Division, Office of the Chief Chemical Officer.

Dr. Bushey advised the Chief Chemical Officer on science and technology relations with Department of Defense elements, other Government agencies and civilian scientific organizations. He also represented him before the Defense Science Board, the Army Scientific Advisory Panel, and the President's Science Advisory Committee.

In 1959 Dr. Bushey was the first technically trained and active civilian research and development specialist to represent the Army and Defense Departments at the National War College.

Prior to coming to Washington, he spent six years in research and teaching in physical and inorganic chemistry at Rice University and the University of Illinois.

Dr. Bushey has served as chairman of a technical session at three biennial Army Science Conferences. He was honored by the District of Columbia Engineering and Architectural Societies, the Washington Section of the Institute of Radio Engineers, and the Washington Academy of Sciences as an outstanding young scientist at the 1956 Engineer and Architects Day.

Dr. Gordon L. Bushey

inspirational leadership in teaching his younger colleagues.

The award honors the memory of Rear Adm Edward Rhodes Stitt, a former Surgeon General of the Navy, who made outstanding contributions in the field of tropical medicine, and is presented through the courtesy of Pfizer Laboratories of Brooklyn. It consists of life membership in the AMS, a bronze plaque and honorarium of $500.

Col Crosby earned an M.D. degree from the University of Pennsylvania in 1940, accepted an Army commission, and interned at WRGH. During World War II, he was a regimental surgeon with the 85th Infantry Division in Italy, later returning to Brooke General Hospital for residency.

He was granted a Research Fellowship at Pratt Diagnostic Hospital in Boston (1949–50), and followed it with a year at the Queen Alexandria Military Hospital in London. In 1951, he was appointed chief of the Department of Hematology at WRAIR, and became director of the Department of Medicine in 1959.

JERROLD MARK MICHAEL, chief, Office of Special Staff Services, Division of Indian Health, U.S. Public Health Service, won the *John Shaw Billings Award.*

The award is given annually by the Eaton Laboratories Division of the Norwich Pharmacal Co., to honor the Army Doctor who originated the Index Catalogue of Medical Literature and drew the plans for the Johns Hopkins Hospital buildings.

The award is a scroll and honorarium of $500. The recipient must be a member of the Federal Medical Service, under 41 years of age, who has demonstrated outstanding executive leadership in medicine.

At 37, Jerrold Michael has published 25 scientific articles on sanitation, received several awards and citations for sustained superior performance, outstanding contributions to the field of environmental health, and served as Deputy U.S. Representative, NATO Medical Committee in Paris, France.

He has a bachelor's degree in civil engineering from George Washington University, and an M.S. degree in sanitary engineering from the Johns Hopkins University and a master of public health degree from the University of California.

An article on "A New Theory on Shock," published in *Military Medicine*, March 1963, won the *Major Louis Livingston Seaman Award* for Walter Reed Army Medical Center's COL ROBERT M. HARDAWAY, III, and DR. DALE G. JOHNSON.

Given annually from funds left to the Association by Maj Seaman for the best article published in its journal during the preceding year, the award consists of a scroll and honorarium of $160.

Col Hardaway has been the director of the Division of Clinical Surgery, WRAIR, since 1960. At the time the article was written, Dr. Johnson was an Army captain, serving as a surgical research investigator in the Department of Experimental Surgery. He is now a resident in pediatric surgery at Children's Hospital in Philadelphia. Both authors are Diplomates of the American Board of Surgery.

Col Hardaway joined the Army in 1939 on graduation from Washington University School of Medicine in St. Louis. He served in the Pacific during World War II, took his surgical residency at Madigan (Tacoma, Wash.) and Fitzsimons (Denver) General Hospitals, and has headed the Surgical Service at Fort Belvoir, Va., the 97th General Hospital, Frankfort, Germany, and Fort Benning, Ga., before joining Walter Reed. His articles have been appearing in professional journals since 1944.

Dr. Johnson, a Phi Beta Kappa, graduated with high honors from the University of Utah College of Medicine in 1956. He served his internship and residency at Massachusetts General Hospital and joined WRAIR for two years active duty as a surgical research investigator.

MAJ THOMAS W. SHEEHY, assistant chief of Gastroenterology, WRAIR, received the *Sustaining Membership Award* consisting of a scroll and a $500 honorarium. The award is given annually by the Sustaining Membership Group to an individual in the U.S. Government Medical Service who has made some outstanding contribution to the field

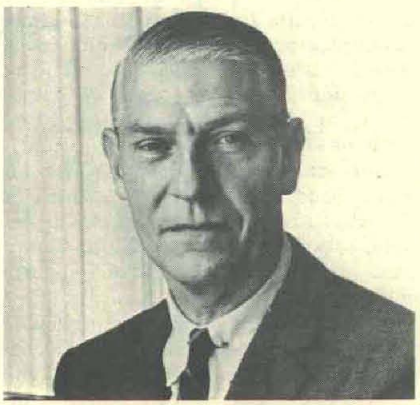
(*Continued on page 20*)

R&D Reservist Reviews Medical Research Abroad

An exceptionally distinguished U.S. Army R&D Reservist, Dr. Gustave J. Dammin, professor of pathology at Harvard University Medical School, recently spent 24 days abroad visiting medical research facilities.

A full colonel in U.S. Army Reserve R&D Unit No. 1001, Boston, Mass., Dr. Dammin is Pathologist-in-Chief at the Peter Bent Brigham Hospital, president of the Armed Forces Epidemiological Board and a member of the Expert Advisory Panel on Enteric Diseases of the World Health Organization (WHO). He made the tour under the auspices of the latter two organizations.

Dr. Dammin lectured and reviewed research programs primarily in the fields of kidney disease and kidney transplantation and diarrheal diseases. He visited Switzerland, Yugoslavia, Egypt, India, East Pakistan, Malaya, Thailand and the British Crown Colony at Hong Kong.



Dr. Gustave J. Dammin

In Switzerland, he visited the WHO offices concerned with the work of the Committee on Enteric Diseases and served as a consultant for a motion picture concerned with tissue transplantation.

He also conferred with scientists who have compiled case studies on interstitial nephritis, thought to be related to the use of analgesics.

In Dubrovnik, Yugoslavia, he presented a paper on the pathology of endemic nephropathy in Southeastern Europe.

In Cairo, Egypt, he visited the U.S. Naval Medical Research Unit, where in 1963 he assisted in setting up a study of diarrheal disease. He divided his time in India and East Pakistan between Calcutta and the cholera laboratory of the Southeast Asia Treaty Organization (SEATO) in Dacca.

Dr. Dammin's laboratory at the Harvard Medical School has been in communication with members of the Dacca Hospital laboratory, where attempts are being made to isolate enteroviruses from patients with cholera or other diarrheal diseases.

He concluded his tour with visits to the U.S. Army Research Laboratory at Kuala Lumpur, Malaya, conferences with the SEATO group (including a sizeable group of distinguished U.S. Army medical research scientists) in Bangkok, Thailand, and a study of cholera control procedures in the British Colony at Hong Kong.

U.S. Army Role in Laser Development, Future Potential Discussed

By Charles S. Porter
Physical Sciences Division, USARO

Research in Review...

Charles S. Porter, a solid-state physicist with the U.S. Army Research Office, Physical Sciences Division, since May 1964, was formerly a leader of an Applied Laser Group at the Harry Diamond Laboratories, Washington, D.C. Beginning as a physical chemist in 1952, he moved into solid-state physics and concentrated on Laser research and development.

After graduating from Baylor University with a B.S. degree in chemistry (1948), he worked as a graduate assistant in physical chemistry at Purdue University for two years, then served in the U.S. Army before beginning Federal service.

He is the author of over 30 scientific papers on materials, microwave phenomena, and Lasers.

Charles S. Porter

A great deal has been said and done in the study and application of Lasers in the few years since the successful operation of a Laser was achieved in 1960. Lasers have been described in glowing terms as well as in disparaging terms, and been called "a solution in search of a problem" by T. H. Maiman, the scientist who first observed Laser operation.

Others have spoken of the Laser as an exciting breakthrough more promising than the transistor, capable of accounting for X fraction of the gross national product by the year Y, and capable of revolutionizing Z industries; or that the Laser is the most important scientific tool to be discovered in the past 50 years. One measure of the glamour of the subject is that this magazine prints Laser articles at a rate of about one a month.

The purpose of this article is to trace some of the history of the Army Laser program, to point out some achievements, past and present, and to evaluate certain predictions for the future.

Lasers provide concentrated, highly directional single-frequency light beams. The word Laser is an acronym coming from the first letters of the phrase "*l*ight *a*mplification by stimulated *e*mission of *r*adiation."

The process of controlled stimulated emission can be made to occur in several different media, leading to different characteristics and configurations. In a gas Laser (Fig. 1, top), excitation occurs by coupling radio frequency or direct current electrical power into the gas to produce excited atoms which decay with an accompanying emission of light. The Laser takes the form of a gas-filled tube with partially transmitting mirrors at the ends. The light energy is contained by the mirrors in a direction along the axis and builds up in intensity to a threshold level, at which further emitted light along the axis is stimulated in an avalanche of decay from other excited atoms.

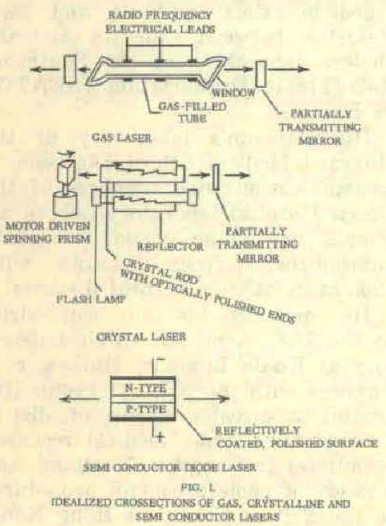


FIG. 1.
IDEALIZED CROSSECTIONS OF GAS, CRYSTALLINE AND SEMI CONDUCTOR LASERS

One of the most widely used gases is a mixture of helium and neon, but numerous other combinations of gases have been used and many wavelengths have been found at which Laser action occurs, ranging from the infrared through the visible to blue. In fact, it is feasible that any gas will exhibit Laser action with pulsing techniques. If the mixture is excited strongly enough, there will be some output from decays that can be made to amplify and oscillate.

In a crystalline Laser, (Fig. 1, center), the active medium is a crystal containing the excitable ions as a dopant, excited or pumped by high intensity light from a flash lamp. Examples are ruby (aluminum oxide doped with chromium), calcium fluoride doped with uranium or samarium, and calcium tungstate doped with neodymium.

Important exceptional examples include neodymium in glass, which is not crystalline, and the recently developed neodymium in yttrium aluminum garnet, which does not require high-intensity pumping.

In a semiconductor junction diode Laser (Fig. 1, bottom), the light output occurs due to the decay of an electron-hole pair, in the volume intervening between N-doped and P-doped regions of a single crystal semiconductor host. The electrons and holes are supplied by electrical leads attached to opposite sides of the junction. The most prominent example of semiconductor Laser material is gallium arsenide, but other analogous materials and solid solutions have produced Laser action.

In both the crystalline and diode Lasers, the mirrors may take the form of reflective coatings applied directly onto the optically polished ends of the crystals or they may be mounted separately.

With suitable power levels, mixing and doubling of Laser frequencies can be achieved, so that coherent radiation is available from the infrared up to the ultraviolet.

BACKGROUND. Insofar as the Laser depends on stimulated emission, it has much in common with the stimulated nuclear decays of atomic bombs and nuclear reactors and of the transitions between discrete energy levels of electrons or atoms in a radio-frequency Maser (*m*icrowave *a*mplification by stimulated *e*mission of *r*adiation).

The name of "optical Maser" instead of Laser has strong justification. The difference between a Maser and a Laser (or optical maser) are important to understand in a recitation of the developments of the time. The Maser controls and contains the stimulated microwave emission in a single (or a few) modes (directions) of energy by confining the energy within properly sized conducting boxes or cavities and constraining it to flow through conducting pipes or waveguides. This containment and control is important in producing the

coherence in the microwave signal.

The equivalent function in a Laser is performed by the mirrors, which do not contain all the fluorescent energy, but only that which is emitted in the proper direction to be reflected in a repetitious path as, for example, along a single path between two opposing parallel mirrors.

In the early 1950s shorter-than-millimeter-wavelength coherent stimulated emission from a Maser seemed unattainable because of the small cavity dimensions required. In 1956 the idea of using mirrors at reasonable separations was proposed in a celebrated paper by C. H. Townes and A. L. Schawlow.

Another difficulty lay in the necessity for discovering atomic systems with energy storage processes able to produce enough output to overcome the losses of the cavity.

Study of the principles of stimulated emission, the arrangement of energy levels of the electrons of atoms, and the effect of crystal hosts had received wide attention in the Army program in connection with Masers for high-sensitivity radar systems, for high-stability frequency control, and in other microwave device applications.

Leaders of work in these fields could be found at the U.S. Army Signal Research and Development Laboratory (now the Army Electronics Laboratories) at Fort Monmouth, N.J., at the Ordnance Materials Laboratory (now the Army Materials Research Agency), at Watertown Arsenal, Mass., at the Diamond Ordnance Fuze Laboratories (now the Harry Diamond Laboratories) at Washington, D.C., at the Office of Ordnance Research (OOR, now the Army Research Office) at Durham, N.C. and in contract work supported by OOR.

Capability in equipment and systems development, functional electronic circuitry, and electronics microminiaturization existed at the above laboratories and at the Army Ballistic Missile Agency and the Army Guided Missile Agency (now combined in the Army Missile Command) at Redstone Arsenal, Ala. Since World War I there had been work in optical components technology at Frankfort Arsenal in conjunction with fire control apparatus such as binoculars, periscopes, gunsights and rangefinders.

The above agencies are now under the Army Materiel Command, which coordinates the work and makes mission assignments.

ARMY PROGRAM. The Army Program in Lasers follows the normal and proper course from basic research through exploratory development to advanced development programs. The general basic research in generation, modulation, propagation and reception flows into oriented basic research. Thus at the Army Research Office–Durham, the military theme in Lasers identifies the oriented basic research. The basic research carried out at Army laboratories flows into a Laser research project, which in turn supports work of an exploratory development nature related to Army functional areas. The exploratory development programs would feed advanced development programs. Some examples follow.

RANGEFINDERS. The serious need of an artilleryman's ability to range on field targets accurately has long been recognized. The Laser offered the possibility of ranging since it was able to transmit a high concentration of energy to a distant target. The distance could be determined by measuring the time of transit from the Laser to a chosen target, and back to an optical receiver.

Prior radar work and new computations showed that the range and range accuracy would be seriously limited by the fact that the pulsed ruby Laser output of 1961 was composed of a random series of bursts. Discouraging attempts were made to devise complicated electronic correlation systems to compare the returned pattern of spikes with those transmitted.

Fort Monmouth researchers first conducted the brilliant experiments with rapidly spinning mirrors, or prisms acting as mirrors, showing that energy could be stored in the crystal until the mirror came into alignment whereupon a large portion of the energy would be emitted in a single burst of much greater amplitude.

The process of energy storage and release came to be called Q-switching. The spinning mirror was the least sophisticated of several means of Q-switching. Other less well understood systems were attractive because they operated without moving parts.

One of the systems that deserves comment was the early "shaded ruby" Q-switch investigated at Frankford Arsenal. In design, it was composed of a piece of ruby shaded from the flash lamp illumination, but included between one of the mirrors and the excited ruby. The shaded ruby absorbed a part of the fluorescence from the excited ruby, holding back the build-up of optical energy between the mirrors during pumping, while the amount of energy being stored in the excited atom was increasing. Finally the shaded ruby was sufficiently bleached, as its chromium atoms were raised to the non-absorbing excited state, to allow oscillation, and a large single pulse was emitted.

The size of the shaded ruby and the concentration of chromium in principle could be adjusted to optimize the output characteristics. Although there were unresolved difficulties in this early work, it was the forerunner of the very useful bleachable dye Q-switches, which have proved very successful in recent work at International Business Machine laboratories supported by the U.S. Army Research Office–Durham, N.C.

A "bird in the hand" decision was made at Frankford Arsenal: the more advanced Fort Monmouth Q-switching technique was combined with the Frankford optics capability in work that led to a laboratory feasibility demonstration of a breadboard Laser suitable for rangefinding. In FY 1963 an exploratory development program was initiated which has led to successful design of a man-portable rangefinder (XM–23, Fig. 2).

During the same period, Fort Monmouth scientists engaged in electronics and advanced surveillance research began work on a lightweight rangefinder designated the AN/GVS–1 (XE–6) (Fig. 3).

The model XE–6 and the XM–23 have both undergone successful design test evaluations, and the XM–23 has been through field tests. Results show that the devices are relatively immune to the effects of atmospheric turbulence, heat shimmer, and ambient light levels. Sometimes they will range on dust, smoke, or unnoticed small objects within the field of view.

(*Continued on page 18*)

Figure 2
XM–23 Laser Rangefinder

Philip G. Rust, donor of Samuel S. Wilks Award, congratulates Dr. Frank E. Grubbs, initial winner.

(*Continued from page 1*)

presented technical papers or appeared as guest speakers. About half of the participants came from Army agencies.

The Army Mathematics Steering Committee sponsored the meeting on behalf of the Chief of Research and Development. The Army Research Office was host to the sessions, held in the Statler-Hilton Hotel.

Maj Gen (USA, Ret.) Leslie Simon
Pays Tribute to Samuel S. Wilks

The Wilks Award memorializes the late Princeton University professor as one of the Nation's great mathematicians, responsible for exceptional contributions to both theoretical and applied mathematics.

During World War II his services were frequently in demand as a consultant to industry and Department of Defense agencies. He served as a member of the Applied Mathematics Panel, National Research Council, and was active in many committees and study groups on behalf of the defense effort.

From the establishment of the Army Mathematics Advisory Panel in 1954 (later redesignated the Army Mathematics Steering Committee) until he died Mar. 7, 1964, Samuel Wilks served as a key member. The Conference on Design of Experiments in Army RD&T resulted from his suggestion for improvement of communication and exchange of ideas among Army and academic statisticians with respect to solution of Army logistics and materiel problems.

In the future the Wilks Award will be presented annually through a committee to be appointed by the American Statistical Association. Consisting of a gold medal (still to be designed) and an honorarium, the award is funded through a donation of about $5,000 by Philip G. Rust, Thomasville, Ga. Mr. Rust, an associate of Prof. Wilks, was present to make the award to Dr. Grubbs.

An 8-page article in the April 1964 issue of *The American Statistician* paid tribute to Prof. Wilks' achievements by terming him the "Statesman of Statistics." One of the highlights of his illustrious career was his election as president of the American Statistical Association in 1950.

Donald C. Riley, executive director, represented the association when the Wilks Award was presented to Dr. Grubbs. In a brief tribute to Prof. Wilks and an explanation of the criteria that will be used to select future winners of the award, he commented that the occasion auspiciously marked the 125th anniversary of the ASA.

The Tenth Conference on Design of Experiments in Army RD&T was acclaimed by many attendees as the most successful ever held because of the professional stature of those who appeared as guest speakers, presented technical papers, or served as chairmen and panelists. Eight technical and six clinical sessions were held.

Two world renowned mathematical statisticians spoke at the closing general session. Prof. John W. Tukey of

Army Research Office Host

SOME MEMBERS OF PROGRAM C
Research and Development Maj Gen
G. S. Watson, Johns Hopkins Univers
Warfare Laboratories, Fort Detrick
(conference secretary), Duke Universi
of Health; Dr. F. E. Grubbs (confere
Laboratories, Aberdeen Proving Grou
State College; Fred Frishman, chai

PARTICIPANTS (l. to r.) Joseph Cameron, National Bureau of Standards; Bernard Harris, Mathematics Research Center (MRC), University of Wisconsin; Prof. H. A. David, University of North Carolina; Dr. H. B. Mann, MRC.

Don Riley, executive director,
American Statistical Association

...esign of Experiments Meet

...MMITTEE pose with Deputy Chief of ...ustin W. Betts. Left to right are Prof. ...y; Dr. W. D. Foster, Army Biological ...d.; General Betts; Prof. F. G. Dressel ...; Dr. C. J. Maloney, National Institute ...ce chairman), Army Ballistic Research ...d, Md.; Prof. H. L. Lucas, N. Carolina ...man of local arrangements, USARO.

Princeton University and a member of the President's Scientific Advisory Committee discussed "The Future of Processes of Data Analysis." Dr. M. G. Kendall, C-E-I-R, London, England, gave his views on "Statistics and Management."

Deputy Chief of Army Research and Development Maj Gen Austin W. Betts presided as chairman at the opening general session, highlighted by two major addresses. Maj Gen Leslie E. Simon (USA, Ret.) spoke on "The Stimulus of S. S. Wilks to Army Statistics." As a guest speaker, Prof. Oscar Kempthorne, Iowa State University, discussed "Development of the Design of Experiments over the Past 10 Years."

The conference banquet addresses were given by Dr. Churchill Eisenhart, National Bureau of Standards, Washington, D.C., on "Sam Wilks as I Remember Him" and by Dr. W. J. Youden, also of the NBS staff, on "An Operations Research Yarn and Other Comments."

General session 2 featured a presentation by Prof. H. O. Hartley, Institute of Statistics, Texas A&M University, on "Assessment and Correction of Deficiencies in PERT Analysis."

General session 3 offered three distinguished panelists—Prof. G. E. P. Box, University of Wisconsin, whose subject was "Use and Abuse of Regression"; Prof. Jack C. Kiefer, Cornell University, "Optimum Extrapolation and Interpolation Designs"; and Prof. Ingram Olkin, Stanford University, "Estimates for a Regression Model with Covariance." Prof. Gerald J. Lieberman of Stanford presided as chairman.

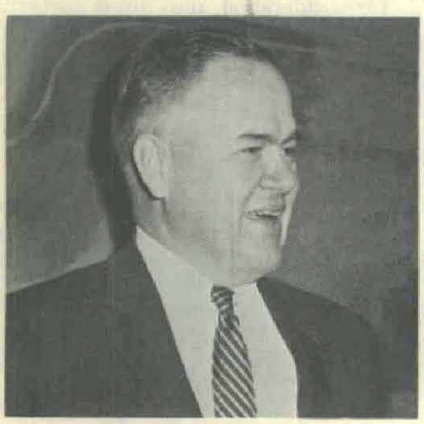
CLINICAL SESSION PANELISTS included Dr. Frank E. Grubbs (also general chairman of the conference); Dr. Emil H. Jebe, Institute of Science and Technology, University of Michigan; Prof. H. L. Lucas, Institute of Statistics, University of North Carolina; Mr. O. P. Bruno, Army Ballistic Research Laboratories, Aberdeen Proving Ground, Md.; Dr. D. S. Burdick, Duke University;

Prof. Clyde Y. Kramer, Virginia Polytechnic Institute; Dr. R. L. Stearman, C-E-I-R, Inc., Los Angeles, Calif.; Dr. William Wolman, Goddard Space Flight Center, National Aeronautics and Space Administration; Dr. Walter D. Foster, Biological Warfare Laboratories, Fort Detrick, Md.; Dr. Samuel W. Greenhouse and Dr. Clifford C. Maloney, National Institutes of Health, Bethesda, Md.;

Prof. R. E. Bechofer, Cornell University; Dr. H. B. Mann and Dr. Bernard Harris, Mathematics Research Center, U.S. Army, University of Wisconsin; Dr. H. M. Rosenblatt, Bureau of the Census, Washington, D.C.; Prof. G. S. Watson, Johns Hopkins University, Baltimore, Md.; Dr. R. J. Lundegard, Office of Naval Research, Washington, D.C.; Dr. T. W. Horner, Booz-Allen Applied Research, Inc., Bethesda, Md.; and David R. Howes, U.S. Army Strategy and Tactics Analysis Group, Bethesda, Md.

GENERAL SESSION speakers Dr. Maurice Kendall (left), CEIR, London, England, and Professor Oscar Kempthorne of Iowa State University.

Dr. Churchill Eisenhart
National Bureau of Standards



Professor John Tukey,
Princeton University Guest Speaker

PANELISTS (l. to r.) Dr. W. J. Youden, National Bureau of Standards; Professor H. L. Lucas, North Carolina State College; Professor G. J. Lieberman, Stanford University; Professor E. H. Jebe, University of Michigan.

E-Command Selects 1964 Achievement, Leadership Winners

An atmospheric physicist and an electronic engineer are winners of 1964 Outstanding Technical Achievement and Leadership Awards at the U.S. Army Electronics Command, Fort Monmouth, N.J.

Dr. Robert W. Fenn was honored for technical achievements and Frank J. Triolo won the leadership award. With eight other E-Command employees they were cited at the recent fourth annual award ceremonies. Col James M. Kimbrough, Jr., director of the Laboratories, presented awards.

Recognized also for technical achievements were Thomas R. AuCoin, David Haratz, and Charles Marisca. Leadership citations were presented to Theodore J. Sueta, Chester E. Sharp, James A. McClung, Daniel P. Salvano, and the late Sidney Weitz.

DR. FENN, of the Laboratories' Surveillance Department, won the top achievement award for research on light-scattering properties, distribution and other characteristics of aerosols, conducted at sites ranging from the Arizona desert to Greenland.

Working with equipment of his own design, Dr. Fenn produced results that are being acclaimed as a major contribution to knowledge of atmospheric physics. His findings have a direct bearing on military surveillance, use of Lasers for communications, atomic radiation measurements and cloud modification. The results were so conclusive that they went far toward proving theoretical and mathematical conjectures of other scientists in the field.

Born in Germany, Dr. Fenn received his Ph. D. degree from the University of Munich. He has been at Fort Monmouth for seven years.

Frank J. Triolo

Dr. Robert W. Fenn

FRANK TRIOLO, deputy team leader, Communications Department, the top leadership winner, was cited for directing an Army Materiel Command program to provide "unprecedented homing and communications capabilities" for eight diverse types of Army fixed-wing and rotary-wing aircraft.

Program requirements for production and procurement of a radio set, the AN/ARC-54, and design of suitable antenna systems for the diverse aircraft were completed ahead of schedule by the team he headed.

Triolo has worked at Fort Monmouth since 1941. He earned bachelor's and master's degrees in electrical engineering from Auburn University and N.Y. College of Engineering.

THOMAS AuCOIN, E-Command Laboratories' Institute for Exploratory Research was cited for designing a high-precision unit for synthetic growth of Laser crystals of high optical quality, for working out methods to investigate their properties, and for the data he compiled on his work.

DAVID HARATZ, Communications Department, won honors for working out a new technique that assures complete compatability for all the combinations of equipment planned for use with Fieldata processors.

CHARLES MARISCA, Engineering Sciences Department, was recognized for his contributions to the evaluation of new and modified electronic equipment.

THEODORE SUETA, Surveillance Department, received a leadership citation for professional competence in guiding technical projects which have greatly expanded in breadth and complexity to meet new electronic requirements entailed in the operation of Army tactical aircraft.

CHESTER SHARP, Institute for Exploratory Research, earned acclaim for his direction of research that has led to new findings in radio wave transmission.

JAMES McCLUNG, chief of Programs and Events at the Laboratories, was credited for organizing or assisting sponsoring groups to arrange and conduct major scientific symposiums and other presentations necessary for the interchange of information at the Laboratories.

DANIEL SALVANO, Electron Components Department, was cited for leadership and direct contributions in development of a highly dependable Klystron tube which was given the Nike Zeus target acquisition radar sets a 4-fold power increase, and for directing evaluation of the proposed design for the Nike X Multiple Array Radar receiver.

SIDNEY WEITZ, who died Jan. 16, was a branch chief in the Engineering Sciences Department. Presented to his widow, Mrs. Sally Weitz, the citation commended the work of Mr. Weitz in frequency measurement that "contributed greatly" to a Department of Defense program to eliminate serious problems of interference in the operation of military radio equipment.

Artillery Officer Joins CDEC As Deputy Chief of Project Team

The U.S. Army Combat Developments Command Experimentation Center at Fort Ord, Calif., recently announced the assignment of Col Maxwell Grabove as deputy chief of Large Project Team IV.

An Artilleryman backed by more than 22 years of active service, he previously was a staff member of the Advanced Tactics Project at Combat Developments Command Headquarters, Fort Belvoir, Va., for two years following graduation from the U.S. Army Command and General Staff College in 1962.

A native of Alabama, he was awarded a B.S. degree in chemistry from the University of Alabama in 1942 and was called to active duty as a Reserve Officer the following month.

From April 1944 until after the end of World War II, he served in the European Theater with the Psychological Warfare Division, Supreme Headquarters, Allied Expeditionary Force.

In the Korean War he was executive officer of the 21st Antiaircraft Artillery, Air Warning Battalion and, later, the 159th Field Artillery Battalion. He entered the Artillery School at Fort Bliss, Tex., in November 1951 and was retained as an instructor for nearly four years.

Army Contracts Total $200 Million

Largest of the research, development and production contracts awarded by the U.S. Army in recent weeks, totaling just short of $200 million, went to Chrysler Corp. in the amount of $34,639,230.

Received by Chrysler's Defense Operation Division, Detroit, Mich., the grant called for various quantities of M60 tanks, Armored Bridge Launching Vehicles and combat engineer vehicles, with repair parts.

Philco Corp., Aeronutronics Division, Newport Beach, Calif., was awarded three contracts totaling $33,688,982 for Shillelagh missile research, development, engineering services and a classified quantity of Shillelagh hardware and tooling.

General Electric Co., Pasco, Wash., received a $24,410,000 award for 16 of the 142,105 KVA generators. Bendix Corp., Eclipse Pioneer Division, Teterboro, N.J., was issued a $23,206,535 contract for guidance and control items for the Pershing system.

Hercules Powder Co., Wilmington, Del., was awarded a $14,845,498 modification to a previous contract for miscellaneous propellants and explosives for Nike boosters, Improved Honest Johns and Little Johns.

Martin-Marietta Corp., Orlando, Fla., received a $9,300,000 contract for components for the Pershing Missile system. Raytheon Co., Lexington, Mass., was granted two contract modifications and one new contract totaling $5,840,207 for continuation of design and development on the Hawk missile program and Hawk ground support and field maintenance equipment.

Ford Motor Co., Dearborn, Mich., was issued a $5,516,290 award for various quantities of cargo pickup trucks, panel trucks and carryall trucks.

General Dynamics Corp., Pomona, Calif., received two contracts totaling $5,300,000 for Redeye engineering services and continued research and development during Fiscal Year 1965.

Thiokol Chemical Corp., Bristol, Pa., won a $5,231,611 modification to an existing contract for miscellaneous components and motors for Sergeant and Pershing missile systems.

Zenith Radio Corp., Chicago, Ill., was awarded a $4,633,225 contract for sensing elements for M20 proximity fuzes. Colt's Inc., Hartford, Conn., received a $4,305,750 modification to a previously awarded contract for M16 rifles and repair parts. General Motors Corp., Allison Division, Indianapolis, Ind., will get $3,722,958 for transmissions and oil filter kits for the M60A1 Armored Vehicle and Combat Tank.

Sylvania Electric Products, Inc., Electric Defense Labs, Mountainview, Calif., received a $3,215,000 contract for research engineering services in electronics. High Voltage Engineering Corp., Burlington, Mass., won a $1,988,113 award for an engineering design study and for the design, construction and installation of a machine for nuclear research.

Rohm and Haas, Huntsville, Ala., was issued a $1,946,000 contract for exploratory design and development in the field of solid and hybrid rocket propellants and propulsion. Electrospace Corp., Glen Cove, N.Y., was awarded a $1,876,870 job for manual telephone switchboards and jack line telephone circuits. Saco Lowell, New England Division, Maremont, Corp., Saco, Maine, received a $1,811,665 contract for miscellaneous components for the modernization program on the M60 machinegun.

Western Electric Co., New York City, received a $1,740,600 award for engineering services, modification and maintenance of equipment in support of SLEIGH RIDE Program. Communications Systems Corp., Morton Grove, Ill., was awarded a $1,690,200 modification to a previous award for R-390 URR Field Communication Station radio receivers.

Supreme Products Corp., Chicago, Ill., is being awarded a $1,600,260 contract for bomb fuzes. Sperry Rand Corp., Univac Division, St. Paul, Minn., received a $1,500,000 contract for electronic communication systems.

Ravens Shinnston Corp., Parkersburg, W. Va., received a $1,471,096 contract for 1½-ton, 2-wheel ammunition trailers. Norris-Thermador Corp., Los Angeles, Calif., received a $1,443,728 contract for 105 mm. target practice tracer projectiles. Skagit Corp., Sedro-Woolley Wash., was issued a $1,407,415 contract for producing 106 mm. cartridge cases.

Lockley Machine Co., New Castle, Pa., was awarded a $1,277,117 contract for demolition kits for clearing mine fields. Jacks-Evans Manufacturing Co., St. Louis, Mo., will produce links for metallic cartridge belts for $1,240,790.

DoD Tests Procurement Forms At 22 Military, DSA Activities

A 6-month test of new and simplified Department of Defense procurement forms was started this month at 22 Army, Navy, Air Force and Defense Supply Agency activities and installations.

Four new forms are being used interchangeably for negotiated and advertised procurements in excess of $2,500 in lieu of 20 existing forms. The Department of Defense completes each year 2,000,000 procurement transactions of $2,500 or more.

If the new forms prove successful, they are expected to be used throughout the Department of Defense, with substantial savings to both the Department of Defense and industry.

Other Federal Government procurement agencies have expressed interest in the test and if the forms prove successful for the Department of Defense, they may be adopted Government-wide.

The test is being conducted at one DSA, three Army, two Navy, and 16 Air Force activities and installations under supervision of the Armed Services Procurement Regulation Committee.

The forms being tested are: DD Form 1489 (Request for Quotation); DD Form 1480 (Solicitation and Offer); DD Form 1491 (Award/Contract); and DD Form 1492 (Modification of Solicitation of Contract).

GOOD COMMUNITY RELATIONS between Redstone Arsenal and Huntsville, Ala., were evident when former Huntsville Mayor R. B. Searcy (left) received Department of the Army Outstanding Civilian Service Medal upon his recent retirement. Huntsville banker M. B. Spragins (right) was awarded an honorary plaque. Mr. Searcy was recognized for services to the Army, particularly as a member of Army Advisory Committee, during 12 years he served as mayor. Spragins is chairman and has been a member since 1947. The committee is composed of civic leaders who advise the commanding general on community affairs. Maj Gen J. G. Zierdt is CG.

CRDL Honors 32 at Patent Award Ceremonies

Thirty-two persons were honored at a recent patent award ceremony at the U.S. Army Edgewood (Md.) Arsenal Chemical Research and Development Laboratories (CRDL).

The awards were presented by Col William G. Willmann, commander of the Laboratories; Lt Col Gordon L. Jacks, commanding officer of the U.S. Army Nuclear Defense Laboratory (NDL) at Edgewood Arsenal; and Lt Col Robert C. Brenneman, deputy director of Engineering and Industrial Services.

Recipients included Gaston E. Dudley, Jacob I. Miller, Omer O. Owens, and Philip A. Blackwell, for the invention of a chemical process. Blackwell was assigned to CRDL during his military service.

John N. Bruce, a retired Edgewood employee, was granted a patent on a type of flamethrower, Charles E. Williamson for an invention in the field of chemical research, Donald E. Smith for a detonation block fuze mount, and William B. Roberts for a supplemental seal for a garment sealing flap.

Dr. Albert Pfeiffer's patent was on an "Aerosol Catcher" while Jefferson G. Davis, Jr., Thomas R. Moore, Bernard M. Zeffert and Sigmund R. Eckhaus shared an invention in chemistry. Davis and Moore are former military personnel. Eckhaus is employed by the Arsenal Directorate of Engineering and Industrial Services.

Paul Shivers, an Army contract employee, and Theodore R. Paulson received awards for an invention in the munitions development field. Ella B. Dwaayer, a retired Edgewood Arsenal employee, Saul Hormats and Eugene Sovinsky won an award for a type of protective shelter.

David Easterday, who was stationed at Edgewood Arsenal during his tour of military duty, Dr. Robert I. Ellin and Dr. Albert A. Kondritzer were cited for the invention of a chemical preparation process, Elmo Maiolatesi for a microscope slide holder, and John B. Jackson for a decontaminating solution.

Bernard W. Fromm, Dr. Edward J. Poziomek, John A. Stein, Dr. David N. Kramer, and Robert H. Poirier received awards for an invention in the chemical research field. Formerly a soldier-scientist stationed at Edgewood, Poirier also was cited jointly with Dr. Poziomek for another patent.

Dr. Poziomek also was cited jointly with Dr. Brennie E. Hackley and Dr. George M. Steinberg for a series of six patents.

Woodrow W. Reaves received patents on a dispersing system for liquids and volatile solids and on a colored smoke-producing composition. Nathan Klein's invention was titled "Rare Earth Shield."

5 U.S. Army Pilots Claim 10 Helicopter World Records

Five U.S. Army pilots established claims to 10 world records for helicopter performance, including two previously held by the Russians, during recent flight test runs at Edwards Air Force Base, Calif.

The record-breaking flights were conducted in Bell UH1–D helicopters by the U.S. Army Aviation Test Activity, based at Edwards AFB. Certification of the results is now pending with the Federation Aeronautique Internationale.

The Army pilots are Maj John A. Johnston, Youngstown, Ohio; Capt William L. Welter, Jr., Secane, Pa.; Capt M. N. Antoniou, Levittown, N.Y.; CWO Emery E. Nelson, Santa Rosa, Calif.; and CWO Joseph C. Watts, Miami, Fla.

Maj Johnston claimed two records —one for distance and one for speed. In the E–1 class, open weight, distance in closed circuit, his 1614.6 statute miles bettered the previous Russian mark of 1531 miles.

In the E–1D class speed closed circuit, his speed of 146 miles per hour beat the previous U.S. speed of 134 m.p.h.

Capt Antoniou also set two new records. In the E–1 and E–1E class his distance in straight line of 1348.8 miles nonstop from Edwards Air Force Base to Rogers, Ark., beat the previous U.S. record of 1217 miles for open weight and also exceeded the record for the weight class of 6614 to 9921 pounds.

CWO Watts established claims to three new world records, including one previously held by the U.S.S.R. In class E–1 open weight, 2000 km., speed closed circuit, his 139.9 m.p.h. beat the Russian record of 126.984 m.p.h. In the E–1E class he set one speed and one distance mark for which there was no previous record.

In the weight class 6614 to 9921 pounds, 2000 km., speed closed circuit, he established 139.9 m.p.h. and in distance for closed circuit his 1242.8 statute miles exceeded the record.

CWO Nelson broke two previous U.S. records set in 1962 by the same helicopter. His time to climb to 3000 meters of 2 minutes, 9.6 seconds bettered the old record of 2 minutes, 17 seconds. His time to climb to 6000 meters of 4 minutes, 35.8 seconds best the former time of 5 minutes, 47 seconds.

Capt Welter's time to climb to 9000 meters of 9 minutes, 13.7 seconds beat the previous U.S. record of 14 minutes, 30 seconds.

With official recognition of the new records, the United States will hold 26 marks (or 52 percent), Russia 14 (28 percent), France nine (18 percent) and Czechoslovakia one.

Official timing of the runs at Edwards Air Force Base was conducted by the National Aeronautic Association, acting as agents of the Federation Aeronautique Internationale.

CWO Emery E. Nelson (left) and Capt William L. Welter, Jr. (right) two of five U.S. Army pilots who established claims to helicopter records, discuss performance of Bell UH-1D Iroquois (used to set records) with Bell test pilot Lou Hartwig.

Friedman Named Deputy (ASD) International Security Affairs

Deputy Assistant Secretary of Defense (International Security Affairs) Alvin Friedman, 33, was appointed recently to succeed Frank K. Sloan, who resigned to resume law instruction at the University of S.C.

In previous assignments in the Department of Defense, Mr. Friedman served as special assistant to the Assistant Secretary of Defense (International Security Affairs) and as special assistant to General Counsel.

Before coming to the Department in 1963, he was associated with the Washington, D.C., law firm of Covington and Burling. He is a member of the District of Columbia, Texas and American Bar Associations.

During the Korean War, he served as an Air Force officer and taught courses in international affairs and military law at the Air Force Officer Candidate School. He is a graduate of Cornell Univ. and Yale Law School.

Two California Firms Selected to Bid on LOH Multi-Year Contract

The U.S. Army's Light Observation Helicopter (LOH) competition ended with the recent announcement that two California firms will bid for the multi-year contract. Bids will be opened in January.

The LOH, which has been called the jeep of the air, is to be bought in the following quantities initially: 88 during Fiscal Year 1965; 168 in FY 66; and 458 in FY 67.

Hiller Aircraft Co., Palo Alto, Calif., and Hughes Tool Co., Culver City, Calif., were selected to bid on the procurement following competition which began in 1961.

Basically a 2-place helicopter with sufficient additional space to carry at least 400 pounds or two other passengers, the LOH will replace the O–1 (Bird Dog) fixed-wing aircraft and the OH–13 (Sioux) and OH–23 (Raven) helicopters.

In qualifying tests the LOH has demonstrated that it is a reliable, easily maintainable, turbine-powered helicopter capable of performing the primary tactical missions of visual observation, target acquisition, battlefield reconnaissance and command control.

Army requirements for a light observation helicopter were established in mid-1960, and initial discussions with industry were instituted shortly thereafter. A development program based on Federal Aviation Agency certification of the aircraft was adopted in June 1961.

Contracts which contained general performance specifications, including the engine to be used, and required the production of prototype aircraft certified by the Federal Aviation Agency were awarded to the competing manufacturers in November 1961.

Five prototypes of each aircraft were delivered early in 1964 to the U.S. Army Test Agency, Edwards Air Force Base, Calif., where they were subjected to an extensive test program.

The aircraft were given 1,000 hours of logistical tests, approximately 200 hours of engineering and aeronautical design tests, 300 hours of tactical and operational suitability tests, 36 hours of instrumented armament tests, 50 hours of operational armament tests and 100 hours of avionics tests.

The test results showed a substantial breakthrough for this class of helicopter—in speed, range, reliability and maintainability.

An evaluation group consisting of an operations team, a technical team, and an economic team, met from

OH–5A

OH–6A

Sept. 14 until Oct. 6. A design selection board consisting of seven general officers convened on Oct. 5 and finished their deliberations on Oct. 10.

In total these two groups spent four weeks reviewing and evaluating the data which had been accumulated as a result of the competition. Their recommendations covering selection of the aircraft to be procured and the method of procurement were made to the Chief of Staff and the Secretary of the Army.

The program is considered highly successful because the development has taken place rapidly, the selected prototype aircraft meet Army requirements with only minor modifications, and finally the first production run can be procured on a competitive bid basis as a result of the availability of the multi-year procurement technique, developed by the Army and authorized in the Armed Services Procurement Regulations in 1963.

Project manager of the LOH program is Col Joseph L. Gude, U.S. Army Materiel Command, Washington, D.C.

Bionics Viewed as Key to Better Electronics Design

Engineers seeking better ways to design electronic equipment in the Test Plans and Evaluation Department, U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz., are turning to bionics for information.

Defined as the science of systems which function similarly to living organisms, bionics is bringing together professionals from many fields. The birds and bees, other insects, animals and even fish may perform functions more complex than those of today's most advanced computers.

Fred J. Ludwig, operations research specialist with the USAEPG Test Plans and Evaluation Department points out, for example, that an investigation at the Max Flanck Institute on the nerve system of the beetle was shared by a zoologist, physicist, electrical engineer and a mathematician.

Beetles, it was discovered, react much like humans in that they can tell how fast they are going by scanning the passing landscape beneath them. Researchers at the Massachusetts Institute of Technology found that the nerves which transmit signals from the eyes of a frog end in four separate layers of the brain, each performing a different function.

Interest in the structure and behavior of living models is gaining tremendous momentum, Mr. Ludwig said. Researchers are investigating vision, hearing, equilibrium, navigation, temperature discrimination and special sensory perception at all levels of animal life.

Bionics already has begun to "payoff." The beetle's system of measuring speed, he said, has led to the design of a ground-speed indicator for airplanes. The frog's four separate channels from the eye to the brain, each responding to a different type of stimuli, point to a better way of processing information in computers. Instead of sorting data within the computer, it may be quicker to sort the data outside the computer—after the frog's system.

Mr. Ludwig's interest in bionics stems from the fact that the U.S. Army Electronic Proving Ground will one day be testing equipment systems based on bionics research.

Research In Review...

(*Continued from page 11*)

This effect may sometimes be desirable; when it is not, techniques have been developed to insure obtaining the range to the desired target.

Variations in application and capability are scheduled for future work in the way of efficiency, miniaturization, long range in large units, application to vehicle and airborne equipment, to meteorology, and to mapping and geodesy, all of which are of importance to the Army.

Missile Guidance. Missile guidance is another area backed by an interesting history. Optical radar missile guidance using conventional light sources was not practical due to the overriding noise from sunlight. If high power monochromatic sources could be found, narrow banded filtering might make possible a variety of applications. One of the most important was semi-active homing, in which illumination from a transmitter is reflected from the target to be directionally sensed by the missile.

Radar beams were too broad to distinguish easily small targets surrounded by reflective backgrounds, such as camouflaged equipment on the battlefield. The Laser seemed to be the required transmitter to make such applications possible. The capabilities of the Army Missile Command, with its mission of missile development, and of Frankford Arsenal, with its mission of fire-control, were applied to classified development programs and work is now in progress.

Unclassified supporting research related to missile guidance is devoted to the study of the behavior of the Laser materials and the nature of the emission from the Laser—specifically, the time development of the output and its spacial arrangement. Studies of the related optical materials and deterioration of the components during use, due to the Laser action itself, have been important here as well as in the rangefinder work. A variety of new forms of Q-switches have evolved from the work as well as novel Laser configurations, power supplies, and pumping lamps, leading to improved efficiency.

Figure 3
XE-6 Laser Rangefinder

Night Vision and Illumination. Mobility in darkness is seriously limited by the soldier's ability to see. The limitations of darkness have led to years of Army study, design, and use of battlefield illumination by searchlights and flares which sometime aid the enemy as well as friendly troops. Late in World War II, radar and snooperscopes began to modify this situation, but full-scale research and development were initiated only during and after the Korean War. Now there are programs in night vision, target acquisition and surveillance.

Techniques employed include microwave and millimeter wave radar and active and passive infrared viewing systems. The Laser may contribute to this effort as a source of continuous pulsed and gated energy or perhaps in receivers which make use of amplification of incident light by stimulated emission. Infrared quantum counter schemes exist in which excitation and decay between several excited levels can be used to produce conversion of infrared energy into visible energy, with an accompanying amplification. At present, the night vision program is largely at Fort Belvoir, Va., at the Engineer Research and Development Laboratories, with monitoring and exploratory research activity in Lasers.

Communications. Prior to Lasers it was anticipated that if coherent optical sources could be attained and modulated by the same percentage as existing microwave equipment, a tremendous gain in the number of communications channels could be realized. The required modulation is still not available; it is recognized that if it were, atmospheric turbulance would serve to jumble such high-frequency modulation in long-range transmission. Further, optical communications are seriously limited by scattering by fog and clouds, although scattering by fog is less in the infrared than in the visible.

Some work on atmospheric control through gas-filled or evacuated pipes is being done, but if such systems are adopted they may be expensive and will not gain the opportunity the Laser offers of a wireless, narrow-beam system.

Microwave amplitude and frequency modulation can be imposed on the Laser beam, as demonstrated by successful efficient designs. Electro-optic modulators use potassium dihydrogen phosphate or other crystals. Demodulation can be achieved with photodetectors mounted in microwave receiver structures. Messages can be impressed in turn on the microwave signal at megacycle rates. Simultaneous modulation at several microwave signal frequencies and the use of corresponding multiple-tuned detectors achieve communication over many channels on a single narrow beam.

Pulse position modulation can greatly reduce difficulties of atmospheric turbulence. In this technique, variation in the time of separation of the pulses is used to impress information on the beam. Atmospheric-caused noise appears only in second-order effects, but the hoped-for extreme bandwidths are not available by this technique.

One of the first and most desirable Army communication links would be in tactical, highly secure communication along line-of-sight paths by aimed voice-modulated Lasers; for example, for the transmission of tactical messages between deployed vehicles.

In the Army laboratories and through contracts, research is directed toward amplitude, frequency, and pulse modulation of gas, crystalline and semiconductor Lasers. Model communication links have been prepared in breadboard form. Materials and components are being studied as well as the propagation difficulties encountered in transmission through the air, through pipes and more complex guiding structures.

To date, a noteworthy Army-supported development is the successful lasering of yttrium aluminum garnet doped with neodymium. It is so efficient that it can be made to operate continuously at room temperature with the pumping light intensity available from a domestic tungsten filament light bulb. Other achievements are the first successful operation of semiconductor Lasers, the first detection of microwave modulation and the first successful design of high gain Laser amplifiers.

Medical Aspects. Carrying out its mission for survivability studies for protection against modern and future weapon systems, the Office of the

Surgeon General has initiated work on the physiological hazards of Laser radiation, the dangers of use, and the related necessary precautions and protections. The work is partly in laboratories under the command of The Surgeon General and partly on contract.

In the most basic studies, the effects of Laser irradiation have been noted in organic materials selected because of their simplicity and similarity to physiological materials, ranging from proteins to gamma globulin to blood cells. The general aim of the work is toward an understanding of the basic mechanisms likely to be found in the complicated physiological systems.

In studies on more complicated models, effects have been observed on various types of biological systems, including skin flaps, micro-organisms, isolated biological systems, hemotherapeutic and physical agents, and effects on animal and skin tissues.

At a still higher level of model complexity, comparative pathology of burns from thermal, Laser, chemical, and incendiary sources were undertaken to determine proper treatment of ensuing wounds. Goats' thighs were used in these experiments to study the course of healing.

Other studies concern the effect of high-intensity Laser and non-Laser radiation in producing temporary flash-blindness in trained dark-adapted monkeys, and permanent retinal damage to rabbit eyes from Laser energy in larger doses. This work has resulted in the tentative establishment of danger threshold levels for Laser experimenters and for military personnel using Lasers in future field operations. Based on results of these studies, operating procedures for the proper and safe use of rangefinders and other Laser equipment have been drawn up and made public.

In brief, high-power Laser energy incident on the eye can be expected to produce damage ranging from imperceptible retinal burns from small doses up to catastrophic loss of eyesight from existing Lasers.

The precautions can be summarized: *Respect Laser radiation as a hazard and take precautions to prevent accidental impingement on eyes, skin, or flammables. Periodic ophthalmic examinations of laboratory personnel are recommended.*

Application of controlled doses of Lasar radiation have been used for the welding of detached retinas. In the future, Laser energy in finely focused spots may be used to conduct delicate surgery or for the destruction or removal of malignant tissue. The Army Missile Command has cooperated with the National Cancer Institute in a series of studies on the treatment of normally malignant cancerous tumors implanted in the skin of rats.

Although the results of the experiments are not adequately understood, the results show that several days after radiation with an experimental neodymium Laser array, the tumors began to recede and finally disappear.

Interferometry. Interferometry is an example of work which has only indirect impact on Army functional areas. Optical interferometers can be constructed using gas Laser light sources to provide more accurate and more precise measurements of position, distance and translation than have been previously possible.

Simply stated, in an interferometer, a light beam is split by being half passed through and half reflected by a semi-transparent mirror. The two beams thus formed travel different paths and, by means of mirrors, are finally recombined. Differences in the two paths are manifested by patterns of light and dark fringes in the reformed beam.

The advantages of Laser light over other light sources will be considered, followed by considerations of application to Army problems.

The inherent accuracy of a Laser interferometer is about one part in two million, and, by Laser wavelength stabilization, can probably be improved to at least one part in ten million. This accuracy is obtained without providing the precisely machined and adjusted components required by other types of transducers. The principal potential source of inaccuracy in an interferometer is from electronic miscounting of fringes.

Because a Laser interferometer permits rapid measurements, it is feasible to make multiple measurements to reveal such errors. The electronic counter indicates the distance in one-fringe multiples or approximately 12.5 microinches per count. By electronic fringe interpolation methods, measurements to about one-tenth of a fringe, or about 1.2 microinches are possible.

The interferometer system of measurement indicates position directly, independent of mechanical couplings which are susceptible to strain, thermal changes or variations in oil films, etc., at contact surfaces.

Prior to the use of Lasers in interferometry, the best available light sources (mono-isotope mercury discharge tubes) provided a product of monchromaticity and intensity that permitted a range, with reasonable speeds of translation, of only eight to ten inches. Fringe contrast for greater optical path differences was not usable. The Laser provides usable fringes at distances of up to hundreds of feet or literally many orders of magnitude of improvement.

Possible Army application of Laser interferometry include precision positioning in research, manufacture, and in field use of equipment, such as missile alignment or turret aiming equipment; in geodesy and mapping, where one does not need a map accurate to microinches, but where the accurate establishment of base lines is essential; and in the remote measurement of variations of temperature in the atmosphere itself which affect optical seeing ability.

Long-Range Implications. In August 1964, the Army Research Office at Durham, N.C., sponsored a conference on "Quantum Electrodynamics of High Intensity Photon Beams." It is in this area that expectations are highest and where the claim "most important . . . in 50 years" may ultimately prove true. The conferees were physicists interested in research on problems arising from the availability of Laser-produced light beams of extremely high intensity.

The Laser has opened up a new area of physics since intensities of billions of watts per square centimeter are now available. This is many orders of magnitude larger than has been available in such a clean, controllable form before.

With such novel physical conditions available, important basic concepts are susceptible to reexamination and new concepts are sure to arise—concepts of light, radiation, interaction with matter, the definitions of photon, quantum, atomic configuration, the nature of relativity and gravity.

Not since the early work of Hertz, Thompson, Planck, the Curies, Rutherford, Einstein, and Millikan, has there been such an opportunity for the discovery of new and unpredictable phenomena, which will ultimately lead to greater knowledge and to greater Army capability, as there is in Laser research.

TEMPUS FUGIT. *When one recognizes that life is made up of time, time is used up in meetings, and typical Pentagon practice is two meetings per day, he can readily understand the accuracy of Dr. Sulzberger's observation that:*

Life in Washington does not consist so much in making two ends meet as in making two meetings end. (*From Dr. R. G. H. Siu's* "T-THOUGHTS.")

6 Army Medical Corps Personnel Win ASM Awards

(*Continued from page 9*)

of medical research.

Maj Sheehy is recognized for his research on small intestinal diseases and human nutrition. Much of his work has been directed toward tropical sprue and the relation of folic acid and vitamins. Through research he has provided new and important information on the minimally effective folic acid requirement for patients with pernicious anemia.

He earned his M.D. degree from Syracuse University (1951), interned and took residency training at Brooke General Hospital, served a fellowship in hematology at WRAIR (1956–57), and was certified by the American Board of Internal Medicine in 1958.

His time at Walter Reed was interrupted by a 4-year tour in Puerto Rico until he returned in 1962 to become assistant chief of the WRAIR Department of Hematology. He has been assistant chief of gastroenterology since March 1964.

Maj Sheehy has published over 50 professional articles on hematology and gastroenterology in the medical journals, and has several more manuscripts in preparation and in press.

BRIG GEN JOE M. BLUMBERG, BRIG GEN C. J. KRAISSL, and COL FREDERIC J. HUGHES, Jr., shared honors as recipients of the *Founders' Medal* for meritorious service to the Association of Military Surgeons. Each received an engraved medal awarded by the Executive Council of the Association.

General Blumberg, general chairman of this year's meeting, is the director of the AFIP. A graduate of Emory University School of Medicine, he has been in the Army for the past 23 years, and was appointed to his present position in May 1962.

General Kraissl, chairman of the Scientific Program of the meeting, is the director of surgery at Bergen Pines County Hospital, and a member of the Air National Guard of New York. He serves on the Air Surgeon General's Reserve Medical Advisory Council, and the Medical Advisory Council of the Air Force Association.

Col Hughes, vice chairman of the Scientific Program, is the director of Professional Service in the Office of The Army Surgeon General.

The only feminine winner of any of the prizes, DR. FAYE G. ABDELLAH, chief, Research Grants Branch and senior consultant, Nursing Research, Division of Nursing, U.S. Public Health Service, received the *Federal Nursing Service Award* presented through the courtesy of Hoffman-La Roche, Inc., Nutley, N.J.

Given each year for an outstanding accomplishment in or contribution to the advancement of professional nursing, the award consists of an honorarium of $500 and a scroll, and is awarded for the best essay submitted in competition. Dr. Abdellah's winning essay, "Quality Nursing Care," will be published later in *Military Medicine*.

A graduate of Fitkin Memorial Hospital School of Nursing, N.J., she earned her Ph. D. from Columbia University, and has been on the faculties of Yale University School of Nursing, and at Teachers' College. She joined the U.S. Public Health Service in 1959, and holds the rank of Nurse Director in the Regular Commissioned Corps.

The author or coauthor of more than 40 publications on nursing and related fields, Dr. Abdellah is a member of the National League for Nursing, the American Psychological Association, the New York Academy of Science, the American Association for the Advancement of Science, and serves on the Nursing Advisory Committee to the Kellogg Foundation.

Dr. Joseph M. McNinch, chief medical director of the Veterans Administration, succeeded Col Robert C. Kimberly, Maryland Army National Guard, as president of the Association of Military Surgeons at the close of the 71st Annual Meeting.

Engineer Labs Let 3 Contracts; Largest Calls for Photomapper

Three contracts awarded recently by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., totaled nearly $1.2 million.

A contract for $992,500 to Bunker Ramo Corp., Canoga Park, Calif., is for producing an automatic photomapper. Developed by the U.S. Army Engineer Geodesy, Intelligence and Mapping Research and Development Agency (GIMRADA), also at Fort Belvoir, the automatic photomapper is designed to provide topographical information in addition to photos.

General Motors Corp., Harrison Radiator Division, Lockport, N.Y., was awarded a $150,668 contract to develop, design and fabricate four environmental control units for application to the main battle tank.

United Aircraft Corp., Norwalk, Conn., will receive $49,498 for readout techniques for detector array.

By Ralph G. H. Siu

RESEARCH ON HORSE-FLYING. Budget formulation time is just around the corner and the bugaboo of some projects being terminated is again rearing its ugly head. For those who are at their wit's end in further defense of their project, the following story is offered for encouragement:

Once upon a time, two men were sentenced to death by the Sultan of Persia. One man, knowing how much the Sultan loved his white stallion, promised that he could make the horse fly in one year in return for his life. The Sultan, fancying himself as owning the only flying horse in the world, agreed to postpone the execution for a year.

The other prisoner looked at his friend in disbelief. "You *know* you can't make a horse fly! What made you come up with a crazy scheme like that? You're just prolonging the inevitable!"

"No," answered the wise one, "I have actually given myself four chances for freedom: First, the *Sultan* might die during the year . . . second, *I* might die . . . third, the *horse* might die, and fourth—I just *may* teach the stallion to fly."

DULL MEN. One of the hardest things to do seems to be the reduction of glittering generalities into specific contributions. As one listens to some of the less-gifted proponents of research, for example, he is reminded of what the seventeenth century English playwright, Sir George Etherege said:

. . . men grow dull when they begin to be particular.

THE MAN WHO'S NEVER TURNED DOWN. "There's a man in the world who is never turned down, wherever he chance to stray," said Walt Mason (1862-1939), "he gets the glad hand in the populous town, out where the farmers make hay; he's greeted with pleasure on deserts of sand, and deep in the aisles of the woods; wherever he goes, there's the welcoming hand—he's the Man Who Delivers the Goods."

HORSE SENSE. Talking about morale, some anonymous weaver of rhymes said a number of years ago:

A horse can't pull while kicking, and he can't kick while pulling.

E-Command Communications Programs Explained

Some of the more important communications programs being carried out by the U.S. Army Electronics Command (E–Command) as an element of the U.S. Army Materiel Command were explained recently to 27 top civilian and military officials.

Participants included Victor Evans from the Executive Office of the President, General Frank S. Besson, Jr., CG of the Army Materiel Command (AMC) and Maj Gen Frank W. Moorman, CG of E–Command.

The session at the Bell Telephone Laboratories in Holmdel, N.J., consisted of a briefing and demonstration of some of the salient operating features of Defense Automatic Integrated Switch (DAIS), being developed under contract with Western Electric Co.

The project is under the direction of Col Hugh F. Foster, Jr., UNICOM-STARCOM project manager, U.S. Army Materiel Command.

The session conducted at the E–Command's Army Electronics Laboratories encompassed Random Access Discrete Address (RADA), various aspects of automatic switching, and jungle communications.

The objective in the work on RADA, which is a project-managed undertaking directed by Col D. R. Guy, is to provide automatic dial telephone-type service to users without wires or switchboards.

Accomplishment of this project would eliminate the wire lines, central offices and VHF radio relays of conventional tactical communications systems. Each user would be provided with a wireless dialing system capable of private connection with any other similarly equipped user.

Other participants in the briefings included Maj Gen R. J. Meyer, CG, Army Strategic Communications Command; James M. Bridges and David Solomon, Department of Defense; Maj Gen John D. Bestic and Brig Gen J. H. Weiner, U.S. Air Force, and C. D. May, Defense Communications Agency; and Brig Gen L. P. Jacobs, deputy chief, Communications-Electronics, Department of the Army.

Fort Monmouth participants included Brig Gen J. W. Johnston, commanding general of the Army Satellite Communications Agency (SATCOM); Dr. Hans K. Ziegler, chief scientist, and A. W. Rogers, chief engineer, E–Command. W. H. C. Higgins attended as executive director of Electronic Switching, Bell Labs.

Army Electronics Laboratories representation included W. L. Doxey, technical director; Dr. Harold A. Zahl, director of Research; S. E. Petrillo, director of Engineering; Johann Holzer, chief of the Plans Branch, Rudolph Richs, director of the Transmission Division; and J. Soos, Analogue Switching Branch, all in the Communications Department.

Army Announces Contract for DC-MAW Missile System

A $314,861 Army contract has been issued for engineering support work on a proposed DC–MAW missile system—the directional control medium assault antitank weapon currently undergoing exploratory development.

A man portable, shoulder-fired weapon, DC–MAW features a unique guidance system not heretofore developed for such a small weapon according to officials of the U.S. Army Missile Command, Redstone Arsenal, Ala. The weapon concept was advanced there in the Directorate of Research and Development.

The contract to Thiokol Chemical Corp. calls for support in the design of propulsion hardware and an ignition system for the weapon. DC–MAW overall design, preliminary testing and evaluation has been initiated under an exploratory development program at the Missile Command R&D Directorate.

DoD to Distribute Bibliography of Logistics Studies

The 1965 edition of the annual Department of Defense Bibliography of Logistics Studies and Related Documents will be released in January.

Published by the Defense Logistics Studies Information Exchange, which was established in 1962 at the U.S. Army Logistics Management Center, Fort Lee, Va., the third annual bibliography will be distributed to all Department of Defense agencies which perform, or have responsibility for the supervision of, logistics research.

Other interested agencies of the Department of Defense may obtain copies on request to the Defense Logistics Studies Information Exchange, as may other Federal agencies and Government certified civilian organizations.

The bibliography will have approximately 1,500 listings, representing the logistics research effort of some 200 different agencies. Currently significant logistics studies will include citations with an abstract of completed findings as well as citations with a scope statement for planned and in-process logistics studies. The bibliography also will list significant books, magazine articles, and theses of interest to logistics researchers and managers.

Citations are indexed by subject, contractor (if applicable), and military sponsor.

Wide dissemination and use by all the Military Services of the information contained in the bibliography is expected to save considerable time and money. As reported by the Secretary of Defense in the Annual Report for Fiscal Year 1963, this "service is helping to prevent the initiation of overlapping or duplicating research projects."

SCIENTIFIC CALENDAR

Annual meeting of the American Association for Advancement of Science, Boston, Mass., Dec. 26-31.

Symposium on General Systems Knowledge, sponsored by the Society for General Systems Research and IEEE, Montreal, Dec. 26-31.

4th Western National Meeting of the American Geophysical Union, Seattle, Dec. 28-30.

Annual Industrial Electronics Symposium, sponsored by IEEE, Philadelphia, Jan. 13-15.

ASTM International Symposium on Solar Radiation, Los Angeles, Calif., Jan. 18-21.

20th Annual Instrumentation Symposium for the Process Industries, College Station, Tex., Jan. 20-22.

Winter Meeting of the National Society of Professional Engineers, New Orleans, La., Jan. 20-23.

ASTM National Symposium on Hydrocarbon Analysis, Houston, Tex., Jan. 22-23.

2nd Annual Aerospace Science Meeting, sponsored by the American Institute of Aeronautics and Astronautics, N.Y.C., Jan. 25-27.

Joint Annual Meeting of the American Mathematical Society and Mathematical Assn. of America, Denver, Colo., Jan. 25-28.

ASTM National Meeting on Steel, Mexico City, Mexico, Jan. 25-29.

Winter Power Meeting, sponsored by IEEE, N.Y.C., Jan. 31-Feb. 5.

NATO Working Group Sets Semiconductor Device Policy

Uniform international specifications for semi-conductors moved a step closer to achievement as a result of a recent meeting at the U.S. Army Electronics Command Laboratories, Fort Monmouth, N.J.

The North Atlantic Treaty Working Group on Semiconductor Devices meeting was attended by representatives of Canada, France, the Netherlands, the United Kingdom and the United States. Bernard Reich, of the Electronics Command, the U.S. Member of the group, was chairman.

"As a result of the meeting of the NATO Working Group," Mr. Reich said, "concepts have been set forth for the preparation of detail semiconductor specifications."

A draft copy of a guide for the preparation of such specifications is being prepared at E–Command Labs.

Kudos

George K. Orton, a general engineer (master planning) in the office of the Deputy Chief of Staff for logistics at Fourth Army Hq, Fort Sam Houston, Tex., recently was presented with a $1,000 check for a proposal which has saved the Army an estimated $329,000.

This figure is only for the area of the Fourth U.S. Army—Texas, Arkansas, Louisiana, Oklahoma and New Mexico—and for the first year the suggestion has been used. Longer term and wider range savings have not yet been determined, although the suggestion has been adopted by the Department of the Army.

Orton suggested a modification of "Drafting and Reproduction Methods," the regulation included in Government engineering contracts. Civilian firms submitting bids are required to use the scribing method which provides short cuts in the reproduction of maps, drawings and future development plans.

Through use of the scribing method instead of ink drafting, composite reproductions may be made from combinations of basic information maps (both general and detailed), general site plans and detailed utility maps, or similar material. In some instances, results of these maps and plans are used for Congressional review in support of annual MCA (Military Construction/Army) programs.

The scribing procedure results in a permanent negative drawing and does not require exposing and developing a photographic negative for use in composite printing of various overlays. Use of the scribe-coated material permits progressive development from existing information to planned facilities with the minimum of conventional drafting, and alterations can be added to the negative drawing as desired.

One of the advantages of the new method is a shortened training period whereby on-the-job trainees are capable of making revisions without changing the quality of the end work, thus freeing more highly skilled personnel for other types of work.

Since scribing is more accurate and can be done approximately 50 percent faster, labor costs are reduced considerably. In addition, when revisions are made, the final reproduction remains uniform with respect to the line weights of the original drawing.

A suggestion that helps prevent the breaking of manifold connecting flanges on 2½-ton trucks has earned a Department of the Army Suggestion Award Certificate and $135 for an employee at the U.S. Army Engineer Research and Development Laboratories (ERDL), Fort Belvoir, Va.

Col J. H. Kerkering, CO, presented the award to Thomas A. Eckloff, an employee of the Modification and Repairs Branch. Eckloff redesigned and modified the muffler and tail pipe brackets in a manner to prevent the exhaust manifold from breaking at the connecting flanges.

Dual awards were presented to two employees at ERDL. Mrs. Naomi K. Nelles received an Outstanding Performance Rating and Quality Salary Increase. Solomon Goldfein was promoted to chief of the Plastics Section in the Materials Research Laboratory and also was awarded a $150 Special Act and Service Award. The award was for an article, "Computing High-Rate Tensile Strength from Static Strength Data," published in a recent issue of *Modern Plastics*.

Brig Gen J. Wilson Johnston, CG, U.S. Army Satellite Communications (SATCOM) Agency, recently presented Certificates of Outstanding Performance to four SATCOM employees.

They are Samuel P. Brown, Agency technical director, Rollin G. Keyes, assistant technical director, John J. Kling, Jr., a procurement analyst in the Materiel Department, and Mrs. Maxine Pole, secretary to General Johnston.

Mr. Brown was cited for his "technical direction of the program for the development and fabrication of ground terminals for a satellite communications system," which contributed to the continued progress of the complex Department of Defense satellite communications program.

U.S. Army Chief Psychologist, Dr. Lynn E. Baker, receives a token of appreciation, a special ash tray, for his planning and chairing of the 10th Annual Human Factors R&D Conference at Fort Rucker, Ala., in October. Making the presentation is John D. Weisz, left, technical director, Human Engineering Laboratories, Aberdeen Md.

Col Charles B. Hazeltine, right, deputy Berlin Brigade commander, receives Legion of Merit from Brig Gen John H. Hay, CG, Berlin Brigade, in ceremony at U.S. Army Headquarters in Berlin. The citation for the award praised his contributions from August 1960 to July 1964 at the U.S. Army Research Office, Washington, D.C., as chief of Research Planning Division, then as Assistant Director of Army Research, Office of the Chief of R&D.

General Frank S. Besson, Jr., CG, Army Materiel Command, presents Army Meritorious Civilian Service Decoration to Richard C. Kerr (right), AMC Surface Transportation Technical Director until his retirement.

Computer Communication System Demonstrated

One of the most promising techniques available in integrated computer-comunication systems was demonstrated recently at the Pentagon to about 150 senior military and civilian Department of Defense personnel.

Army Chief of Staff General Howard K. Johnson was among the group who observed operation of a system that uses a touchstone telephone with a tactical general purpose computer and teletype.

Sponsored by Maj Gen David P. Gibbs, Army Chief of Commmunications-Electronics (C–E), the series of six demonstrations was a cooperative project of the C–E staff, the Army Materiel and Strategic Communications Commands, and the American Telephone and Telegraph Co.

In stressing the importance of the concept, General Gibbs noted that the technique and others like it offers promising solutions to the problem of serious imbalances in today's information systems. The problem involved is that the computer may work in milli-seconds, the communications system in seconds and minutes, and the preparation and handling of the source data often in hours and days.

General Gibbs stated that the techniques demonstrated to Defense personnel for the first time clearly show the fundamental changes in our communications systems. The concept is that eventually all basic military and commercial communications will serve as an integral part of information processing systems, and will offer significant capabilities to many Army strategic and tactical functions.

Data can now be transmitted from remote points over voice frequency circuits to a central data base at a higher echelon. Source data can then be extracted from the data base through query by use of a teletype linked to the computer, and can be used as both an input and an output device in the information retrieval system, the demonstration showed.

Technical Paper Describes X-Ray Films of Vocal Tract

How high-speed, sound-synchronized X-ray motion pictures of the human vocal tract are made was described recently to the Inter-American Congress of Radiology by a U.S. Army Electronics Command's Laboratories employee.

Joseph L. DeClerk presented a technical paper, "Cinefluorography of the Vocal Tract," of which he is co-author, at the meeting in Venezuela. Other authors are Dr. Lloyd S. Landa and Dr. Sydney I. Silverman of the New York University Dental College, Douglas L. Phyfe, also of the Army Electronics Laboratories (AEL) and Michael Hecker, formerly of the AEL.

The development of a high-speed method of making sound motion pictures of the human vocal tract is part of the Laboratories' effort to develop voice synthesizers for military communications. The sound film of the human voice source in operation —speaking—is shot at a speed of 120 frames per second, as compared with a normal 24 frames per second. A digital synchronizer developed at the Laboratories makes these accurate X-ray movies of the human voice possible.

Motion pictures made by this method, Mr. DeClerk said, are vital in determining just how speech is formed, and are necessary in the research and development of voice synthesizers.

Mr. DeClerk is a member of the New York Academy of Sciences.

Sprint Missile Unveiled at AUSA Meeting

The Army's newest missile to kill other missiles, the high-acceleration Sprint, was unveiled Nov. 16 in Washington, D.C. at the annual meeting of the Association for the United States Army.

Designed to operate at hypersonic speeds, and developed during two years of close secrecy, the Sprint bears little resemblance to any other tactical missile. The full-scale mock-up on display was nearly a perfect cone in shape. It looks like an elongated missile warhead nosecone.

The Sprint is one of two interceptor missiles which will be used in the Nike–X missile defense system. The other is the long-range Zeus missile. Used together, the Sprint and Zeus will allow the Nike–X system to attack and destroy attacking intercontinental and intermediate missile warheads at a wide variety of ranges.

Col I. O. Drewry, the Nike–X project manager at Redstone Arsenal, Ala., says that the Sprint's acceleration—higher than any missile yet flown—will allow it to climb to intercept altitude and destroy a warhead within seconds. It is powered by solid-propellant booster and a sustainer motor and will carry a nuclear warhead.

The Nike–X Project Office reports Sprint components as well as its configuration have undergone successful static testing. Successful tests have also been run on the missile's cell ejection system. The Sprint will be the first ground-launched missile to be "popped" from its cell rather than flown out.

A hot-gas generator installed under the missile in its vertical tubular cell will hurl the Sprint into the air. There its booster will ignite and it will pitch over to a flight angle which will take it to a pre-planned intercept point.

Sprint and the 3-stage Zeus, which is nearly twice its length, may be emplaced at the same time. Both will be controlled in flight by signals from ground-based computers and radars; also, the Nike–X system will be capable of controlling a number of interceptor missiles in flight simultaneously.

The concept of using a high-acceleration missile for close-in intercepts is one of three major innovations conceived by the Army for the Nike–X System. Others are the Multifunction Array Radar (MAR), which will perfom the functions of three radars in one, and the Missile Site Radar (MSR), which will issue the interceptor missiles their guidance instructions.

Both the MAR and MSR are phased-array radars, the first of this type radar to be utilized by an Army missile system. Instead of using heavy moving antennas, as found in conventional radars, the phased array radars use electronic switching to steer the radar beam.

Western Electric Co. is prime contractor for the Nike–X system and Bell Telephone Laboratories are responsible for design and development. The Martin Co. at Orlando, Fla., is the Sprint subcontractor.

Sprint antimissile missile

Engineer Labs Show Night-Vision Devices

A new family of night-viewing devices that can pick up faint light produced by the stars, moon or skyglow and intensify it thousands of times was unveiled recently by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Scheduled for limited production in the near future, the viewers were developed by the Engineer R&D Labs. They do not require an artificial light source, as needed for infrared night vision equipment now used by the Army. Through intensification of the natural light source, a clearly visible image of enemy personnel or equipment is produced.

Initial production of three types of night-viewing sites will be made for Infantry weapons, tanks and armored personnel carriers, battlefield surveillance and for artillery observation. All three types, for which operating prototypes now exist, will undergo troop tests for future tactical use.

The Starlight Scope weighs less than 6 pounds and can be mounted on standard military rifles or used as a hand-held device. The Crew Served Weapons Night Vision Site weighs less than 20 pounds and can be mounted on standard military crew-served weapons such as the .50 caliber machinegun and the 106 mm. recoilless rifle. The Medium Range Night Observation Device weighs slightly more than 40 pounds, is tripod-mounted, and will be used for battlefield surveillance.

Medium Range
Night Observation Device

Crew-Served Weapons
Night Vision Site

Future applications of the image intensification principle envision development of helmet-mounted binoculars, night driving aids, and hand-held binoculars for long-range viewing.

Remote viewing also is possible by using the new device with a TV orthicon pickup tube. Placed in an aircraft or on a ground position, the device enables a battlefield commander to view night operations within a widespread combat area.

To date, all development of the light intensification principle has been conducted by the Army. It is expected that the Marine Corps will use the instruments for much the same purposes as the Army.

The Navy will conduct tests of the equipment to assist night aircraft landings on carriers. The Coast Guard is interested in the equipment for improved night surveillance of coastal areas, harbors and other installations.

Developmental costs for the items to date have been approximately $18 million.

Starlight Scope

U.S., German Defense Chiefs Agree on Mutual R&D

NATO Forward Defense, the Main Battle Tank and utility helicopters were only a few of the areas of broad mutual defense agreement reached between the United States and the Federal Republic of Germany during mid-November meetings in Washington, D.C.

German Minister of Defense Kai-Uwe von Hassel and Secretary of Defense Robert S. McNamara discussed research and development in general, operations research, the exchange of scientific personnel, procurement, supply, maintenance, training and production elements and other strategic and tactical matters.

Progress on the Main Battle Tank development includes establishment of military characteristics which will significantly increase tank capabilities, the conduct of studies covering development of specific tank components, and agreement on the initiation of a production engineering program which will lead to early production of the tank.

An agreement was signed last year which provided for joint US/FRG development of the Main Battle Tank, with a joint board responsible for development progress. The German Development Corp., Augsburg, Germany, and General Motors Corp., Detroit, Mich., are prime contractors.

Secretary McNamara stated that the U.S. is interested in equipping its forces with a 20 mm. automatic gun currently being used by German armed forces. The U.S. Army has been testing the gun for the last year.

A memorandum of understanding covering a 3-year period was signed under which the German Federal Ministry of Defense will develop greater capability in the solution of high-priority military problems through operations research techniques, utilizing a U.S. civilian organization.

The German Ministry of Defense has selected the Bell UH-1D helicopter to meet its utility helicopter requirements and has indicated its intention to proceed as rapidly as possible with cooperative production of at least 200 of the aircraft.

Agreement also was reached to expand the program of exchange of technical and scientific personnel between the Federal Ministry of Defense and the U.S. Department of Defense. The two Defense chiefs expressed belief that such a program is clearly beneficial to both countries and should be instrumental in furthering cooperative research action.