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Engineers Regain Control, Restore Name of CRREL

Transfer of control and redesignation of the U.S. Army Terrestrial Sciences Center, Hanover, N.H., effective July 1, completed a full cycle of change that began in 1962.

Until the Army-wide reorganization in that year, the U.S. Army Chief of Engineers had command jurisdiction over what was then known as the Cold Regions Research and Engineering Laboratory (CRREL). Now its "new" name is again CRREL and it is back under the Chief of Engineers.

The U.S. Army Materiel Command, which acquired CRREL as part of the massive consolidation of Army materiel activities in 1962, redesignated it

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ASC Paper Proposals Given Oct. 20 Cut-Off

Oct. 20 is the cut-off date for submission of narrative summaries of technical papers proposed for presentation at the 1970 U.S. Army Science Conference, June 16–19, U.S. Military Academy, West Point, N.Y.

Nearly 500 summaries were submitted in competition for the 1968 Army Science Conference. They were screened for excellence in the various

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ISO Centers OCRD Information Management

Structure of a new Information Systems Office (ISO), with single-manager responsibility for technical information and data programs within the jurisdiction of the Army Chief of Research and Development, includes headquarters and field units.

Chief of R&D Lt Gen Austin W. Betts has approved an ISO organization that has 3 officers and 4 civilians at DA staff level and a supporting Class II activity collocated with the Army Research Office, 3045 Columbia Pike, Arlington, Va. ISO initial staffing is being accomplished within existing OCRD departmental and field space limits.

Elements of the Class II activity are a Data Management Division and a Management Information Division, each with two branches. The ISO was set up in compliance with Chief of Staff Memorandum 68–252, which states a need to consolidate all related data processing functions.

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AMC Selects Dr. Dillaway Deputy for Laboratories

(See story on page 9)

Dr. Robert B. Dillaway

R&D Newsmagazine Consolidated

Annual leave is a luxury that members of the 2-man editorial staff of the Army Research and Development Newsmagazine have long had to forego to meet production schedules—which, admittedly, we often have failed to do since the staff was halved more than a year ago by personnel losses.

To permit staff members to get away for about a week of vacation each, and hopefully to get somewhere near back on schedule, consolidated June–July and August–September editions are being published.

Group Seeks Aircraft In 60-Ton Lift Class

Creative ideas for achieving a substantial increase in Army aircraft heavy-lift capability—a gain to the 50–60-ton regime in the 1990s—were discussed recently by industrial, academic and defense experts.

The 3-day meeting was sponsored by the Advanced Materiel Concepts Agency (AMCA), U.S. Army Materiel Command. It was the sixth in a series conducted by AMCA to consider concepts geared to Army long-range materiel development goals in a broad variety of areas.

Dr. Barnes McCormick, professor, Department of Aerospace Engineering at Pennsylvania State University, presided at the heavy-lift aircraft sessions held in the Nassif Building near Baileys Crossroads, Va. AMCA has since moved to the Hoffman Building at the intersection

(Continued on page 4)

Kwajalein Radar Complex Memorializes Lt Col Kiernan

Kiernan Reentry Measurements Site, Roi Namur, is the new designation of the radar complex on the Island of Roi Namur, Kwajalein Missile Range in the Pacific, in memoriam to the late Lt Col Joseph M. Kiernan Jr.

Army Chief of Research and Development Lt Gen Austin W. Betts was

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FROM RIGHT: Lt Gen A. W. Betts, Chief of R&D; Brig Gen I. O. Drewey, Kwajalein Missile Range CG; Mrs. Marianne Kiernan, sons Joseph, Thomas.

Featured in This Issue . . .

Army R&D Newsmagazine

Vol. 10 No. 6 • June-July 1969

Editor . . . . . Clarence T. Smith
Associate Editor . . . . George J. Makuta

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

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

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OTHER GOVERNMENT AGENCIES' requirements should be submitted directly to the Army Research Office, OCRD, Department of the Army, Washington, D.C. 20310, ATTN: Data Management Division, Publications Branch.

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

ASAP Weighs Airmobility Gains, Challenges

U.S. Army Scientific Advisory Panel members and consultants centered discussion on "Achievements, Trends and Challenges of Organic Army Airmobility" at their spring meeting, May 11–14, Fort Rucker, Ala.

As guests of the U.S. Army Aviation Center/School, commanded by Maj Gen Delk M. Oden, who gave the welcoming address, 15 general officers joined with about 85 ASAP members, consultants and aviation experts in considering Army airmobility objectives extending to 1985.

U.S. Army Materiel Command CG General Ferdinand J. Chesarek participated as a member of the ASAP executive committee for the first time since he succeeded General Frank S. Besson Jr., effective Mar. 10.

Acting Assistant Secretary of the Army (R&D) Charles L. Poor, Assistant Secretary of the Air Force (R&D) Grant L. Hansen, ASAP Chairman Dr. Harold M. Agnew and Vice Chairman Dr. Ralph E. Fadum, Deputy Assistant Chief of Staff for Force Development Maj Gen Robert R. Williams and U.S. Marine Corps Deputy Chief of Staff Maj Gen Louis Metzger and Maj Gen George Seneff, U.S. Strike Command, were among participating dignitaries.

Army Combat Developments Command CG Lt Gen Harry W. O. Kinnard, one of the leading pioneers of Army airmobility, proposed and sponsored the meeting and helped develop plans, but was prevented by illness from attending. CDC Deputy CG Maj Gen Leo H. Schweiter gave the introductory address.

General Williams spoke on "Overview of Army Aviation" and General Metzger discussed "R&D Support in Vietnam" as the banquet speaker.

Eleven major presentations were made on various aspects of Army airmobility, including: "Soviet Bloc Airmobility Concepts and Capabilities," Maj Rex V. N. Perkins, Office of the Assistant Chief of Staff for Intelligence, HQ DA; "Challenges to Army Aviation," Col Howard I. Lukens, commander, CDC Aviation Agency; and

"Air Mechanization Concepts 1985," Col Edwin W. Emerson, CDC Institute of Advanced Studies; "Aeromedical R&D Aspects of Air Safety and Life Support Equipment," Lt Col Robert W. Bailey, commander, U.S. Army Aeromedical Research Laboratory; and

"Human Factors in Airmobility," Dr. Wallace N. Prophet, director of research, Human Resources Research Office, Division No. 6 (Aviation), Fort Rucker; "Intelligence Support and Trends in Aerial Surveillance," Col Orville R. Hughes, deputy CO, CDC Intelligence Agency, Fort Holabird, Md.; "Avionics," Lt Cols Conrad J. Provencher and Cecil E. Wroten, CDC Aviation Agency; and

"Systems Safety Research," Lt Col James T. Darrah Jr., U.S. Army Board for Aviation Accident Research; "Current and Future Developments in Helicopter Armament," Lt Col Michel Costino, HQ Army Materiel Command; and "Considerations Affecting Helicopter Vulnerability/Survivability," Lt Col John D'Aura Jr., CDC Institute of Special Studies.

Army Scientific Advisory Panel consultant Andrew J. Viterbi is sworn in by Lt Col Wayne D. Miller, ASAP.

Col Jay D. Vanderpool (USA, Ret.), a pioneer of Army airmobility, gave one of the highlight addresses in discussing initial concepts, approaches and reasons for arming the helicopter for airmobility needs.

Featured were a massive air-assault exercise and a demonstration of rapid refueling of aircraft under simulated combat conditions. The program included a briefing on helicopter armament systems and displays of grenade launchers, rocket firing and the aerial minigun. Participants were served a luncheon of long-range patrol rations developed by the U.S. Army Natick (Mass.) Laboratories.

ASAP's mission is to provide advice and long-range guidance to the Secretary of the Army, Chief of Staff, Assistant Secretary of the Army (R&D), and the Chief of Research and Development on over-all scientific and technological matters concerning the Army research, development, test and evaluation program.

In addition to General Chesarek, Dr. Agnew and Dr. Fadum, ASAP's executive committee consists of Acting ASA (R&D) Charles L. Poor, General Betts and General Kinnard. Lt Col Wayne D. Miller is executive secretary of the ASAP.

Information Systems Office Centers OCRD Information Management

(Continued from page 1)

Functions of the chief of ISO include:

- Serving as principal adviser to the Chief of R&D on information systems and related ADP activities.
- Guiding, directing and supervising activites of support divisions.
- Developing, maintaining and operating the Army R&D Information System (ARDIS) and supervising OCRD data-processing installations.
- Assuring appropriate interfacing of the OCRD system with other Army information systems.
- Monitoring and supporting research, development, test and evaluation (RDT&E) activities directed toward advancement of ADP technology.
- Serving as Army Director of Technical Information with responsibilities detailed in a memorandum for the Deputy Secretary of Defense from the Assistant Secretary of the Army (R&D), Oct. 24, 1962, "Policy on Scientific and Technical Information."
- Executing all SOMISS (Study of Management Information Systems Support) related actions having impact upon or relationship to the mission of OCRD.

Chief of Staff Regulation 10–56 is being revised to reflect the ISO organization and reassignment of certain functions of the Plans and Programs Directorate, the Army Research Directorate, and the Army Research Office, including supervisory and support responsibilities.

Reporting directly to the Chief of R&D, the ISO is headed by Col Dale L. Vincent as acting chief, with Morton H. Marks as deputy chief. Since Aug 14, 1964, Col Vincent has served as Army Director of Technical Information and as chief of the Data Management Division (formerly the Scientific and Technical Information Division).

Marks joined the Army Research Office staff Nov. 12, 1967, as chief of the Systems Research and Engineering Branch, following two years as technical adviser to the head of the Computer Systems Directorate, U.S. Army Information and Data Systems Command, Washington, D.C.

Pending assignment of a colonel to head the Management Information Division, Marks also is serving as acting chief of this element, representing a substantial expansion of the Systems Research and Engineering Branch when it was one of four branches in the Data Management Division.

CHIEF OF R&D Lt Gen A. W. Betts discusses Information System Office with Col D. L. Vincent, flanked by Morton Marks (l.), Martin H. Weik.

The MID is responsible for formulating detailed systems requirements and performing the planning, analysis, design, development and operation of OCRD management information systems as part of HQ DA operating systems.

MID functions include preparation of detailed RDT&E information requirements for design of operating information systems for multicommand use; also, providing advice, consultation and support for these activities.

The MID is comprised of a Systems and Operations Branch, headed by David Nemore, and a Plans and Requirements Branch under Lt Col Edgar B. Ross Jr. Nemore, a former Army Materiel Command employe, came to the MID as a member of the ARDIS Working Group and joined the Army Research Office staff in 1967. Col Ross was, until reassigned, with the OCRD Review and Evaluation Office, which has been dissolved.

Martin H. Weik Jr., one of the Army's well-known leaders in ADP and computer technology with 16 years continuous service in this field, is acting chief of the Data Management Division. Since 1967 he has been deputy to Col Vincent as chief of the DMD and its predecessor organization.

Functions assigned to the DMD include providing over-all direction, long-range planning, initiation, staff supervision and funding for HQ DA programs in information science and technology. The division participates in the review and evaluation of ADP-related, prototype multicommand scientific and engineering information systems, and policy guidance.

The DMD consists of an Advanced Information Technology Branch headed by Dr. John C. Hayes, who has served as chief of the Programs and Concept Branch since September 1965, and a Publications Branch with Clarence T. Smith as chief.

Dr. Hayes is well-known to the Army R&D community for his work on the Army Science Conference, the Army Junior Science and Humanities Symposia Program and numerous other scientific meetings. Smith has been on the staff since 1958. Known as the originator and editor of the *Army Research and Development Newsmagazine*, he has served as chief of the Publications Branch since March 1963.

Under the reorganization plan approved by General Betts, guidance for the conference and symposia program, the technical library, publications, and information processing technical programs functions may be provided directly to the Data Management Division from the Director of Army Research and the commander of the Army Research Office

Maj Gen Rollins Named to Head Mississippi River Commission

President Nixon has nominated Maj Gen Andrew P. Rollins Jr. to become head of the Mississippi River Commission, Vicksburg, Miss., where the U.S. Army Engineers Waterways Experiment Station (WES) is located.

Scheduled to take this position Aug. 1 and also to become division engineer for the Lower Mississippi Valley Division, subject to Senate confirmation of his appointment, General Rollins will succeed Maj Gen R. G. MacDonnell upon retirement.

The Mississippi River Commission is composed of three officers from the Army Corps of Engineers, one officer from the U.S. Coast and Geodetic Survey and three civilians.

Government, industrial and academic heavy-lift helicopter specialists at Advanced Materiel Concepts Agency parley.

Advanced Materiel Concepts Agency Holds Heavy-Lift Aircraft Meeting

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of Telegraph Road and Beltway 495, Alexandria Va.

Participants included representatives of the Army R&D community, U.S. Air Force, the Navy and Marine Corps, academic institutions and aerospace industrial organizations, and other U.S. Government agencies such as the National Aeronautics and Space Administration (NASA), and Federal Aviation Agency of the Department of Transportation.

Stated objectives of the AMCA Ad Hoc Working Group include:

- To examine all potential very-heavy-lift concepts which may be capable of lifting payloads in the 50-60-ton area in the 1990s.
- To document the technical feasibility and the operational practicability of each concept.
- To identify the technological constraints which exist for each of the concepts, with a view toward what is required now in the way of R&D effort to determine the plausibility of the concept.
- To recommend those approaches that should be pursued by the Army as a matter of priority in order to achieve a very-heavy-lift capability for the U.S. Army of the 1990s.

Consideration of means of achieving these objectives included all existing and plausible new approaches, such as various types of helicopters, future V/STOL (Vertical and Short Takeoff and Landing) aircraft, dirigibles and blimps, flexible-wing vehicles, gliders, aerial platforms and other new concepts.

Discussions at the recent AMCA-sponsored meeting included in-depth examination of characteristics and major subsystems of each approach.

Operational practicability and restraints to effective utilization in the field of each of the concepts were considered and documented. Heavy airlift capability, it was stated, appears to be a field in which the Soviet Union presently has a clear edge.

"Current Status of U.S. Army Heavy-Lift Helicopter Program" was a presentation by Lt Col Harold Small, Office of the Assistant Chief of Staff for Force Development, HQ DA. Lt Col Alan B. Cayo, chief, Doctrinal Concepts Branch, U.S. Army Combat Developments Command, spoke on "Future Army Requirements for Heavy Lift."

Dr. Robert Burton, chief of Threat Analysis Branch, Intelligence Threat Analysis Group, Office of the Assistant Chief of Staff, Intelligence, discussed "Survey of Foreign Heavy-Lift Technology." Robert D. Powell Jr., acting chief Systems Development Division, U.S. Army Aviation Materiel Laboratories (AVLABS), presented "Current Helicopter Technological Problems."

One of the featured talks was given by Dr. George F. Wislicenus, head of the Department of Aerospace Engineering, Pennsylvania State University, on "General Design Considerations." Another highlight was "Ad-

AMCA, Other Agencies Move to Hoffman Building

When the U.S. Army Advanced Materiel Concepts Agency (AMCA) is termed an organization "on the move," the meaning is dualistic—moving ahead rapidly with important planning related to Army materiel, and moving to new locations.

For the third time in little more than a year of its existence, the AMCA was relocated late in May from the Nassif Building on Columbia Pike near Bailey's Crossroads to the Hubert N. Hoffman Building near the intersection of Beltway 495 and Telegraph Road, 301 Taylor Drive, Alexandria, Va. AMCA is an element of the Army Materiel Command.

Consolidation of elements of the so-called Army advanced planning "troika" organizations was accomplished in the move to the Hoffman Building. Relocation of the Combat Developments Command's Institute of Land Combat (ILC) and the Intelligence Threat Analysis Group (ITAG), Office of the Assistant Chief of Staff for Intelligence, HQ DA, was accomplished at the same time.

The function of the "troika" is to generate alternative systems and concepts of materiel that will impact upon future Army combat operations.

OTHER AGENCIES RELOCATED. Several other Army, Navy and Air Force elements moved into the Hoffman Building at about the same time as the "troika" organizations. One of the largest of these is the U.S. Army Strategic Communications Command–CONUS (STRATCOM–CONUS), which involved the relocation of about 380 military and civilian employes previously in Suitland, Md., Washington, D.C., and Alexandria.

Commenting on the move into the 14-story Hoffman Building, the first of a projected $25-million 4-building complex, STRATCOM–CONUS Commander Col G. Hines said he considers the relocation "will be of great advantage to the command and its members. Consolidation of our headquarters elements will aid . . . smooth operation."

About 1,700 U.S. Government and private industry employes will occupy the Hoffman Building. When completed, the 4-building complex will provide 342,000 gross square feet of space, with parking for 2,100 cars.

vanced Helicopter Technology" by Kurt Pfleiderer, chief of design, Messerschmitt-Boelkow, Germany.

Four major presentations were made by representatives of major industrial firms. John Schneider, manager of advanced design, Boeing-Vertol Corp., spoke on "Tandem Rotor Technology for Very Heavy-Lift Helicopters." Lester Veno, manager of military requirements for General Electric Co., presented "General Propulsion Technology."

Lewis Knapp, chief designer for heavy-lift helicopters, Sikorsky Aircraft Co., discussed "Helicopter Heavy-Lift Technology: Shaft-Driven." This same topic with respect to gas-reaction drive systems was presented by Kenneth B. Amer, assistant director, Aero Enginering Division, and Thomas Schonlau, senior systems engineer, Hughes Tool Co.

"V/STOL Aircraft Technology" was the topic of Norwood W. Tillinghast, project manager for V/STOL, Ling-Temco-Vought Aerospace Corp. Dr. Robert S. Ross, manager of Aero-Mechanical R&D, Goodyear Aerospace Corp., spoke on "Lighter than Air Vehicles."

High-ranking officials, scientists and engineers of several other aircraft and aerospace industrial firms participated, including Kaman Aircraft Co., Lockheed (Calif.) Aircraft Corp., Gyrodyne Co., Pratt and Whitney Corp., Ryan Aeronautical Co. and Lycoming Division of AVCO.

The U.S. Army Aeronautical Research Laboratory was represented by H. Andrew Morse, director of research. Other recognized Army leaders in the field of heavy-lift helicopter design and engineering included Carl Stephenson, technical director, Office of the U.S. Army Aviation Systems Command; Project Manager for PM-HLH Dr. Sudhir Kumar, associate director, Engineering Science Division, Army Research Office-Durham (N.C.); Prof. Henry R. Velkoff, Mechanical Engineering Department, Ohio State U.

Richard L. Ballard, Physical and Engineering Sciences Division, Army Research Office-Washington, D.C.; Donald Ball, Concepts and Technology Division, R&D Directorate, U.S Army Aviation Systems Command; Lt Col Harold Small, Department of the Army special staff officer for HLH, Office of the Assistant Chief of Staff for Force Development; Lt Col William J. Tedesco; HLH project officer, HQ Army Combat Developments Command; and

Louis Borges, Office of the Chief Scientist, Army Materiel Command; Clifford Wrestler, Military Technology Division, CDC Institute of Land Combat; Dr. Berthold Zarwyn, chief, Intelligence, Command and Control Task Group, AMCA; Marshall Waller, acting chief, Exploratory Evaluation Division, AMCA; Bernard Rashis and Daniel Belvin, aerospace engineers, AMCA.

Among participants from other government agencies were V. H. Gough, chief, Technical Analysis Branch, Systems Analysis Division, Federal Aviation Agency; Frederic B. Gustafson, staff scientist, Flight Mechanics and Technology Division, National Aeronautics and Space Administration-Langley; and

J. C. Vaughan, Advanced Concepts Division, U.S. Naval Air Systems Command; Richard Murphy, Naval Ship R&D Center; Robert J. Tracy, senior aerospace engineer, U.S. Navy; Bernie Lindenbaum, deputy for Studies and Analysis, U.S. Air Force Flight Dynamics Laboratory, Wright-Patterson Air Force Base, Ohio; and George A. Brigham, operations research analyst, Air Support Section, U.S. Marine Corps Development Center.

The action officers who arranged the high-level HLH conference, under the guidance of Col Norman Hall, AMCA deputy director and commander, are Lt Col George W. Adamson, R&D coordinator, and Robert V. Johnson, aerospace engineer, both with AMCA.

Chesarek Appoints Redling, Jones to Key AMC Posts

General F. J. Chesarek, CG of the U.S. Army Materiel Command, on June 5 announced assignment of Maj Gen William N. Redling as deputy CG for Logistical Support and Maj Gen Leo B. Jones as chief of staff.

Formerly CG of the Army Transportation Center and Fort Eustis, Va., and commandant, Army Transportation School, General Redling will concentrate on AMC's goal of improving support of the Army in the field. He is widely recognized as one of the Army's most seasoned logisticians.

Among numerous high command posts he has filled are CG, 1st Logistical Command, U.S. Army Europe, where he also served as USAREUR chief of transportation; assistant chief of staff, G-4, and then, chief of staff, U.S. Army Alaska; Chief of Transportation, HQ Department of the Army; and logistical staff officer, Supreme HQ, Allied Powers, Europe.

During World War II, General Redling served in the Aleutian Islands Campaign, with the U.S. Marine Corps as Shore Group and Port Commander during the Iwo Jima Assault in 1945, and in Japan with the advance party of occupation forces following surrender.

He is a graduate of the Armed Forces Industrial College, Washington, D.C.

GENERAL JONES is a former chief of staff and CG, Support Troops, U.S. Army Vietnam, a combat arms veteran of World War II and Korea, and has held major assignments in artillery and logistics most of his career. In Europe he served with the 808th Field Artillery Battalion and in Korea with the 11th Field Artillery Battalion.

Among his major assignments in recent years have been top staff positions in the Office of the Deputy Chiefs of Staff for Military Operations and for Logistics, and in the Office of the Joint Chiefs of Staff.

With the Seventh U.S. Army in Europe, he served as CO of the 72d Artillery Group, assistant commander of VII Corps Artillery, and assistant chief of staff, G-4, VII Corps.

A 1941 distinguished military graduate from Iowa State University, he is a graduate from the Army War College and National War College.

Maj Gen Leo B. Jones

Maj Gen William N. Redling

Engineers Regain Control, Restore Name of CRREL

(Continued from page 1)

the Terrestrial Sciences Center July 1, 1968. In the minds of many of the agencies and individuals concerned with its mission, however, that name was less than popular as descriptive of the mission.

Return of CRREL control to the Chief of Engineers is a result of the recent change of his responsibilities to include basic and applied research in support of the Corps of Engineers mission, which historically has included many activities of military interest in the cold regions.

CRREL's traditional mission, it was stated, will remain unchanged; also, there will be no major change in funding or personnel involved as a result of the transfer. Plans are being developed, however, which may result in the reassignment of a small number of personnel to the U.S. Army Night-Vision Laboratories of the Electronics Command.

The Photographic Interpretation Research Division will remain under Army Materiel Command control and will be assigned to the Army Night-Vision Laboratories, Fort Belvoir, Va. The division will remain at CRREL until arrangements can be completed for transfer early in 1970.

Lt Col John E. Wagner, who served as commander and director of the Terrestrial Sciences Center, continues to perform in both capacities.

Cold regons, as defined in CRREL's mission, include much more than the popular concept of the Arctic and Antarctica. They include a sizable portion of the temperate zones and the areas of high elevation located on every continent of the world.

"The serious problems posed by cold for military operations, as well as for much of the civilian economy," a CRREL statement explains, "necessitate a complete understanding, on a global scale, of the pertinent environmental factors and materials, and a thorough knowledge of techniques for coping with or utilizing the world's vast cold regions."

CRREL's mission, as a result, includes the conduct and coordination of research and surveillance of technology applicable to U.S. Army needs where cold presents a severe problem at least one year in ten. Included are most of the land masses of Asia, Europe and North America, primarily north of the 40th parallel.

CRREL is concerned with the operational factors and the design of materiel introduced into these cold environments. Areas of research and study include geomorphology and near-surface geology related to engineering and design problems.

Primarily, CRREL activities are directed toward military requirements. However, the laboratory performs a substantial amount of scientific investigation for, or in conjunction with, nonmilitary U.S. and state government agencies, foreign governments, and government contractors.

Dr. Haley Becomes OCRD Missiles/Space Adviser

Appointment of Dr. Richard L. Haley as scientific adviser to the Director of Missiles and Space, Office of the Chief of Research and Development, HQ DA, recently filled a position vacated by William B. Taylor in January to become technical director, Army Mobility Equipment R&D Center, Fort Belvoir, Va.

Dr. Haley has been manager of the Nimbus weather satellite program, National Aeronautics and Space Administration, Washington, D.C. Assigned to NASA in September 1963, he served as program engineer and then as manager for Advanced Technology and Projects in the Meteorological Programs Division.

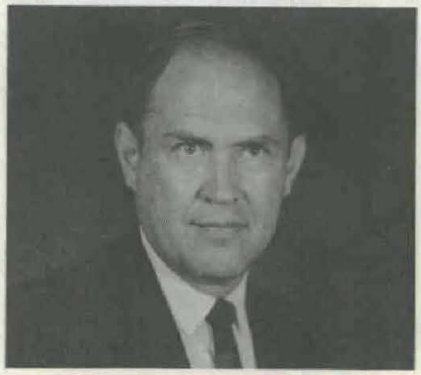
"Meteorological Satellites—Beyond the First Nine Years," a technical paper authored by Dr. Haley, was presented in 1968 at the Joint National Meeting of the Operations Research Society of America and the American Aeronautical Society.

Another of his papers, "The Nimbus Satellite Program," was also presented in June at the Fifth Annual Meeting of the American Institute of Aeronautics and Astronautics. He is the author of "NASA's Meteorological Programs—Beyond the First Five Years," presented at the Second Space Congress in 1965.

Prior to joining the NASA staff as a civilian employe, Dr. Haley served 21 years as an officer in both the Army and the Air Force, following graduation from the United States Military Academy in 1945. He received MS and doctoral degrees (1950 and 1963) from the University of Pennsylvania while on military duty.

Before transferring to the U.S. Air Force in 1961, Dr. Haley served a year with the 7th Infantry Division in Korea. From 1956 to 1959, he was assigned to missile intelligence work in the Office of Assistant Chief of Staff for Intelligence, HQ DA.

Earlier assignments have included service in the Philippines and in the occupation of Japan, followed by command of the only existing surface-to-surface missile unit in the Army which was firing U.S.-built V-1 type missiles. He was Corporal missile R&D project officer at White Sands (N. Mex.) Missile Range in 1953.



Dr. Richard L. Haley

ASC Paper Proposals Given Oct. 20 Cut-Off

(Continued from page 1)

major commands before they were submitted to the Army Research Office for consideration by a panel of judges. This year's competition for the honor of being chosen to present papers is expected to be equally keen.

Dr. Richard A. Weiss, chairman of the ASC Advisory Group and also the Deputy and Scientific Director of Army Research, said letters notifying authors of the 100 papers that will be selected for presentation will be sent out by Nov. 20. The papers will be given before five concurrent sessions.

In addition to the 100 selected papers, 15 will be chosen as alternate papers in the event that substitutions may be necessary. One of the alternate papers at the 1968 conference was among the prize winners.

Under provisions of the Army Incentives Awards Program, cash honorariums will supplement Certificates of Achievement presented to authors of about 10 of the prize winning papers. Authors of 9 papers shared $3,500 in 1968. Ten additional papers were chosen for Outstanding Achievement Awards.

Serving on the ASC Advisory Group are Col Helmuth Sprinz, chief, Department of Experimental Pathology, Walter Reed Army Institute of Research; Dr. Gilford G. Quarles, chief scientific adviser, U.S. Army Corps of Engineers, with Robert Jackson as alternate; and Dr. Craig M. Crenshaw, Army Materiel Command Chief Scientist, and his deputy, Dr. Gordon Bushey, alternate.

Dr. John C. Hayes, project officer for the 1968 ASC, will serve again in that capacity and is also executive secretary of the Advisory Group.

How Can We Make Helicopters More Useful?

Acting Assistant Secretary of the Army (R&D) Charles L. Poor, speaking recently to the American Helicopter Society meeting in Washington, D.C., detailed the challenge confronting designers of future helicopters and short-take-off-landing aircraft. His address, titled as here headlined, dealt with problems involved in military and civilian utility, as follows:

When General Tolson invited me to speak here today, I welcomed the opportunity. It was a particularly attractive invitation, because he said I could talk on any subject I chose.

As time went by, the apparent attractiveness of the invitation diminished somewhat. There are many, many subjects of deep interest to all of you in the industrial side of the team, and to all of us in the Department of Defense. There is the pressing matter of the ABM, there is the growing debate over the proper role of the University in helping to secure the nation against the technical and social threats both external and internal, and there is the deepening general concern about the relationship between industry and government in a time when the growing complexity and escalating costs of our weapons systems have caused us all to re-examine our management methods, and to reassess our priorities.

So, faced with so many choices, I have decided to take the easy way out, and to talk about the one subject I am sure you all expected me to talk about —the helicopter, its promise, and some of the properties of the helicopter that seem to stand in the way of fulfillment of that bright future we all hope it will attain.

In its military role, the helicopter has proven itself. It is, I think, generally agreed that the mobility given our soldiers by rotary-wing machines has been the most important single factor easing our task in Vietnam. Patrol missions nearly impossible to perform on foot are made, if not easy, at least practicable by moving through the air over uncharitable terrain. Logistics are eased, firepower rapidly concentrated and, most important, manpower is saved. The rotary-wing machine, once thought of as fragile, unsafe, and totally unsuitable for military uses, has been the mechanized hero of the war in Vietnam. We must not, however, become complacent. Excellent as the rotary wing machines have proven themselves to be in the airmobile role, there remain problems which must be addressed seriously if the helicopter is to realize its full potential in both the military and commercial markets.

Ann Morrow Lindbergh said some 30 years ago words to the effect that the airplane was the dirtiest, most uncomfortable, most unreliable form of transport known to man. This was at a time when the airplane was becoming an important competitor to the railroads, was a fully accepted military weapon system, and was on the threshold of a virtual take-over of much of the transport market.

I think the helicopter is in much the same state today as the airplane was when Mrs. Lindbergh so pungently described its properties. Let us examine together some of the properties of the helicopter as we know it today, so as to see what areas should have our attention to make it better for the tasks in which we all believe it should be able to excel. Since the government shares with the industry the responsibility for the research that must be done to reach the goal, we must work together to that end.

To paraphrase Mrs. Lindbergh's remark, the helicopter today is one of the noisiest, most complicated, expensive forms of transport known to man. In addition, it demands tender loving care from expert maintenance mechanics, and, despite the allegations of the highly skilled pilots who fly it, is difficult to fly.

High acquisition costs, difficulty in operation and high maintenance costs have been the principal hurdles to be overcome in the military market

(Continued on page 16)

Acting Assistant Secretary of the Army (R&D) Charles L. Poor has served in that capacity since the departure of ASA (R&D) Dr. Russell D. O'Neal in December 1968. Poor was Deputy ASA (R&D) from June 1963.

Graduated from Harvard University in 1941 with an AB degree in aeronautical engineering, he was one of the Army nominees in 1966 for the Rockefeller Public Service Awards and has distinguished himself as an Army career scientist since he joined the staff of the Army Ballistic Research Laboratories, Aberdeen (Md.) Proving Ground in 1945.

ARADMAC Airlifts 5,454 Engines to Vietnam in One Year

Direct airlift of turbine aircraft engines to and from Vietnam, inaugurated May 29, 1968, as part of an intensive maintenance program to "keep 'em flying," completed first-year operations with 5,454 engines to Vietnam on 152 flights.

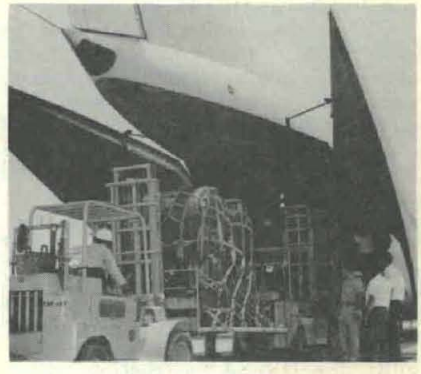
The Army Aeronautical Depot Maintenance Center (ARADMAC), Corpus Christi, Tex., reported that May operations were the largest, with a total of 522 engines shipped to Vietnam via Military Airlift Command giant C–141 aircraft. Three flights a week are normal.

ARADMAC Commander Col Luther G. Jones Jr. watched the first takeoff of a plane with 38 engines and commented, "Within five days they should be powering UH–1 (Huey) and CH–47 (Chinook) helicopters."

Each C–141 aircraft carries a load of reparable engines on the return flight (turn-around time is 55 hours) and this rapid exchange has contributed greatly to the success of U.S. helicopter operations in Vietnam.

ARADMAC is the U.S. Army's main overhaul and repair center for helicopters of both the Huey and HueyCobra type. Before assuming command of ARADMAC in January 1968, Col Jones was commander of the 34th General Support Group in Vietnam.

The engine airlift, he commented recently, "has been part of the process of getting materiel to the man on the battlefield in Vietnam with the least possible delay."



HELICOPTER ENGINES encased in pressurized cannisters are loaded into an Air Force C–141 for shipment to Veitnam from the Army Aeronautical Depot Maintenance Center (ARADMAC), Corpus Christi, Tex. Turnaround time is 55 hours, and plane returns loaded with reparable engines.

Kwajalein Radar Complex Memorializes Lt Col Kiernan

(Continued from page 1)

present at recent designation ceremonies in the Pentagon, Washington, D.C. Brig Gen I. O. Drewry, CG of Kwajalein Missile Range, presented a memorial plaque to Mrs. Marianne Kiernan, widow of the officer who lost his life in a helicopter crash June 3, 1967, in Vietnam.

The action designating Kiernan Reentry Measurements Site, Roi Namur, cited the deceased officer for a "substantial contribution to the development of strategic technology in the United States." Lt Col Kiernan served as program manager, Pacific Range Electromagnetic Signature Study, Advanced Research Projects Agency, Office Secretary of Defense.

"While serving in this capacity," the citation states, "he displayed outstanding leadership, and under his extremely able guidance extensive additions and improvements were made to the technical and support facilities of this site. Due in large measure to these accomplishments, the necessary data were obtained to produce the first evidence of our ability to do discrimination during reentry."

This ability to discriminate between missiles carrying nuclear warheads and those that might be used as decoys to confuse an antiballistic missile defense system is essential to success of the Safeguard ABM system.

Lt Col Kiernan was credited with making "significant contributions by urging the incorporation of certain sensors that aided the intelligence community in collecting data on foreign reentry vehicles.

"As a result of his careful planning, he was instrumental in creating a coherent systematized operation incorporating the varied aspects of experiment planning and data interchange on all missile flights into Kwajalein Missile Range so that maximum utility would be gained from each flight. The procedures that he pioneered are substantially in effect today and the success of our offensive and defensive technology development is, in large measure, due to his foresight and leadership ability."

Graduated No. 1 in General Order of Merit from the United States Military Academy (Class of 1948), Lt Col Kiernan was later to achieve recognition of several general officers as a "brilliant intellect . . . his potential is unlimited . . . his career should receive special handling in order to prepare him for top posts." He earned a master's degree from California Institute of Technology in 1958.

While assigned to the Office of the Chief of Research and Development, HQ DA (3-year tour, 1958–61), Lt Col Kiernan was a staff officer in the Missiles and Space Division. After graduating from the Army Command and General Staff College in August 1961, he served a year in Izmir, Turkey, as a resident engineer.

Assignment as program manager of PRESS (Pacific Range Electromagnetic Signature Study) from May 1963 to June 1966 was followed by duty as battalion commander, 1st Engineer Battalion, 1st Infantry Division, Vietnam, until he died.

CGSC Conducts Symposium On Operations Research

Representatives of Army branch schools and other Department of Defense agencies participated recently in the first Operations Research/Systems Analysis (OR/SA) Symposium conducted by the Command and General Staff College, Fort Leavenworth, Kans.

Divided into four discussion groups, representatives spent much of their time making suggestions for improving future OR/SA instruction.

OR/SA instruction is intended to assist Army commanders and managers in applying analytical methods and techniques to the military decision-making process.

Recommendations of the 1966 Haines Board Study approved by the Department of the Army resulted in establishment of a progressive elective OR/SA training throughout the entire Army schooling system, starting with the 1967–68 school year.

The U.S. Continental Army Command has assigned over-all responsibility for OR/SA instruction within the Army Officer schooling system to the Command and General Staff College (CGSC). The CGSC provides instructional packets to each of the user schools, outlining a suggested course.

Each of the user schools has authority to use all, any part or none of the instructional packet, as directed by the individual school commandants.

Lamp Follows O'Donnell as MERDC Leader

Command of the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., passed recently from Col Edwin T. O'Donnell to Col Russell J. Lamp, a Corps of Engineers officer fresh from duty since 1967 in the Office of the Secretary of Defense (System Analysis).

Col O'Donnell, who had served as MERDC commander since September 1967, was recognized for distinguished service with the award of the Army Legion of Merit prior to departure for duty as assistant chief of staff (Logistics) in Vietnam. Maj Gen Charles C. Case, CG, U.S. Army Mobility Equipment Command, St. Louis, Mo., made the presentation.

Col O'Donnell was cited for his performance in carrying out 25 ENSURE (Expedited Non-Standard Urgent Requirements for Equipment) projects "which were urgently required to meet operational requirements of U.S. Army combat units in Vietnam. Through his vigorous application of intensified management, these projects have an average completion time of an unprecedented 9.2 months from requirement to hardware-in-country."

Col Russell J. Lamp

Col Edwin T. O'Donnell

COL LAMP, during his recent assignment in OASD (System Analysis), served as a staff officer in the SEA (Southeast Asia) Resources Division. His R&D experience includes service as R&D coordinator, R&D Directorate, U.S. Army Materiel Command (1962-65) and as executive, R&D Directorate, Office of the Chief of Engineers (1960-62).

Graduated from the United States Military Academy as a second lieutenant in 1949, with a BS degree in military science, he earned an ME degree in civil engineering at Massachusetts Institute of Technology in 1955 and a master's degree in international affairs from George Washington University, Washington, D.C., in 1966.

Col Lamp also is a 1959 graduate from the Command and General Staff College, Fort Leavenworth, Kans., the Armed Forces Staff College, 1966, and Army War College, 1966.

In 1966-67 he was commander of the 538th Engineer Battalion (Construction) in Thailand. He was resident engineer, Dye 2, Greenland, in 1959-60, and has served in staff and command positions in Corps of Engineers construction battalions in Germany and the United States.

AMC Selects Dr. Dillaway Deputy for Laboratories

Deputy for Laboratories, U.S. Army Materiel Command—the AMC's highest-ranking civilian position, vacant since the resignation of the late Dr. Jay Tol Thomas Sept. 18, 1968—is the new title of Dr. Robert B. Dillaway, a native of Washington, D.C.

AMC CG General F. J. Chesarek announced appointment of Dr. Dillaway as the culmination of a long search for a man with the broad range of scientific knowledge required for the position. Dr. Dillaway was formerly corporate research marketing director and advanced rocket systems manager of North American Rockwell Corp.

As General Chesarek's deputy, Dr. Dillaway exercises command over AMC's nine in-house central laboratories, and also is responsible for technical supervision over AMC commodity command laboratories. Until he accepted his new duties, he was deputy director, Office of Program Appraisal, Navy Department Secretariat.

The AMC laboratory chain conducts activities ranging across the spectrum of scientific and technological investigations. Currently, research, development, test and evaluation activities are budgeted at more than a billion dollars annually.

Graduated from the University of Michigan in 1945 with two BS degrees (mechanical engineering, and mathematics), he was awarded a master's degree in physics in 1951 and a PhD in fluid mechanics in 1953, both from the University of Illinois.

Ten of his 15 years with North American Rockwell Corp. were served in the Rocketdyne Division, prior to his employment by the Navy Department in 1968. He also has served on the faculty of the Universities of Illinois, California and Stanford, teaching such subjects as engineering systems, nuclear reactor engineering, fluid mechanics, rockets and controls.

Dr. Dillaway is the author of numerous articles published in professional journals, has published a university textbook on fluid mechanics, has served as chairman or member on many high-level national and Defense committees, and has written numerous technical reports of importance.

Licensed as a private pilot, he is active in aeronautics activities and is a member of the International Federation of Aeronautics, having served as U.S. delegate to the World Congress and drafter of the first work record rules for manned space flight.

In addition, he has held offices in the National Aeronautics Association as well as in the American Society of Mechanical Engineers and in the American Institute of Aeronautics and Astronautics.

Industry Asks Army Aid on Northwest Passage

Feasibility of transporting oil from the newly discovered fields in northern Alaska to East Coast ports, by charting a usable polar sea route through the Northwest Passage—a goal of numerous historic expeditions—is being investigated as a joint industrial-U.S. Army effort.

Humble Oil and Refining Co. has scheduled a test voyage of a strengthened tanker through the Northwest Passage this summer, and has called upon the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H., for technical assistance.

Secretary of the Army Stanley R. Resor has approved the request for cooperation and authorized Lt Col John E. Wagner, commanding officer and director of CRREL, to work out details with the oil company officials. CRREL assistance in providing scientific and technical services will be on a cost-reimbursable basis.

Humble Oil Co., in appealing to CRREL for cooperation, recognized that "the bulk of the nation's knowledge on sea-ice characteristics" is concentrated in the experienced and highly trained CRREL staff of earth scientists, engineers and technicians. No comparable commercial organization exists.

Essential features of the agreement under which CRREL will join in the Humble Oil Co. expedition aboard the *Manhattan* (the strengthened tanker) include the assignment of one or two senior-level CRREL personnel knowledgeable in sea-ice mechanics.

CRREL services will include establishment of a testing program, training and supervising the ice crews in obtaining data, and analyzing the results by processing data through a shipboard computer.

Benefits of discovery of a feasible Northwest Passage route would include U.S. self-sufficiency in oil, greater capability to aid Western Allies in a fuel emergency, and improved access for development of other mineral resources of Northern Alaska and Canada, the Humble Oil Co. stated.

Col Morrison Selected for Promotion as MCS Chief

Twenty-seven years after he started his military career as an enlisted man, Col Manley G. Morrison will achieve brigadier general rank Aug. 1 when he assumes duties as chief of the U.S. Army Medical Service Corps.

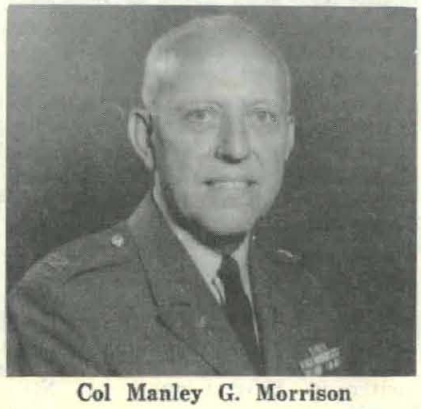
President Nixon selected Col Morrison for promotion to permanent brigadier general subject to Senate confirmation. Col Morrison will serve as the second general officer in the history of the Medical Service Corps when he succeeds Brig Gen William A. Hamrick. Rank of permanent BG was authorized by law enacted in September 1966.

Chief of the MSC responsibilities of Col Morrison will involve about 6,000 active-duty officers engaged in providing scientific, technical and administrative support of the U.S. Army Medical Department.

Six months after he enlisted in the Army in June 1942, Col Morrison was commissioned in the Medical Administrative Corps, following graduation from Officer Candidate School at Camp Barkeley, Tex. During World War II, he was an operations officer with a separate Medical Battalion attached to the Ninth U.S. Army in Europe.

Col Morrison served an additional tour in Europe (1964–67) as executive officer to the chief surgeon, HQ U.S. Army, Europe. Other assignments have included management consultant and secretary to the Policy Review Council; comptroller at Walter Reed Army Medical Center, Washington, D.C.; and chief, Organization and Systems Group, Office of the Deputy Chief of Staff for Logistics, HQ Department of the Army.

Graduated from the University of Maryland with a degree in military science, he received a master's degree in public administration from American University, Washington, D.C. He is a graduate of the Army Command and General Staff College, Army War College, and the Management Program for Executives of the University of Pittsburgh.



Col Manley G. Morrison

Army Halts Cheyenne Production, Reconsiders R&D

Termination of the production phase of the multimillion-dollar planned procurement of the AH–56A armed helicopter (Advanced Aerial Fire Support System) was announced by Secretary of the Army Stanley R. Resor May 19.

The research and development contract with Lockheed Aircraft Corp. contained an option, exercisable by the Army, for the purchase of certain quantities of production model aircraft at specified prices subject to equitable adjustment to reflect the impact of delay.

Under this option provision, the Army contracted on Jan. 8, 1968, for the minimum quantity of 375 aircraft, with an estimated cost of approximately $875 million, to be funded incrementally over a period of several years. About two-thirds of this dollar amount was planned with Lockheed.

Lockheed was issued a "cure" notice Apr. 10, 1969, by the Army contracting officer regarding the production contract. The company replied Apr. 28 that the production schedule could not be satisfied, and proposed an additional development effort and a slip in the production schedule.

The response was evaluated carefully by the contracting officer and HQ Department of the Army and U.S. Army Materiel Command officials. It was determined that Lockheed had defaulted on the contract. The notice of termination was based on these considerations:

- Lockheed could not produce specification aircraft even on its proposed slipped schedule.
- It would be imprudent for the Army to invest large sums of money in the production program without more substantial assurance that satisfactory aircraft would be delivered.

The R&D contract on the AAFSS, however, required production of only 10 prototype aircraft for testing and other activities. As this edition of the *Army Research and Development Newsmagazine* went to press, Lockheed was preparing a revised R&D proposal for evaluation by HQ Department of the Army and U.S. Army Materiel Command officials. The Army's course of action with respect to continued research and development effort is expected to be determined during July.

Approximately $120 million had been obligated and progress payments of $54 million had been made when the production schedule was terminated. In addition, about $105 million had been obligated and $90 million paid on research and development, the Department of Defense disclosed.

Education Program Offers Degrees to Career Officers

A new Officer Undergraduate Degree Program provides young career officers an opportunity to earn a baccalaureate degree at an accredited college or university while drawing pay and allowances for active duty.

Selections are made by the career branches of the Officer Personnel Directorate, with military performance and service potential as primary factors. Basic eligibility criteria for acceptance include:

- The officer must be a Reservist in a voluntary or indefinite category or be a member of the Regular Army, and must have completed not less than two years and not more than seven years active commissioned service.
- The pursued degree must be attainable within a period of two years or less and be related to duties to be performed in the particular branch.
- The officer must accept two years active duty for each year of schooling or fraction thereof, but not less than three years, and must bear expenses incurred, including tuition, textbooks and supplies.

$5.2 Million Contract Expands MICOM LCSS Supporting Role

HQ Army Missile Command, Redstone Arsenal, Ala., has awarded a $5,236,359 contract to expand the Land Combat Support Systems (LCSS) role of supporting tactical weapon systems.

Work performed by Radio Corp. of America will include refurbishing and updating hardware, and preparation of test programs for the Shillelagh and TOW missile systems.

LCSS is designed to isolate failures in electronic and electro-optical components of the Shillelagh, TOW, Lance and Dragon systems under field operating conditions.

The LCSS Product Office at the Missile Command has over-all responsibility for the program and Lt Col Frank A. Matthews is manager.

Picatinny Student Proposals Save $415,000 by Work Simplification

Validated savings of $415,000 are reported from submission of improvement proposals by students who have completed a work simplification course initiated four years ago at Picatinny Arsenal, Dover, N.J.

Designed to expand the knowledge of supervisors in basic management techniques, the course spans a 4-month period. Students must submit improvement proposals within 30 days after completing the course.

Thus far, 93 percent (593) of Picatinny's first-line supervisors have completed the course.

AMC Pictorial Center Wins 'Golden Rocket' Awards

U.S. Army research and development scientific movies produced by the Army Materiel Command Pictorial Center in Long Island City, N.Y., won top honors in recent international competition in Rome, Italy.

GOLDEN ROCKET AWARDS are received by Lt Gen William B. Bunker, deputy CG of the Army Materiel Command (AMC) when he died of a heart attack June 6, from His Excellency Egidio Ortona, Italian Ambassador to the United States. Col Donald S. Bowman, CO of AMC's Army Pictorial Center in Long Island City, N.Y., holds scrolls accompanying the awards.

"Golden Rocket" awards in the popular science film category were voted to "Seeing the Unseeable" and "Fluerics—Thinking with Air." The first film explains the role of photographic instrumentation in U.S. Army R&D activities, particularly in gathering of scientific and technological data.

The film on fluerics presents an introduction to this relatively new field of the physical sciences, in which counting, sensing, amplifying and actuation of various devices—such as the Army's artificial heart machine and the guidance and control system of ballistic missiles—is accomplished by the proper channeling of air or fluids, without using moving parts.

Italian Ambassador to the United States Egidio Ortona presented the Golden Rocket awards to the late Lt Gen William B. Bunker, deputy CG of the Army Materiel Command, at the embassy in Washington, D.C.

Present for the ceremony were Kenneth Hunter, chief of AMC's Pictorial Management Branch, Col Hollis Dakin, deputy director, AMC Installations and Services, and Col Donald S. Bowman, CO of the Center.

ALMC Offers 2 New Courses in Logistics Management

Announcement of a new 19-week Logistics Executive Development Course (LEDC) and a new 6-week Army Integrated Materiel Systems (AIMS) Management Course was made recently by the Army Logistics Management Center (ALMC), Fort Lee, Va., an element of the U.S. Army Materiel Command.

Designed to further the professional growth of selected military and civilian personnel at important stages of their careers, the courses are considered an important advance in logistics management education. They will replace the 12-week Army Logistics Management Course and the 3-week Army Project Management Commodity Management Courses previously offered the ALMC.

The AIMS course will be offered for the first time in November of this year while the LEDC is targeted for a February 1970 starting date.

The AIMS course will provide an educational foundation for that stage in a logistician's career at which he progresses from work in a single technical function of materiel management into line or staff positions involving more than one function.

Expected to be particularly suited to the career needs of Project and Commodity Management personnel, the course will aid personnel engaged in such fields as equipment specialists, supply management, procurement, and research and development.

Students will look at the entire equipment life-cycle from a system point of view, and will attempt to provide a comprehensive answer to: How is my job affected by work and decisions of others? How do my decisions affect the materiel system?

Attendance at the AIMS course will be limited to Army officers in the grade of captain or above, and Army civilian employes in the grade of GS-11 or higher with career status.

The LEDC will be concerned chiefly with the "why" of logistics. It will deal with policy formulation and with the top-level management aspect of the entire spectrum of wholesale logistics, including materiel logistics, personnel-oriented logistics, international and interservice logistics, support to civil authorities, logistical facilities and service.

Students will be given opportunities to make personal contributions to their profession by carrying out independent research projects.

Nominees for the LEDC must be officers in the grade of major or above, or civilian employes in the grade of GS-13 or higher. All nominees must have an actual or anticipated assignment to a top-management position in wholesale logistics.

For additional information for either course, write: The Registrar, United States Army Logistics Management Center, Fort Lee, Va. 23801, or, call: AUTOVON: 555-1850, extensions 2197 or 3398.

CDC Proposes Malfunction Warning System for Crewmen

Proposed as a Small Development Requirement (SDR) by the U.S. Army Combat Developments Command is a Voice Warning/Recorder System that will alert crewmen to malfunctions in fixed- and rotary-wing aircraft.

The concept is for an electronic device to provide prerecorded voice warnings through crewmen's headsets to supplement visual instrument readings. It will warn of failures and malfunctions in engines, transmissions, rotor rpm, tail rotors, engine oil and temperature.

In combat, it will enable crew members to devote as much attention as possible to conditions outside the cockpit, instead of keeping eyes glued to instruments. It will be designed to aid in "nap of the earth" operations close to land obstacles, adding to "sense bombardment" tactical and training operations.

As envisioned, the system will permit playback of faults and malfunctions occurring over a 5-hour duration or longer, providing a moment-by-moment record to aid in post-flight repairs and maintenance analysis. The recorder also will be a reliable "memory-bank" in debriefings and in accident investigations.

Intended to fulfill requirements specified for the Army's heavy-lift helicopter, and the UTTAS (Utility Tactical Transport Aircraft Systems), as well as other aircraft of greater and lesser complexity, the system will have 20 messages of predetermined priority.

Warnings of more critical malfunctions will automatically interrupt those of lesser priority. Each warning will fall into the proper sequence and none will be "lost." Time elapsing between an actual malfunction and the warning will be in milliseconds—virtually instantaneous.

Pilots may turn the system off when desired. Warnings triggered during such periods will be stored and transmitted immediately once the audio system is turned on. It will weigh no more than 10 pounds and operate for 400 hours without repair.

Lt Col Roy J. Young, U.S. Army Standardization Group, United Kingdom, received his British Airborne Forces wings at a recent ceremony at RAF, Abingdon, England. He will leave England in July for his second tour of duty in Vietnam after serving for two years as the U.S. Army Airborne/Infantry representative to the United Kingdom.

Lt Col Young made 15 jumps from balloons and aircraft during his tour in England, where he has been studying British parachuting equipment and techniques. Group Capt R. C. P. Thomson presented the wings at a parade of No. 1 Parachute Training School representatives, including members of the Falcons free-fall parachute team.

DA to Close Nike Hercules Sites

The Department of the Army announced action to reduce the number of Nike Hercules sites in the Continental United States.

Five Nike Hercules firing sites in four states will be closed by the Department of the Army in a move expected to save $3.6 million in FY 1970 and in each succeeding year.

The sites are at Milwaukee, Wis.; Detroit, Mich.; Warrington, Pa.; Carleton, Mich.; and Felicity, Ohio. These units will be converted to other type units and every effort will be made to find alternate positions for the technicians affected.

Armed Forces Day Talk Answers Military-Industrial Complex Critics

Public observance of Armed Forces Day in Akron, Ohio, provided Army Chief of Research and Development Lt Gen Austin W. Betts the opportunity to continue his response to critics of military-industrial relations. (See Army Research and Development Newsmagazine, *April 1969, page 2.) He pointed out that the present furor is little different than the raucous dissent that has often been silenced by progress in United States history.*

By Lt Gen Austin W. Betts

Today is the day that this nation traditionally sets aside each year to honor the men and women of its Armed Forces. It is a day one might expect to see a grateful nation pointing with pride at our modern military establishment, noting the high state of readiness of our retaliatory forces, convinced of the splendid loyalty and dedication of those who wear the uniforms of its Military Services. But the headlines seem to paint a quite different picture.

Behind the sober, reflective and appreciative applause we hear today, from friends such as in this audience, there is a strident cacophony from a segment of the population that seeks to cast discredit on the Military Services. A number of editorials have dealt with this subject in recent weeks.

Life Magazine noted in its Mar. 21 issue that the antiballistic missile debate had "taken a turn into a highly emotional general attack on the U.S. military establishment. The Armed Forces are now exposed to the most withering political fire they have faced in recent memory."

This is not to say, as the editorial points out, that we in the Services have not made mistakes, or that we should be immune to criticism or close review. No responsible person in uniform will dispute this. What we will argue is that much more can be said on the positive side than on the negative.

The so-called military-industrial complex is hardly the sinister force that some people have contended. Again, to quote *Life Magazine*, "After all, U.S. military preparedness has had a lot to do with keeping us out of a really big war for nearly 25 years."

The Mar. 31 issue of *Newsweek* follows a quite similar vein. It sees this military-industrial complex as, in part, just another "convenient house devil" for which Americans have been prone to search with recurring frequency—a whipping-boy for those who wish to vent their frustrations about the war in Vietnam. It appears to me that the so-called "M-I Complex" has become a convenient scapegoat to some people for all the nation's current troubles.

As for defense-oriented industry, *Newsweek* points out that it is the "world's most efficient producer. It is the basis of American power." Surely that is the important judgment to remain with us. The Department of Defense must make effective use of the development and production capabilities of American industry. Any other course would be foolish. We should not have a panic reaction to the critics of the M-I Complex.

Similarly discordant tunes have been played many times in the past. Fortunately, such discord has always been drowned out by the steadier, more thoughtful citizens' symphony of support for responsible military preparedness. Realistic and sober judgment has prevailed and, you will agree, must prevail over naive, misguided, emotional or irrational dissidence.

As far back as the War of the Revolution, one heard this weird song of dissent rising from a segment of the population who placed a higher value on Tory loyalty than on the guarantee of personal freedom. A near-starving Revolutionary Army had to stand by while local citizenry sold produce to the enemy by the wagon load, as Washington's troops were reduced to gnawing on leather. Tories everywhere pushed the theme of "peace at any price."

Certainly Washington's ragged continentals should have been the first to call it quits. They were the ones who were suffering. It has always been so. General Douglas MacArthur expressed it poignantly: "No one desires peace as much as the soldier, for he must pay the greatest penalty in war."

Yet historically, our servicemen have understood. It has not been from them, nor from the honored ranks of veterans, that one has heard noisy attempts to disguise reality and brush away the harsh and distasteful facts of life with rationalization—no matter how well intended it might be.

In still another war, President Lincoln faced a trying period of internal unrest as the Copperhead Movement sought to undermine his efforts to preserve the Union. Draft rioters tore through the streets of New York City. The draft was no more popular then than now. Fortunately for the Nation, as it turned out, wise minds and courageous hearts prevailed. The primary goal, the survival of this Nation, was eventually achieved.

I suspect that there are those in this audience today who can recall the unpopularity of the Military Services in the early 1930s. We faced concurrent trumpetings of the German-American Bund and its misguided sympathizers who argued that Fascism meant no harm to America.

Indeed, the American flag was flown right there alongside of the Swastika when those errant friends of Nazi Germany held parades and mass meetings in Madison Square Garden. I ask you: "Where are those people now? From the perspective of history, was theirs an honorable cause? Do we see them standing up to accept the plaudits of a grateful Nation?"

Sure, conditions today are different from those of the past. The Nation is not engaged in a formally declared war. But I submit that the communist soldiers who swarmed across the 38th Parallel in Korea in 1950, like those who even now have invaded the sovereign Republic of Vietnam, were fanatical, warlike and dedicated to the cause of communism. Their goal then was and still is quite plainly to wipe out any and all vestiges of individual freedom. As long as freedom exists, a controlled state cannot.

I must confess I gag when I read about alleged inhumanities U.S. Forces are supposed to have committed against innocent Vietnamese people. I say emphatically that those who make such charges have things strangely distorted. They are either totally ignorant of the facts, are misguided, or just unbelievably naive. Ask any American adviser who it is that beheads, disembowels or simply murders innocent civilians in South Vietnam.

Furthermore, I find it a little hard to understand that segment of the press that calls on the U.S. to stop bombing military targets, but is quite blase over callous, deliberate, indiscriminate communist rocket and mortar attacks on villages and cities of South Vietnam.

It is a strange and warped logic that leads an otherwise law-abiding person forcefully and illegally to gain entry into the private offices of a major industrial concern to break windows and scatter files to the winds, simply because that particular company makes napalm for the U.S. Government. I do not recall similar protests from these same people when the NVA used flame-throwers against

U.S. Marines or when the VC used them against Montagnard civilians.

I am reminded at this point of some thoughtful remarks by the historian and author Thomas J. Fleming, who wrote: "What, I wonder, would one of our Vietnam reporters have said if he trekked across New Jersey in 1776 with Washington and his disintegrating Army?" Washington sent out frantic pleas for help from the militia —and got less than 100 volunteers. As Fleming put it, "Can't you almost read the stories about the rebel government's total lack of popular support?"

It sounds somewhat like an editorial writer who commented on what he called "the dangerous distorters." He cited the case of a prominent professor who, not long ago, predicted the imminent collapse of the South Vietnamese government and its Army. "Anything that can be effectively called a government," this professor stated, would disappear "within the next few weeks."

The story goes that the U.S. Ambassador to the Republic of Vietnam promptly sent a telegram to this noted professor inviting him to come and witness the expected dissolution. He never came. Equally puzzling is that this professor subsequently boasted that he had made his reputation by being far ahead of others in his opinions.

There are those who say that the threat to U.S. security from militant communism is really a phony threat, born of the imagination of an industrial-military lobby. I wish it were phony, but nothing could be further from reality. The fact is that the Soviets have large, combat-ready armed forces. As reported recently by the Organization for Economic Cooperation, they are spending more each year for research and development than we are.

It is also a fact that the large Soviet forces that invaded Czechoslovakia are well-equipped with modern weapons. Defense Secretary Laird stated, in open testimony before Congress, the deployment by the Soviets of intercontinental ballistic missiles with 25 megaton warheads can scarcely be called a phony threat. His was not an attempt to frighten the American people, but a sober assessment of growing Soviet capability.

A prudent response is to protect our deterrent force, as is our present plan for the Safeguard defensive system. We are certain that as long as the Soviets are convinced that a nuclear attack by them on the United States would mean their own destruction by our retaliation, then our deterrence is effective and we are secure from attack.

Evidence that communist nations are exploiting the technological and scientific explosion for military applications is incontrovertible. The evidence of Communist Chinese thermonuclear warhead development, as well as ballistic missile development, is not conjectural. The modern sophisticated equipment and techniques displayed by the Soviet in their invasion of Czechoslovakia were not figments of U.S. military imagination.

The only question for debate is what these communist nations propose to do with their growing military capability. Until there is hard, factual evidence that the Free World does not need to fear military action against us by these communist powers, simple prudence dictates that we must maintain an effective military posture.

The crux of the problem may be stated simply. Do the people of the United States—the most powerful and richest nation the world has ever known—want this Nation to be the active military guardian and leader of a political-social structure that we call the free way of life? Or do we choose to forego this role that the Free World has thrust upon us?

I do not believe much in the way of an in-between position is possible. This country did not actively seek the role of major world power, for power's sake, other than for enlightened protection of our own interests. But throughout recorded time there have been many instances where one nation, either benevolently despotic or altruistically motivated, has preserved a balance of peace and civilization in the world for varying periods of time.

You will recall how these great nations of the world crumbled and fell into anarchy, revolution, squalor and decay—not from external forces, but by the rotting away of the nation's

(Continued on page 41)

Dr. George Chosen CINPAC Science Adviser

Scientific adviser to the Commander-in-Chief, Pacific will become the title of Dr. Theodore S. George early in July after about two weeks temporary duty in Vietnam for orientation.

Since July 1956, he has served as professor of electrical engineering at the University of Florida. He has been active as a consultant and adviser to industrial and Department of Defense organizations in the field of communicatons systems and automatic data processing technology.

Among organizations he has served in this capacity are Martin Marietta Corp., General Electric Co., Pan-American Airlines, various defense industrial firms, the Office of the Secretary of Defense, Military Assistance Command Vietnam (MACV), the Army's Harry Diamond Laboratories in Washington, D.C., the U.S. Air Proving Ground Center, and other U.S. Government agencies.

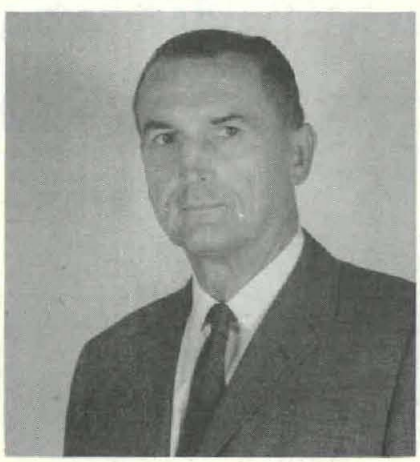
Dr. George received an MA degree in physics and applied mathematics in 1936 and a PhD degree in the same field in 1942, both from Duke University. He also completed a 180-hour course in advanced mechanics at Brown University and a graduate course in electromagnetic theory at the University of Pennsylvania.

From 1946 to 1952, he was an engineer with Philco Corp., specializing in advanced communications technology. As an Air Force scientist, he was employed (1952–56) at Patrick Air Force Base, serving two years as a mathematician at the Missile Test Center and also as chief of the Systems Engineering Office.

Promotion to chief of the Operations Analysis Office for the following two years gave him responsibility for military intelligence research analysis and for directing scientific studies relative to programing, planning and analyzing missile tests. He provided technical services and advice to Missile Test Center staff agencies for range safety, scheduling and logistics.

Author of numerous articles in professional journals on communications systems technology, he is a Senior Member of the Institute of Electrical and Electronics Engineers, and a member of Commission 4 of the International Scientific Radio Union.

Listed in *American Men of Science* and in *Who's Who in Engineering*, he was a visiting graduate professor at the University of Brazil in 1966 and a lecturer in communications theory at the University of Carabobo, Valencia, Venezuela, in 1967.



Dr. Theodore S. George

CSDP to Oversee AMC Supply Operations

Greater supply awareness throughout the U.S. Army Materiel Command Headquarters and improvements in efficient use of AMC's $24 billion materiel resources are goals of a recently announced new program.

Designated as the "Command Supply Discipline Program" (CSDP), the program will investigate every aspect of AMC's mammoth supply operation. Areas of supply such as authorizations and requirements, planning, programing, stocking, accounting, requisitioning, and effective use of supply funds are some supply aspects to come under careful and intensive scrutinization.

HQ AMC has set in motion several major actions to facilitate this campaign for greater supply awareness.

Maj Gen Howard F. Schiltz, chief of AMC's Distribution and Transportation Directorate and "Senior Logistician" for the program, has been delegated primary responsibility for the CSDP. Existing supply review and assistance teams will be used in documenting the status and progress of the program.

General Schiltz said the program will promote compliance with all supply regulations and directives, assure awareness of supply conditions and provide assistance in command management of supply functions and materiel. All program areas within AMC activities will be reviewed at least annually on a scheduled basis.

General F. J. Chesarek, CG of AMC, is required to address this subject in his annual readiness review for the Army Vice Chief of Staff.

Eleven Supply Review Teams will conduct on-site assistance and report on the progress of CSDP by visiting activities of AMC depots, commodity commands, Army Test and Evaluation Command, procurement agencies, logistic control offices and overseas AMC logistic management offices.

Preparation of a comprehensive checklist to cover the mission of each team is the responsibility of three AMC directorates: Distribution and Transportation, Materiel Requirements, and Installations and Services. These directors also have the responsibility for scheduling visits of the teams.

The U.S. Army Maintenance Board at Fort Knox, Ky., will provide staff support and serve as the coordination agency to review schedules, checklists, and reports of the Supply Review Teams. The board president will insure coverage and compliance with requirements and submit, to the senior logistician, periodic summaries of findings.

A 15-member Program Advisory Group at HQ AMC will serve as a central coordinating and policy group for CSDP, including major problems and deficiencies, under supervision of the AMC senior logistician.

CSDP indoctrination will be included in on-the-job training programs of all AMC commanders, and will be used to up-date and up-grade supply courses in the Army Service Schools and management schools systems. The senior logistician will provide the Director of Personnel and Training with CSDP data to insure that information is included in appropriate training courses.

Edgewood Picks Ringenberg As Associate Tech Director

Edgewood (Md.) Arsenal's newly appointed associate technical director is Merl G. Ringenberg, formerly chief of the Customer Relations and Commodity Management Office.

Gerald J. Fleming is acting chief of the Customer Relations and Commodity Management Office.

Ringenberg is responsible for planning and directing the engineering development, production, fielding and disposal aspects of all materiel assigned to Edgewood Arsenal for life cycle management. He serves as the focal point for resolution of all major technical problems encountered during the materiel engineering development phase and subsequent phases, and is a member of the Joint Technical Coordinating Group and New Materiel Review Board.

Additionally, he will assure joint service standardization of new munitions and defense developments.

A 1933 graduate of the University of Washington with a BS in chemical engineering, Ringenberg has been associated with Edgewood since 1951. From 1942 to 1945 he was a chief engineer Pine Bluff Arsenal, Ark., and then spent six years in industrial chemical engineering.

Ringenberg is a member of the American Chemical Society, American Institute of Chemical Engineers, American Ordnance Association, and the National Federation of Engineers, Scientists and Allied Professionals.

Fleming has been employed at Edgewood Arsenal since 1941 except for one year in the Office of the Chief Chemical Officer, HQ DA. He received his BS in chemical engineering from the University of Wisconsin in 1937.

Brig Gen Gates Reassigned to AMC Headquarters

Brig Gen Mahlon E. Gates, CG of the U.S. Army Safeguard Logistics Command since its establishment, was reassigned July 1 to HQ U.S. Army Materiel Command, Washington, D.C., and Col Cecil W. Hospelhorn, his deputy, became his successor.

General Gates headed the planning task force which in early 1968 developed and refined the Army concepts for logistic support of the then Sentinel Antiballistic Missile Defense System in Washington. In mid-April 1968, the Command was activated as the U.S. Army Sentinel Logistics Command (ASLC), a major subordinate command of the Army Materiel Command.

Brig Gen Mahlon E. Gates

In August the ASLC moved to the Huntsville (Ala.) Industrial Center and recently moved again into the Safeguard Building in Research Park.

When the President ordered a reorientation of the system's mission in March and the Sentinel was redesignated Safeguard, the Command became the U.S. Army Safeguard Logistics Command, which is developing a logistic system to support the operational Safeguard system, and a program for managing maintenance of the system.

As a subordinate element of the Army Materiel Command, the ASLC is under operational control of the Safeguard System manager, who exercises Department of the Army executive authority over all approved Safeguard programs and resources.

General Gates, a 1942 graduate of the U.S. Military Academy, was commissioned in the Corps of Engineers. He has an MS degree from the University of Illinois and is a graduate of the Army War College.

During three tours in the Pentagon, he served with the Armed Forces Special Weapons Project, the Joint Chiefs of Staff, and in the Office of Personnel Operations (OPO). His overseas assignments include duty in Vietnam, India and Burma, Europe and Iran.

Maj Gen Miley Succeeds Bunker as AMC Deputy CG

President Nixon has nominated Maj Gen Henry A. Miley Jr. for 3-star rank, subject to Senate confirmation, as deputy CG of the Army Materiel Command, succeeding the late Lt Gen William B. Bunker, who died June 6 of a heart attack at age 58.

General Bunker, who had been deputy CG of the AMC since April 1964, after serving as comptroller and then as director of programs, had announced plans for retirement ir August.

In line with the HQ AMC reorganization announced in the May edition of the *Army Research and Development Newsmagazine*, General Miley's role as deputy to General F. J. Chesarek makes him responsible for all resource management, including supervision of activities of the comptroller, the director of Personnel and Training, and director of Installations and Services.

This reorganization, as announced subsequently, also elevates the position of the director, Quality Assurance, in line with the need for top command attention in this vital area. Similarly elevated is the director of Management Information Systems to accelerate development of automated management systems.

General Miley has been assigned since November 1964 as AMC director, Procurement and Production, after serving as deputy since March 1964. He was U.S. Army Europe Ordnance Officer in 1963–64, following a 3-year tour as commander, Advanced Weapons Support Command, Pirmasens, Germany.

After completing the U.S. Army War College course in 1957, he was assigned four years in Washington, D.C., in the Office of the Chief of Ordnance with responsibility for tank-automotive procurement.

Graduated from the United States Military Academy in 1940 and commissioned a second lieutenant in the Coast Artillery Corps, General Miley has spent most of his military career in Ordnance Corps assignments.

Assigned to Fort Monroe, Va., following graduation from the USMA, he served with the 2d Coast Artillery Regiment. In December 1941, he was assigned to the 57th Coast Artillery when it moved to Hawaii to garrison the north shore of Oahu.

Returned to the United States in late 1942, he served a tour with the Antiaircraft School and was then assigned to the 33d Antiaircraft Artillery Group. With this outfit he participated in the leap-frog operations executed by the Army along the northern coast of New Guinea. In January 1945, he was detailed to the Ordnance Corps and assigned to Hawaii until September 1946, serving first as commander, 189th Ordnance Battalion and then as commander, Ordnance General Supply Depot.

Following a year of service on the faculty at the Army Ordnance School, Aberdeen (Md.) Proving Ground, he entered Northwestern University in 1947 and received a master's degree in June 1949. He remained there an additional year for advanced studies in economics and statistics.

Reassigned in 1950 to Frankford Arsenal, Philadelphia, Pa., he served three years as comptroller and then as works manager until he went overseas to Heidelberg, Germany, for a 3-year tour on the staff of the USAREUR Ordnance Officer.

Maj Gen Henry A. Miley Jr.

Chaparral Survives TNT Blast

The U.S. Army's Chaparral air-defense guided missile system survived a simulated nuclear blast in a recent test at Suffield, Alberta, Canada.

The Chaparral vehicle was located less than 2,000 feet from "ground zero" during the explosion of 500 tons of TNT and was still in a "go" firing condition following the massive blast. U.S. Army Missile Command participants in the test said Chaparral still could have successfully carried out its mission of providing guided missile defense against low-flying, high-speed enemy aircraft.

President Selects Jennings for Surgeon General Post

President Nixon's selection of Brig Gen Hal B. Jennings Jr. to succeed Lt Gen Leonard D. Heaton as Surgeon General of the Army, effective Oct. 1 subject to Senate confirmation, sets him up for promotion from colonel to 3-star rank within 13 months.

General Jennings received his first star in August 1968 while serving as U.S. Army Surgeon, Vietnam, and CG of the 44th Medical Brigade. Two-star rank came recently when he became Deputy Surgeon General of the Army. Lt Gen Jennings will be his rank when he takes over from retiring General Heaton.

Prior to assignment to Vietnam in May 1968, General Jennings commanded Martin Army Hospital at Fort Benning, Ga., and doubled as post surgeon (1964–68). From 1961 to 1964, he was staff surgeon V Corps in Frankfurt, Germany, and commander of the 130th Station Hospital in Heidelberg.

Maj Gen Hal B. Jennings Jr.

During a 5-year tour (1956–61) at Walter Reed Army Institute of Research in Washington, D.C., he was chief of plastic surgery and consultant to The Surgeon General. While at Brooke General Hospital, Fort Sam Houston, Tex. (1953–56), he was chief of plastic surgery and qualified as a Diplomate of the American Board of Plastic Surgery.

Graduated from the University of Michigan Medical School in 1941, General Jennings served his internship there at the university hospital before he entered military service in 1942.

In World War II he was assigned to the South Pacific Theater, where he served in various field hospitals and as a medical staff officer in New Zealand. When hostilities ceased, he was assigned to Letterman General Hospital in San Francisco, Calif., for residency training in general surgery.

Additional training in plastic surgery followed at Barnes Hospital of Washington University School of Medicine, St. Louis, Mo., and with the Blair Brown Group of Surgeons. During the Korean War, he acquired broad experience in surgery while assigned to Brooke General Hospital.

How Can We Make Helicopters More Useful?

(Continued from page 7)

place. They make the cost part of the cost-effectiveness equation high enough to make it hard to convince our systems analysts that the impressive gains in effectiveness are worth the staggering acquisition and operating bills.

To introduce any new weapon system into the Army inventory, it is necessary to prove to our own satisfaction that the new system can compete with the force structure and equipment replaced. The promise of new technology is that it can save manpower, and reduce the cost of defense at any given level of capability. If the new machine increases costs, without commensurate increases in effectiveness, then it simply has no place in the scheme of things.

I am sure you will agree that events of recent months have clearly indicated that our friends in Congress are becoming disenchanted with new and complex weapons systems which have experienced huge cost overruns and have failed to meet specifications.

The Army, the Navy, and the Air Force all have had their share of problems. We must, with the wholehearted cooperation of industry, do better in costing and in performance prediction, to face confidently that horrible moment of truth when we must ask ourselves the question: "Can we really afford it."

Technology opens up ever new weapons system development programs (UTTAS—HLH—MAVS)–a nearly inexhaustible set of opportunities for new machines for the Army, Department of Defense, and for civil use. For this we are glad, *but* each new proposal, each new opportunity, must be carefully assessed so that we can readily answer important questions: "Is this trip really necessary? Does it truly and significantly improve our effectiveness and is it good for our country?"

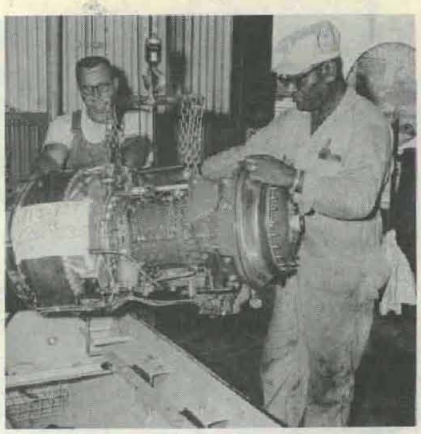
Our philosophy must be that the design of research and development programs consists, for the most part, of prudently choosing, from a large number of attractive proposals, only those that are of sufficient potential importance to justify the expense and increase in capability. Therefore, you must make proposals that meet the acid test of cost, performance, and scheduling. In this respect, we in the Army must share responsibility in asking for sensible things we can afford to buy and operate.

The challenge of simplification of design and cost reduction is, I think, mainly one to be faced by the industrial part of the team. If we in government, or your customers in the airlines, ask for too much complexity, and frustrate your attempts to make it simply and well, then raise your voices and shout your objections. Nobody wants to build the prototype that saturates the market.

How can research help? There are operational problems for which technical solutions must exist. These problems shown in our military experience also represent clearly important limitations to the applicability of helicopters to inter-city transport and short-haul use in densely populated areas.

The first of these problems is helicopter noise. The substantial noise signature of our helicopters is a problem that is just now really presenting itself as a result of operations in Vietnam. The noise of the helicopter telegraphs to the enemy the news that we are coming. In this way we are partially denied the important element and principle of war—surprise—which is one of the essentials of successful airmobile operations.

Part of the problem is that little is known about the basic mechanics of noise generation. Because this is true, it is not yet possible to predict accurately the noise characteristics of a newly designed helicopter blade. Largely, we are obliged to use a



5,000TH TURBINE aircraft engine totally overhauled or repaired in Fiscal Year 1969 (total year over 6,000) at the U.S. Army Aeronautical Depot Maintenance Center (ARADMAC), Corpus Christi, Tex., is packed by engine processors George Paine III (left) and Tom J. Darden for air shipment to Vietnam. In Fiscal Year 1968, only 4,450 engines were reconditioned.

Army Accepts First of 2,200 OH-58A Helicopters

The U.S. Army accepted at recent formal ceremonies the first of 2,200 OH–58A Kiowa light-observation helicopters that will be delivered through mid-1972 under terms of a $123 million fixed-price contract.

Maj Gen John Norton, CG of the U.S. Army Aviation Systems Command (AVSCOM), St. Louis, Mo., accepted the 5-place, turbine-powered helicopter from E. J. Ducayet, president of Bell Helicopter Co.

AVSCOM Light Observation Helicopter Project Manager Lt Col Ed Browne and Col John Bergner, commander of the Army Plant Activity at Bell's factory at Fort Worth, Tex., witnessed the ceremony.

The OH-58A program is surpassed in magnitude of Bell's military production only by the program to build the UH-1 Huey series of helicopters now being used in Vietnam.

Powered by an Allison T63–A–700 engine, the OH-58A has an airspeed of 150 mph and a range of about 350 miles, with a mission gross weight of 2,760 pounds.

Designed to meet U.S. Army requirements for technical performance with the latest technology, the OH-58A is required to possess: a vertical lift capability equivalent to or superior to utility or light helicopters in Vietnam service; maneuverability comparable to the HueyCobra attack helicopter; and safety and survivability capabilities that are unexcelled in the rotary-wing industry.

OH–58A Kiowa Helicopter

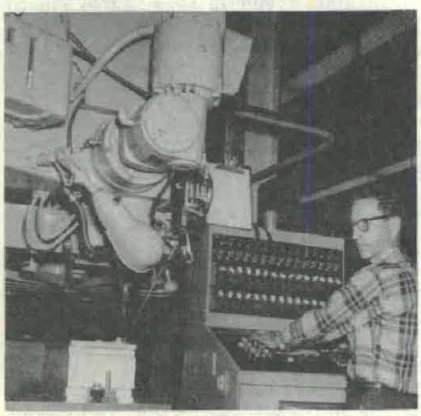
trial-and-error approach to the problem.

One of the principal noise offenders on the helicopter is the main rotor blade. The two primary noise components are the basic rotational sound and the vortex or blade slap sound. In descending order of noise generation are the tail rotor and the engine. Our primary problem is to address the main rotor noise.

We have learned that decreasing the rpm (revolutions per minute) and increasing the number of blades will reduce noise, but such measures are accompanied by performance sacrifices that are not appealing.

We have an active program in the Army to tackle this problem. The National Aeronautics and Space Administration and also the Advanced Research Projects Agency are engaged in studies. ARPA has a "Quiet Helicopter" program under way to attempt to see what can be done to improve some of our inventory helicopters. We hope that new systems coming along—such as UTTAS (Utility Tactical Transport Aircraft System) and HLH (Heavy-lift Helicopter)—will benefit from these efforts. The challenge to industry and the DoD is to alleviate helicopter noise without undue sacrifice of performance or unacceptable price increase.

The second operational problem I want to mention is that of rotor downwash. As helicopters have grown larger, gross weights and corresponding disk loadings have increased. As a result, downwash velocities of our heaviest helicopters are in the range of 75–100 knots when operating near maximum gross weights.



OPERATOR ERRORS are eliminated by an automated mill drill machine that makes the job go faster. The machine is part of the new numerical control equipment recently installed at the Army Aeronautical Depot Maintenance Center (ARADMAC), Corpus Christi, Tex. Kenneth Thornton, an ARADMAC mill machine expert, operates the tape reader electronic console panel which controls movements of the machine. Each desired movement of the machine is put into the tape by coded holes punched into it. A tape reader tells the mill drill what to do.

The Army has learned to live with this problem in the field, but substantially higher velocities would be intolerable in the combat zone. The need to land virtually anywhere in the tactical area makes it imperative that downwash velocities be kept at low levels. Operations near troops on the ground, tent bivouacs, artillery sites and in sand or snow present reasons why this downwash factor is important to the Army.

As we look to future helicopters and V/STOL (Vertical/Short Takeoff and Landing) aircraft designs, low downwash velocity remains high on the priority list of Army desired characteristics. It is of equal importance for civil operations, where it is nearly as important for the machine to allow the people and the baggage to stand comfortably at the loading gate as to keep the neighbors from being harassed by unacceptable noise.

Achievement of low downwash velocity involves larger rotors, more efficient blade sections, and raises difficult problems of rotor stability, especially for larger machines. Here research can help through the development of new materials and fabrication means. Ongoing government and industry efforts in fiber composite materials are one promising approach. The present high cost of the materials and fabrication methods are the principal bar to immediate application. Better understanding of rotor dynamic stability is also necessary over a wider range of speed and size, to permit reliable analysis in preliminary design.

Improved handling qualities are urgently needed, if helicopters are to be truly safe at night, in bad weather, and in the hands of private pilots. Ongoing work in the DoD, the universities, and in industry again offers hope that, in a few years, commercial machines can be made so stable and easy to fly that even I can do it well. The provision of proper stability characteristics without excessive complication would remove a real barrier to general acceptability of rotary wing machines.

As the war in Vietnam deescalates, I know you in the industry are concerned about a shrinking military market. Certainly there will be a reduction in the requirements for production of current inventory machines. But the challenge that lies before us is to make of this noisy, complicated, expensive beast that is the helicopter today the quiet, efficient, simple, reliable flying machine that I feel confident it can become.

If the machine of the near future indeed is made to be a good neighbor, I feel confident it can take over much of the market for transport in the great megalopolis areas. This is the most demanding and exciting prospect for the industry for the years to come. The military market for a tractable, good neighbor VTOL machine is assured, and the civil one seems to me to be equally attainable. Together we can hope to make this dream come true.

$315,114 Contract Awarded JLRB Research Consortium

Award of a $315,114 contract in support of the Department of Defense Joint Logistics Review Board (JLRB), chaired by General Frank S. Besson Jr., former CG of the U.S. Army Materiel Command, was made recently to a research consortium.

The contract calls for an initial level of effort involving six professional man-years of support and a firm commitment of top-level corporate backup from the consortium.

Headed by Booz-Allen Applied Research, Inc., the consortium includes Harbridge House, Arthur D. Young, and RAMAL, Inc., as subcontractors.

The JLRB will be provided assistance in planning, organizing, controlling and coordinating the study of worldwide support to U.S. combat forces during the Vietnam conflict so as to identify strengths and weaknesses and make appropriate recommendations for improvement.

Other members of the JLRB are Lt Gen Frederick L. Wieseman, U.S. Marine Corps; Lt Gen Lewis L. Mundell and Col John W. Hanley, U.S. Air Force; Vice Adm Edwin B. Hooper and Rear Adm John W. Bottons, U.S. Navy; and Lt Gen Oren E. Hurlbut, U.S. Army.

AN/MSC–46 Terminal Goes to Turkey

Airlift of the AN/MSC–46 satellite communications terminal from the U.S. Army Signal School, Fort Monmouth, N.J., to Diyarbakir, Turkey, as the latest ground link in the worldwide Defense Satellite Communications System was announced June 23.

The network consists of 26 satellites in near synchronous (21,000 mile) orbit and a ground complex of Army-developed transportable and fixed terminals. Other AN/MSC–46 terminals are in Hawaii, Philippines, West Germany, Ethiopia, Vietnam, Okinawa, Guam, Alaska and Maryland.

Army RDT&E, Procurement Contracts Total $376.9 Million

A $60,195,595 contract with Atlas Corp. and H. C. Smith Construction Co., DBA Global Associates, Oakland, Calif., for logistic support of the Kwajalein Missile Range, was the largest of Army RDT&E and procurement contracts totaling $376,938,509 from Apr. 9 to May 29.

Bell Aerospace Corp. is receiving $22,223,929 (seven contracts) for rotor blades and hubs, servo cylinders, tail booms, modification kits and hanger assemblies for helicopters.

A $21,975,000 definitization to a contract went to United Aircraft Corp. for CH–54B helicopters with engine air particle separators, and for armor data.

Remington Arms Co. was issued a $14,455,058 order for operation and maintenance of an ammunition plant and manufacture of small caliber ammunition; Day and Zimmermann Co. will receive $13,028,968 to load, assemble and pack artillery ammunition and components.

Four contracts totaling $10,295,325 with Raytheon Co. are for telephone signal convertors, 750-pound bomb fuzes and self-propelled Hawk missile ground support equipment.

Contracts under $10 million. Hamilton Watch Co., $9,118,005 for mechanical time fuzes for artillery shells; Chamberlain Manufacturing Corp., $9,113,600 (two contracts) for 152mm projectiles and metal parts for 175mm projectiles; and

A. O. Smith Corp., $8,493,300 for parts for 750-pound bombs; Federal Cartridge Corp., $8,375,506 to load, assemble and pack ammunition; U.S. Steel Corp., $7,515,500 for parts for 8-inch projectiles; and

General Motors Corp., $7,185,930 (four contracts) for engineering design and testing of the XM70 Main Battle Tank, for T–63 engines for helicopters, and for 12-volt storage batteries; and

Uniroyal, Inc., $7,149,772 for production, loading, assembling and packing ammunition; Page Communications Engineers, Inc., $7,134,662 (two contracts) for operation and maintenance of IWCS sites in the Republic of Vietnam and Thailand; Continental Motor Corp., $6,574,397 (two contracts) for cylinder assemblies and engines for M60 tanks; National Union Electrical Corp., $6,372,450 for parts for 750-pound bomb fuzes; and

R. G. LeTourneau, Inc., $5,980,800 for metal parts for 750-pound bombs; Firestone Tire and Rubber Co., $5,838,588 (two contracts) for loading, assembling and packing 155mm projectiles and for combat tank shoe assemblies; and

Melpar, $5,790,031 for a high frequency ground radio system for Iran; Caterpillar Tractor Co., $5,647,439 for tractors, repair parts and service manuals; and

Texas Instruments, Inc., $5,254,993 (three contracts) for night vision surveillance systems and classified work; Radio Corp. of America, $5,236,359 for refurbishing Land Combat Support System demonstration and service test models; Olin Mathieson Chemical Corp., $5,000,765 (three contracts) for cartridges, propellants, and support activities.

Contracts under $5 million. Pace Corp., $4,857,079 (three contracts) for illumination signals; Standard Container Co., $4,515,000, for ammunition boxes;; Northrop Corp., $4,244,594 for a 2.75-inch rocket warheads; Western Electric Co., Inc., $3,812,420 (two contracts) for Nike Hercules improved kits and for R&D on the Safeguard System; and

White Motor Corp., $3,721,691 (two contracts) for 2-1/2-ton truck gasoline engines with accessories and for engineering services; Bulova Watch Co., $3,567,629 for time fuzes for mortar and artillery rounds; and

Dynalectron Corp., Fort Worth, Tex., $3,407,531 for maintenance on construction equipment in Vietnam; Philco Ford Corp., $3,342,020 (two contracts) for Chaparral simulator evaluators and for analysis, design specifications and development of a platform sensor system; and

Thiokol Chemical Corp., $3,215,156 to load, assemble and pack ammunition; Harvey Aluminum Co., $3,004,954 to load, assemble and pack ammunition; TRW, Inc., $3,000,000 for electronics equipment; and

Ford Motor Co., $2,837,189 for 1/4-ton trucks; Connecticut Cartridge Corp., $2,832,345 for cartridge cases; Electrospace Corp., Glen Cove, N..Y, $2,706,116 for night-vision sights; and

National Gypsum Co., $2,676,545 to load, assemble, and pack ammunition; Cutler-Hammer, Inc., Deer Park, N.Y., $2,581,510 for AN/PPS–5 radar sets and ancillary items; and

KDI Precision Products, Inc., $2,561,190 (two contracts) for fuzes and safety and arming devices for 2.75-inch rockets; Norris Industries, Inc., $2,500,959 for 81mm projectile parts; and

Kanaar Corp., Kingston, Pa., $2,445,885 for 40mm grenade launchers; Uniroyal, Inc., $2,444,536 for explosives and for loading, assembling and packing ammunition; Batesville Manufacturing Co., $2,408,700 for parts for 750-pound bomb fuzes; and

General Electric Co., $2,407,019 (two contracts) for purchase of a previously installed and rented GE635 computer system at Griffis AFB, and for line items of spare parts for the Vulcan XM163 and XM167 weapons system; Flinchbaugh Products, Inc., Red Lion, Pa., $2,393,373 for warheads, insulation assemblies and motor body bonding assemblies for 105mm projectiles; and

Martin Marietta Corp., $2,386,750 for advanced development models of

EXPERIMENTAL SILENCER, undergoing tests for the Army, may make it possible to fire the 105mm gun of the M60 tank at the U.S. Army Weapons Command test and evaluation range at Rock Island Arsenal (RIA), Ill., where firing noise has prohibited such testing. Currently the recoil mechanisms must be shipped from RIA to Aberdeen Proving Ground, Md., for testing after they have been produced by the RIA Fabrication Technology Division. The hollow, steel-drum silencer is 40 feet long, five feet in diameter, and contains plastic bags filled with water to act as a baffle. "Projectiles" fired in tests are cardboard cylinders filled with water and sand, but the simulation produces realistic results.

the Random Access Discreet Address communication system; Atlas Chemical Industries, Inc., $2,334,953 for TNT and related material; and

Chrysler Motors Corp., $2,292,769 (two contracts) for APC engines and transmissions, differentials and rear axles for 3/4-ton trucks; Amron Corp., $2,244,874 for grenade parts; Kaiser Steel Corp., $2,199,120 for ammunition boxes; and

Sperry Rand Corp., $2,105,794 to load, assemble and pack ammunition; Kilby Steel Co., Anniston, Ala., $2,060,329 for base plugs and assemblies for explosive projectiles.

Contracts under $2 million. TRW, Inc., $1,927,080 for bolt and roller assemblies for M14 rifles; Maremont Corp., $1,699,125 for 7.62mm machineguns; Riverside Research Institute, N.Y.C., $1,599,000 for ARPA-developed Advanced Measurements Radar operation and maintenance, and processing missile in-flight data; and

Gentex Corp., Carbondale, Pa., $1,575,000 for air crewmen protective helmets; Hercules Engines, Inc., $1,550,468 for multifuel engine assemblies for 5-ton trucks; Scovill Manufacturing Co., $1,531,914 for cluster bomb fuzes; and

Telex/Midwestern Division, Tulsa, Okla., $1,500,000 for electronic equipment; Brunswick Corp., $1,459,901 for XM202 launchers and XM74 rocket clips; Itt Gilfillan, Inc., Van Nuys, Calif., $1,400,000 for AN/TPN–18 radar sets and ancillary items; and

Lockheed Electronics Co., $1,370,700 for AN/VPS–2 radar systems for the Vulcan Air Defense System; Ralph M. Parsons Co., Los Angeles, $1,297,751 for engineering service support of the Missile Site Radar in the Safeguard Missile Defense System; and

Bowen-McLaughlin-York, Blaire, Pa., $1,157,390 for armor installation kits for the M113 family of vehicles; Whittaker Corp., Westerville, Ohio, $1,157,384 for metal parts for 105mm projectiles; and

Electro-Mechanical Corp., Sayre, Pa., $1,153,733 for electrical equipment shelters; Bell Helicopter Co., $1,144,275 for tail rotor blades for UH–1 helicopters; Silas Mason Co., Inc., $1,113,324 to load, assemble and pack bombs, mines and selected ammunition; and

Sylvania Electronic Systems, $1,105,200 for telephone analyzer sets; FMC Corp., $1,039,000 for kits to convert M113A1 armored personnel carriers to recovery vehicles; Hayes-Albion Corp., $1,036,160 for metal parts for 81mm projectiles; and

Kaiser Aerospace and Electronics Corp., $1,032,150 for items of material required for fabrication, test and assembly of detection devices; Varo, Inc., $1,012,330 for metascope assemblies and viewers; Acushnet Co., New Bedford, Mass., $1,008,934 for gas masks; and

Clark Equipment Co., Battle Creek, Mich., $1,003,528 for rough terrain, fork-lift trucks; AVCO Corp., $1,000,160 for gas turbine engines for OV–1 aircraft; and Hallicrafters Co., Rolling Meadows, Ill., $1,000,000 for radar jammers and test fixtures.

SCIENTIFIC CALENDAR

6th International Conference on the Physics of Electronic and Atomic Collisions, sponsored by ARO-D, NSF, ONR, AFOSR, MIT and Union of Pure and Applied Sciences, Cambridge, Mass., July 27-Aug. 2.

International Conference on High Energy Physics, Chania, Crete, Greece, July 27-Aug. 9.

Annual Meeting of the Society for Cryobiology, Buffalo, N.Y., Aug. 3-7.

Joint Automatic Control Conference, sponsored by IEEE, Boulder, Colo., Aug. 5-7.

Industrial Research Conference, sponsored by The Livingston Institute, Pocono Manor, Pa., Aug. 10-16.

1969 International Conference on Photoconductivity, Stanford, Calif., Aug. 12-15.

5th International Biometeorological Congress, Montreux, Switzerland, Aug. 13-Sept. 6.

Western Electronic Convention and Show, sponsored by IEEE, San Francisco, Calif., Aug. 19-22.

12th International Conference on Coordination Chemistry, Sydney, Australia, Aug. 20-27.

2d International Seminar on Biomechanics, Eindhoven, Holland, Aug. 25-29.

Symposium on Multiple Bonding in Inorganic Chemistry, sponsored by Chemical Institute of Canada, Winnipeg, Canada, Aug. 27-29.

Suggestion Saves Estimated $6.6 Million at Edgewood

An Edgewood (Md.) Arsenal employe serving as chief engineer of the Technical Support Directorate has received an Army Special Act or Service Award of $4,500 for a suggestion credited with a tangible saving of $6,630,389 on salvage of surplus M78 and M79 bombs sold to the Air Force.

Louis E. Garono was the recipient of one of the largest awards in the history of the Incentive Awards Program at Edgewood Arsenal.

Col Paul R. Cerar, CO, presented the check to Garono and complimented him on his contributions to the Army Cost Reduction Program.

The suggestion had been classified earlier on the local level and Garono received a post award of $500, bringing his total to $5,000.

The Department of the Army Incentive Awards Committee decided his suggestion was not part of his job and clearly exceeded normal duties.

Garono received a BS degree in chemical engineering in 1935 from Massachusetts Institute of Technology after undergraduate work at Georgetown University. He completed work on his master's degree in chemical engineering at MIT in 1936 and received training in business administration at the University of Pennsylvania, Wharton School.

Before entering Civil Service at Pine Bluff Arsenal in 1942, he was employed by E. I. DuPont de Nemours and Co., Inc.

After a 6-year break in service, he returned to Civil Service at Edgewood Arsenal in 1951 as chief, Plants Division and was promoted to his current position in 1953.

Garono is a member of the Federal Professional Association, National Society of Professional Engineers, American Chemical Society, American Ordnance Association, American Institute of Chemical Engineers and the Instrument Society of America.

WATERPROOF FOXHOLE COVER, made of close-woven dacron that permits a section of the opening to be covered with up to 36 inches of top soil, is being tested at the U.S. Army Infantry Board, Ft. Benning, Ga. Measuring 80 by 84 inches, the cover has two 8-inch sleeves, one at each end, which can be filled with soil and buried to serve as anchors. Beside providing a good barrier from rain and surface water, the cover forms a CBR protective device, a good barrier from shrapnel, and a means to camouflage the position from aerial reconnaissance.

Natick PRL Publishes CY 1968 Research Report

Eighty-five technical abstracts of CY 1968 basic and applied research work units at the Pioneering Research Laboratory (PRL), U.S. Army Natick (Mass.) Laboratories, are presented in its 30th annual report.

Intended to inform Department of Defense and other U.S. Government laboratories of PRL technical programs and progress in the physical, life and behavioral sciences, the 97-page report lists principal investigators for research tasks, staff members, organizational structure, seminars and PRL publications during 1968.

In basic research, 58 abstracts tell of investigations of mycology, spores, microbial enzymes and products, proteins, theoretical biology, entomology, photo and radiation chemistry, analytical chemistry, food chemistry, chemical synthesis, energy transfer, radiation physics, and experimental and physiological psychology.

In applied research, 27 abstracts review activities in microbiology, insect and rodent control, and psychology.

Physically located with five other Natick operating laboratories, most of which have product-oriented missions, the PRL provides consulting and special measurement services to these and other U.S. Government labs. Five of the abstracts pertain to this type of service.

Particularly cognizant of its role in providing specific support to resolve urgent problems of U.S. troops in Vietnam, the PRL assigned Dr. Fred Parrish to Vietnam to provide liaison between field soldiers and the laboratory at Natick. Abstracts in the PRL report indicate a substantial part of research activities was directed to Southeast Asia priority requirements.

For example, one of the research tasks involved John M. Davies, David I. Randolph, Joseph F. Roach and Gary S. Ross in flash-blindness experiments on cats using a laser beam. The objective was to determine the degree of exposure damaging to the retina, temporarily and permanently, as it may be related to the eyes of humans using laser-beam equipment.

Capt Randolph presented a paper at the 1968 Army Science Conference in June, reporting on these investigations up to that time, and was awarded a second-place prize of $500.

Eyes of the animals were examined about a month after the last exposure by Dr. Richard H. Donovan and Dr. Hal M. Freeman of the Retina Foundation. Findings also were reported in the *Journal of the Optical Society of America*, Vol. 58, 424–426.

Major new instruments added to equipment of the PRL during CY 1968 include a 1–Mev. Febetron electron-pulse generator for pulse radiolysis studies; also, a high-resolution nuclear magnetic resonance spectrometer Varian HA100, a Perkin Elmer mass spectrometer, several minor instruments, and auxiliary pieces for use with existing instruments.

PRL was host in 1968 to an international symposium on Photochemistry and Radiation Chemistry, an annual conference on Organic Chemistry, and a Department of Defense Conference on Prevention of Microbiological Deterioration of Military Materiel.

Increasing use is being made of temporary and part-time employes in several programs. Included are Civil Service part-time employes and post-doctoral students, visiting scientists (through appointments by the National Academy of Sciences) and an occasional predoctoral candidate.

The PRL has encouraged predoctoral students to use its facilities under supervision of staff scientists for research leading to an advanced degree. No established program exists for this type of appointment and efforts are under way to encourage a greater participation with universities in accordance with recommendations of a Federal Council for Science and Technology report of March 1968.

President Nixon has requested that greater use be made of the Federal Laboratories facilities, a policy that is now being implemented.

A revision of National Academy of Sciences advisory panels for the PRL is being made to provide greater participation of leading industrial and academic scientists in the planning and execution of the PRL program.

STRATCOM-CONUS Initiates Commander's Trophy Awards

Commander's Trophy awards were initiated recently by the U.S. Army Strategic Communications Command, Continental U.S. (USASTRATCOM–CONUS) by Col Jack G. Hines, commander.

Lt Col Ralph A. Barker, CO of the East Coast Telecommunications Center at Frederick, Md., was the recipient of the first Command Award. The Civil Defense Operations Award went to E. L. Kilcullen, chief, USASTRATCOM Olney (Md.) Facility.

The first trophies recognized "excellence in over-all achievement" for the first quarter of 1969, with the winners selected by a panel of 10 staff officers at HQ USASTRATCOM. The trophies will rotate quarterly and must be forwarded within 48 hours of announcement of new winners.

Dr. Lampi Receives Isker R&D Associates Award

Presentation of the Rohland A. Isker Award of Research and Development Associates recently recognized Dr. Rauno A. Lampi, U.S. Army Natick Laboratories, for developing an infrared flaw-detection system.

Used for rapid scanning of the seals of packages for freeze-dried and thermo-processed foods, the nondestructive system is termed "a major technological advance in assuring quality of flexible packaging."

The Isker Award is presented annually by R&D Associates, an incorporated nonprofit military-industrial liaison organization, for significant accomplishments in R&D of foods and containers. Dr. Lampi received the award at the organization's 23d annual meeting, U.S. Military Academy, West Point, N.Y.

Before joining the staff of the General Equipment and Packaging Laboratory of the Natick Laboratories two years ago, Dr. Lampi was manager of the food technology section of Central Engineering Laboratories, FMC Corp., for four years.

Dr. Rauno A. Lampi

From 1959 to 1962 he was technical director of New England Apple Products. For two years prior he was assistant manager of the food division, Foxboro Co., Foxboro, Mass., after receiving a PhD degree in food technology from the University of Massachusetts. He earned BS and MS degrees at the same institution.

Dr. Lampi is a registered professional chemical engineer, author of numerous technical publications, and is a member of the American Association for the Advancement of Science, the Packaging Institute and various honorary fraternities.

Army Judges Select 20 International Science Fair Winners

CHERRY BLOSSOM award winners, alternates and officers who presented the awards include, from left, Air Force winner Jean C. Lauricella; Maj Gen Clifford J. Kronauer, CG, Air Force Western Test Range; David L. Maynard, Air Force alternate; Army winner Marilyn Sue Miles; Maj Gen C. C. Haug, U.S. Army Southwestern Division engineer; Scott Allen Henry, Army alternate; Navy winner William J. Synhorst; Admiral Thomas B. Owen, Chief of Naval Research; Cheryl Engleman, Navy alternate. Winners will take part in Japan Student Science Awards.

From 391 highly selective high school science fair winners whose research projects were exhibited at the 20th International Science Fair, Fort Worth, Tex., the U.S. Army, Navy and Air Force named two girls and a boy for 1970 "Operation Cherry Blossom" 10-day trips to Japan.

Selected to continue the remarkable "good will ambassador" record of previous ISF winners of the highly coveted Operation Cherry Blossom trips, to display their work at the Japan Student Science Fair Awards in Tokyo next January, are:

ARMY—Marilyn Sue Miles, Solon (Ohio) H.S., with Scott Allen Henry, 17, Baylor H.S., Chattanooga, Tenn., as alternate. NAVY—William James Synhorst, 18, Roosevelt H.S., Des Moines, Iowa, with Cheryl Engleman, 17, Hazelton (N.D.) H.S., as alternate. AIR FORCE—Jean C. Lauricella, 17, St. Dominic Academy, Jersey City, N.J., with David Louis Maynard, 18, Blaire (Tex.) H.S., as alternate.

The Army also selected 10 Superior Award winners for one-week all-expense-paid trips to an Army in-house laboratory where basic activities are most closely related to the areas of scientific investigation involved in the students' research projects.

Ten Meritorious Award winners also were selected by the Army panel of judges, consisting of 9 Army in-house laboratory scientists and engineers and 11 members of Army Reserve R&D Units. They will be alternates for trips to the laboratories or summer employment in the event that Superior Award winners reject the offers or cannot keep commitments.

SUPERIOR AWARDS—Winners of these awards, each of whom received a Certificate of Achievement signed by Secretary of the Army Stanley R. Resor and Edward G. Sherburne Jr., director of Science Service, the nonprofit organization that administers the ISF, are:

Robert Curliss Benjamin, 17, Melbourne (Fla.) H.S., whose exhibit was titled "Biological Mechanisms of Genetic Repression"; Thomas Michael Brennan, 17, Liberty H.S., Bedford, Va., "Minkowskian Trigonometry"; Michael Brian Ellerin, 17, High Point Sr. H.S., Greenbelt, Md., "Color and Slate—How They Rate"; and

Beverly Fordham, 16, Bryan Adams H.S., Dallas, Tex., "Differential Encoding of Biological Electroencephalograms"; Larry Hayward, 15, Eureka (Kans.) H.S., "Space Reentry Developing a High Performance Reentry Lifting-Body"; Scott Allan Henry, 17, Baylor School for Boys, Chattanooga, Tenn., "Amino Acid Formation in a Primitive Earth Atmosphere"; and

Barry Lawrence Lane, 18, Grand Rapids (Minn.) H.S., "Developing a Pearl-Culturing Process Concomitant with an Ecological Survey of Clams"; Demetrio Mena Jr., 17, Thomas Jefferson H.S., Brooklyn, N.Y., "Bonding Habits of the DNA Bases"; Marilyn Sue Miles, 17, Solon (Ohio) H.S., "The Golden Section in Nature"; and Gary Ray Rylander, 18, Stephen F. Austin H.S., Austin, Tex., "Transistors Integrated with Physically Small Antennas."

MERITORIOUS AWARDS—Winners in this category, each of whom also received a Certificate of Achievement, are; Philip Duane Dicks, 17, Albia (Iowa) Community H.S., "Oocystis Polymorpha in a Plant Bioregenerative Life Support System"; Jeffrey Lawrence Hawryluk, 16, Jamaica (N.Y.) H.S., "Psycho-Biological Effects of Commissurotomy on Mice"; Gregory M. O'Drobinak, 18, Bishop Noll Institute, Hammond, Ind., "Effect of an Electric Field on NOR Absorption of Chlorine 35"; and

Steven Kurt Roberts, 16, Seneca H.S., Louisville, Ky., "A System of Speech Synthesis Utilizing an Acoustic Aanlog of the Vocal Tract"; Ron Sanches, 17, Gustine (Calif.) H.S., "Obtaining Control of a New Strain of Gray Rot Fungus"; Leland Rex Smith, 17, South Sioux City (Neb.) Community H.S., "An Affine Space Approach to Conditional Probability Systems"; and

Greg von Bokern, 18, Tracy (Minn.) H.S., "Using Sterics Count-Rate and Intensity Profiles to Classify Sels"; Howard Michael Webb, 17, Corydon (Ind.) Central H.S., "Turbidity Avoidance by Fish"; James Nicholas Wisner, 16, Catholic Central H.S., Detroit, Mich., "Fluidics"; and Steve Kent White, 17, Central H.S., Davenport, Iowa, "The Trial Synthesis and Analysis of Krypton Tetrafluoride."

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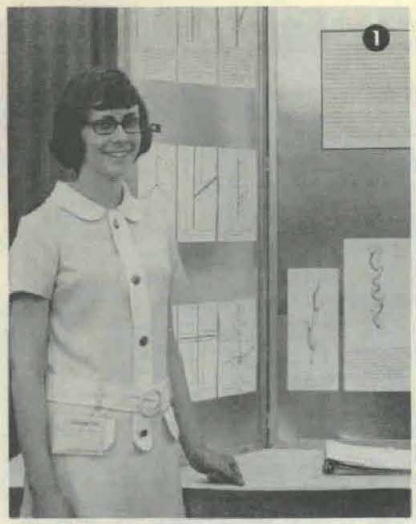
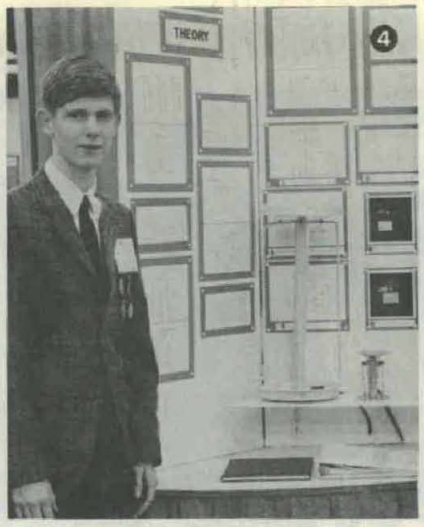
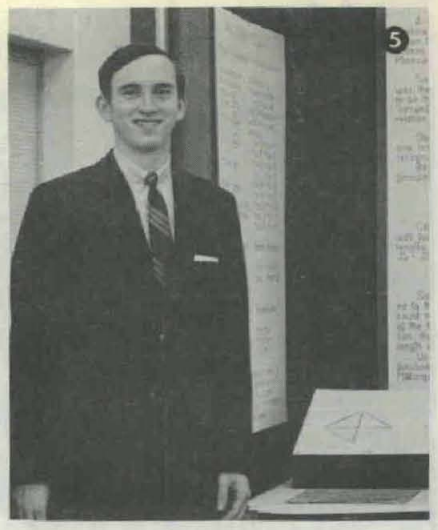
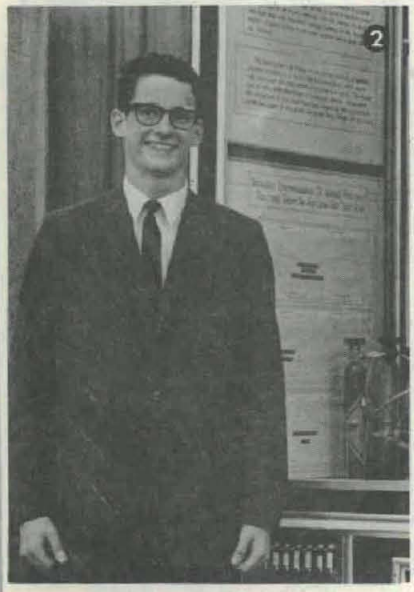
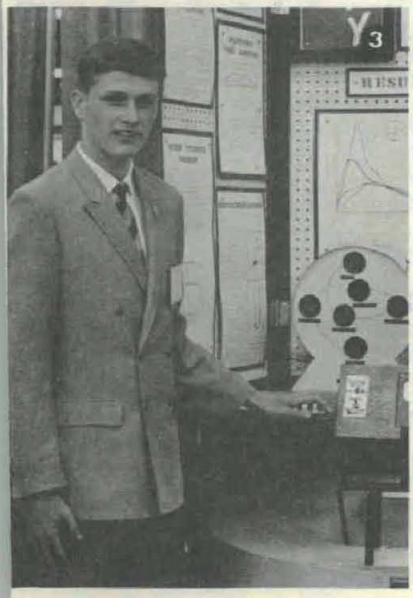










Army Selects 20 International Science Fair Winners

ARMY ISF Superior Award Winners: (1) Marilyn Sue Miles, (2) Scott Allen Henry, (3) Larry Hayward, (4) Garry Ray Rylander, (5) Thomas M. Brennan, (6) Robert C. Benjamin, (7) Michael B. Ellerin, (8) Beverly Fordham, (9) Barry L. Lane, (10) Demetrio Mena Jr.

(Continued from page 21)

QUAD A AWARDS—The Army Aviation Association of America presented handsome wall plaques and $100 honorariums to International Science Fair winners with the best Army aviation-oriented projects in five categories of interest, as follows:

Larry E. Lewis, 17, Emma Sansom H.S., Gadsden, Ala., "Ionocraft Analysis"; Steven P. Parfitt, 18, Airport H.S., West Cola, S.C., "Laser Radar"; Joe Bill Peterson, 15, Lamesa (Tex.) H.S., "Using Photocells to Follow a Light Beam"; Kurt Van Voorhies, 16, Governor Livingston Regional H.S., Berkeley Heights, N.Y., "Application of the Proportional Flueric Amplifier in Carburetor Design."

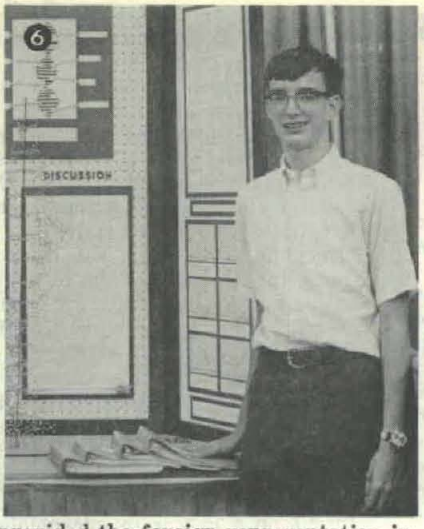
CHERRY BLOSSOM AWARDS—The Army Operation Cherry Blossom winner and alternate received a congratulatory telegram from the Secretary of the Army. They will be escorted on the trip to Tokyo, where they are scheduled for 10 days of intensive activity that will bring them into contact with high Japanese officials, scientists and engineers as well as with Japanese science students. They will tour points of major interest and also will be entertained as guests in Japanese homes.

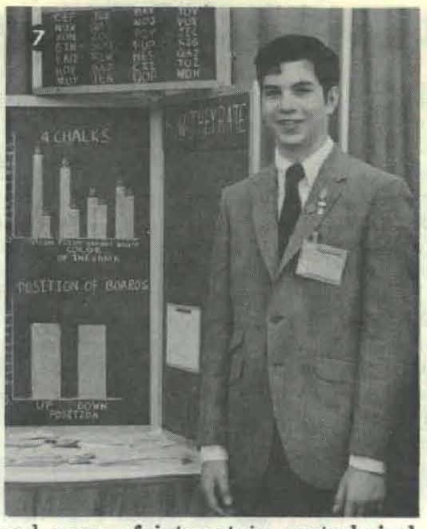
Under the plan adopted by the U.S. Army, Navy and Air Force, each of the services provides an escort officer in successive years. The Army has selected Jack B. Fenn, U.S. Army Research Office, Office of the Chief of Research and Development, as escort officer this year. He has been identified with Operation Cherry Blossom since its inception and has worked on the ISF and junior science fair activities for many years.

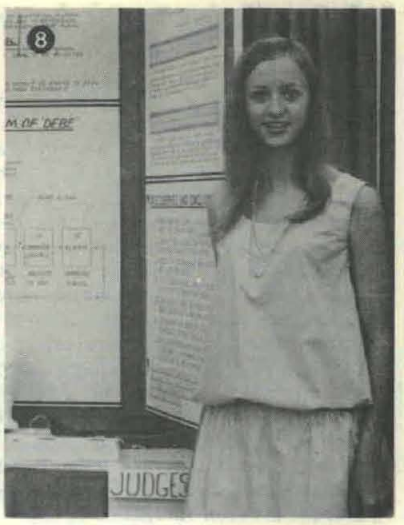
Competition in the ISF for awards presented by numerous supporting organizations is exceptionally keen, since the ISF brings together the most gifted high school students screened from 214 affiliated fairs. Students from Canada, West Germany, Japan, Peru, Sweden and Switzerlzand

Army Judges for 1969

FRONT ROW, from left, Dr. J. Fred Oeste cer for the ISF Jack B. Fenn, Fred R. Bro Salvidor L. Comacho, Capt William D. Fr B. Mefferd. Third row, Col William Surovil Miller and Capt Ronald D. Stricklett. Fou M. Vaughn, Col Bruce S. Ott and Col Jaros Vernon D. Damsteegt, Lt Col (Dr.) Herbe Top row, Lt Col Basil Pruitt Jr. and Dr. A







provided the foreign representation in the exhibitors' ranks this year.

The 391 exhibits included 55 in the field of applied physics and engineering, 26 in biochemistry, 30 in botany, 43 in chemistry, 31 in earth and space sciences, 44 in mathematics and computer technology, 84 in medicine and health, 22 in pure physics, and 56 in zoology.

Operation Cherry Blossom choices, it may be noted, did not win as many additional prizes as did some of the Army's Superior and Meritorious Award selections. However, the OCB awards recognized other attributes in addition to scientific achievement, such as appearance, personality, poise and scope of interest in nontechnical areas—all with a view to their role as good will emissaries in Japan.

Navy OCB alternate Cheryl Engleman received a National Aeronautics and Space Administration Certificate of Merit and a book award for creative scientific endeavor in space exploration. Honored with a Navy Science Cruiser Award, she also won a U.S. Department of Agriculture certificate and an offer of summer employment.

Air Force OCB winner Jean Lauricella was also awarded a $100 U.S. Savings Bond by the Aerospace Education Association of the Air Force Association, an honorary plaque, and an all-expense-paid trip to an AF research facility.

One of the Army Superior Award winners, Michael Brian Ellerin, was also the recipient of an American Psychological Association $100 U.S. Savings Bond and a first award of a Certificate of Merit. He also received a $50 award from the APA Division on the Teaching of Psychology.

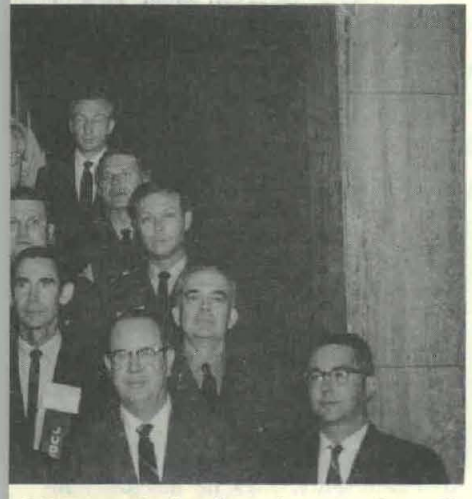
Another Army Superior Award recipient, Beverly Fordham, also was awarded a $100 U.S. Savings Bond by the Society of Women Engineers and a $75 bond by the U.S. Patent Office, Department of Commerce.

An Army Meritorious Award recipient, Howard Michael Webb, earned major additional awards. The Naval Institute/Marine Technology Society presented him with its Grand Award of a 2-week, all-expense oceanography summer course at St. Croix in the Virgin Islands. The Oceanographer of the Navy made him one of two winners of cruises aboard a Naval Oceanographic Survey Ship.

Army Meritorious Award winner Ron Sanches added a Department of Agriculture certificate and offer of summer employment, and also re-

(Continued on page 24)

ernational Science Fair



Col Sidney L. Leveless, Army project offi-
nd Richard L. Hartman. Second row, Capt
, Dr. Gordon L. Bushey and Col (Dr.) Roy
Col (Dr.) John V. Perry, Capt Larry L.
ow, Lt Col Charles L. Welch, Lt Col Edwin
. Klima. Fifth row, John W. Barry, Dr.
Schwartz and Dr. Durwood B. Rowley.
D. Mason Jr.

Army Selects 20 International Science Fair Winners

(Continued from page 23)

ceived a $100 first award from the American Phytopathological Society.

Greg von Bokern, Army Meritorious Award recipient, was honored with a $100 award by the American Meteorological Society, plus a 2-week expense-paid cruise from the Society of Exploration Geophysicists aboard a Navy oceanographic research ship.

Leland Rex Smith, Army MA winner, was among those selected for an expense-paid "Nuclear Research Orientation Week" at the U.S. Atomic Energy Commission National Laboratory, Oak Ridge, Tenn. He also was chosen for an Air Force honorary plaque and a trip to one of the Air Force research facilities.

The Air Force selected an Army Superior Award winner, Gary Ray Rylander, for an honorary plaque and expense-paid visit to one of its research laboratories. Another Army SA winner, Larry Hayward, received a Certificate of Merit and a book award from NASA. Quad A winner Kurt Van Voorhies also was awarded a $75 U.S. Savings Bond by the Patent Office, with a Certificate of Achievement.

OCB Biographies. U.S. Army representative for Operation Cherry Blossom, Marilyn Sue Miles, who also won a Navy Science Cruiser Award, states that she has been interested in science since she was eight years old. Drum Corps and outstanding success as a marimba soloist were her major concerns as a high school freshman, but she did win honorable mention at the Northeastern Ohio Science Fair.

In her sophomore year she became a member of the Ohio Junior Academy of Science and was an exhibitor at the Ohio State Fair junior science show, as well as a winner at other high school science exhibits.

Science honors began to pile up for her in her junior year, when she was a speaker at the Junior Session of the annual meeting of the Ohio State Academy of Science, received an honorary membership in the American Association for the Advancement of Science, became a member of the Ohio Academy of Science, and was an exhibitor at several science fairs.

As a senior she was a speaker at the Ohio Junior Science and Humanities Symposium, the NASA–NSTA Youth Science Congess, and the Junior Session, Ohio Academy of Science annual meeting.

Meanwhile, numerous other scientific activities did not prevent her from finding time to serve as head of a section in the high school symphonic band, become fluent in the Spanish language, and be active in a ski club.

Marilyn's interest in science at an early age may well have been inspired by her parents. Fiske Miles Jr., a high school principal, has BS and MA degrees from the Universities of Missouri and Illinois and his wife is a teacher with a BS degree in education from the University of Arkansas.

The ISF research project exhibit that helped to make Marilyn the Army choice as a representative in the Japan Student Science Fair Awards depicts results of a complex study of "The Golden Section in Nature." By studying 200 specimens of each of various types of plants, she was able to establish the phyllotactic cycles of leaf formation and the reasons for variations in leaf structure in measurable terms.

OCB Army Alternate Scott Allen Henry is the son of Dr. W. B. Henry, a physician, and Mrs. Jo Ann Henry, a singer with a BA degree from the University of Illinois. Scott admits to being interested in science since he was nine years old.

Scheduled to enter Duke University in the fall, Scott has established a long list of academic and scientific honors, including an Angier Biddle Duke Scholarship Award. In the 20th ISF competition, he also was the winner of a Navy Science Cruiser Award.

Listed in *Who's Who Among American High School Students*, he has received the Charles Palmer Davis Award for Excellence in Current Events (also a similar award from *Time Magazine*), the Daughters of the American Revolution History Award, and membership in the Society of Outstanding High School Students.

Scott's exhibit in the ISF, "Amino Acid Formation in a Primitive Earth Atmosphere," was an attempt to simulate the conditions of lightning discharge in an Abelson gaseous system, which might have constituted the atmosphere of the primitive earth; also, to determine whether lightning might have formed amino acids and other organic compounds.

NAVY OCB SELECTIONS. The Navy's representative for participation in the Japan Student Science Awards, William J. Synhorst, will display an exhibit titled "Associative Learning from Relative Environmental Data." A robot with sense as well as response functions, programed by a digital computer, is used to establish and "learn" sense response relationships by trial and error, associating future experiences with those in its magnetic tape memory.

His father is Ohio Secretary of State Melvin D. Synhorst, a graduate from the University of Iowa with BA and JD degrees. Alice R. Synhorst, who now lists her occupation as housewife, likewise has a BSc degree from the University of Iowa, where William plans to enroll this fall. William's hobbies are electronics, high-fidelity-audio, and photography.

Cheryl M. Engleman, the Navy alternate for the OCB trip to Japan, came by her scientific interest without strong stimulus in her home life. Her father is a rancher and neither he nor his wife went to college. Cheryl's interest, she said, was sparked by a Hazelton (N.D.) high school science fair. Her first honors came in the 1967 state fair and she was a winner again in 1968.

Intent on a career in microbiology, with plans to attend the University of North Dakota, she also has an abiding interest in music, is a member of a chorus, and went on a European tour as a member of the North Dakota all-state band. Another of her interests is horseback riding. For the past two summers, she has taught in the Head Start Program for underprivileged children.

AIR FORCE SELECTEES. Jean C. Lauricella, selected to represent the Air Force in Operation Cherry Blossom, will exhibit "Osteoid Demineralization of the Chick Embryo Skeletal Structure by Five Cycline Compounds."

This project is a comparative study of the effect of these compounds on development of the skeletal structure of the chick embryo, using alkaline hydrolysis and slides of the femurs stained with H&E; also, by using the von Kossa technique.

Jean's father is an electrical contractor and neither he nor his wife is a college graduate. Jean became interested in science, she claims, at age five when she learned how to plant lima beans and how to make them grow the tallest in her primary class.

From the fifth through the eighth grade she entered grammar school science fairs. Winning first and second prizes in the Hudson County science fairs in 1967, 1968 and 1969, she also entered the ISF for the first time in 1967. She has been an ISF finalist for three years.

David Louis Maynard, Air Force OCP alternate, says he has been interested in science "as far back as I can remember. I have been reading science books from the library since first grade. I built my first computer while in the sixth grade."

David's father, Ralph J. Maynard, is an attorney with a master's degree in education in addition to an LLB

degree. Wanda Denney Maynard, his mother, has a BA degree from Baylor University.

David started to build up a long list of prize awards in junior science fairs as a 1965 first-place winner in the mathematics division of Johnson (Tex.) High School competition. He has won honorable mention, second and first place awards in the Greater Houston Science Fair continuously since 1966.

The ISF research exhibit that earned him selection by the Air Force is titled "Cibernetic Self-Organizing Systems." By electronic means, the project shows the duplication of three learning functions of the human brain cell, and the redundancy principle displayed by the brain.

QMR Issued for 19 Materiel Items

Qualitative materiel requirements for LINCLOE (Lightweight Individual Combat Clothing and Equipment) prepared by the U.S. Army Combat Developments Command, Fort Belvoir, Va., call for weight reduction of about 50 percent on 19 materiel items.

A new helmet is one of the principal items and various concepts now being tested are radically different in design than the World War II type. Other items include a poncho, sleeping bag, entrenching tool, combat uniform and combat boots.

The Atomic Energy Officer Program

By Brig Gen James A. Hebbeler

The U.S. Atomic Energy (AE) Officer Program is one of several special career fields that include Research and Development; Logistics; Operations Research/System Analysis, and others. In terms of participants, it is one of the smallest but its size belies its importance to the Army and to the individual inclined to nuclear affairs and materiel.

Prior to 1967, the Atomic Energy and R&D Special Career Programs were combined. With publication of Army Regulation 614–131 in September 1967, Atomic Energy became a separate program to identify and develop officers of proven ability for assignment to *atomic energy positions* that are widely varied and are found in R&D, Operations, Logistics and Training activities. These positions are filled whenever possible by officers participating in the AE Officer Program, although normally a tour will not be curtailed solely to enable such an assignment.

Certain AE positions are designated as *key* positions because they involve a high degree of responsibility and authority in nuclear operations or policy. Examples are the deputy assistant to the Secretary of Defense (Atomic Energy); executive secretary of the Military Liaison Committee to the Atomic Energy Commission; member of the Nuclear Weapons Branch of J–3, Joint Chiefs of Staff; assistant director for R&D, Division of Military Application, Atomic Energy Commission; chief, Special Weapons Plans Branch, J–5, U.S. European Command; and many others in the Department of Defense, Army, and Atomic Energy Commission.

Key positions are designated by HQ Department of the Army in coordination with the commanders or agencies concerned. Listed in AR 614–131, they have recently been reviewed and updated. Most *key* positions require assignment of colonels; the remainder are lieutenant colonels. Currently, there are 72 positions designated as *key* and they represent some of the most important assignments in the Department of Defense.

AE Positions are designated by the commanders and agency heads without reference to HQ Department of the Army. Thus, it is difficult to maintain a current worldwide list of such positions. However, personnel requisitions to fill these positions request assignment of officers participating in the AE Program. Experience in one or more of these positions qualifies an officer for later assignment to a key position.

Prerequisites for joining the program are designed to attract only highly qualified and motivated officers. Full particulars on prerequisites and applications are in AR 614–131. The highlights for prospective applicants are grade of captain through colonel, baccalaureate or higher degree, appropriate military schooling (advanced course for captains, Command and General Staff College for field grade officers), three years of active service remaining, a varied military background, and a demonstrated high level of intelligence, imagination, initiative, judgment and the potential for advancement to positions of great responsibility.

Naturally, "What does it do for me?" is a question that cannot be avoided, no matter how altruistic one may be. On a statistical basis, officers participating in the program have fared substantially better than others in promotions. Promotion selections in 1968 illustrate this fact. The percentages listed below are Army Promotion List (APL), for first time considered:

RANK	*AE%*	*ARMY-WIDE%*
To Col	62.5	51.1
To Lt Col	100	87.3
To Maj	100	85.9

These figures are not conclusive proof, of course, that participation in the AE Program generates a halo that guarantees a promotion, but they do indicate an elite group of officers, further illustrated by level of education. Sixty-two percent hold master's degrees and four percent have gained doctorates.

Current assignments of program members indicate that membership does not preclude normal career progression that provides a solid, diversified military background. AE officers are assigned as brigade and battalion commanders, to joint and combined staffs, to service schools, to Military Assistance Advisory Groups, and to the entire spectrum of interesting and challenging jobs that lead to increasingly responsible positions.

To staff the 72 Key Positions with AE Program members of the proper grade on a continuing basis, the Office of Personnel Operations (OPO) esti-

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Brig Gen James A. Hebbeler has served since June 1966 as Director of CBR and Nuclear Operations in the Office of the Assistant Chief of Staff for Force Development (ACSFOR), HQ DA, and also serves as president of the Atomic Energy Officer Program Consultant Board.

He was commanding general, Deseret Test Center (1963–1966) after commanding the Army Chemical Research and Development Laboratories at

General Hebbeler began his career as an ROTC instructor in field artillery at Purdue University in 1940. He later served in artillery units during the Normandy, Northern France, Central Europe, Ardennes-Alsace, and Rhineland Campaigns in Europe. He transferred to the Chemical Corps in 1949 and has served in chemical and nuclear-related assignments.

General Hebbeler has a BS degree in chemistry from Purdue University and a MS degree in physics from Columbia. He is a graduate of both Field Artillery and Chemical Advanced Courses, Command and General Staff College (1956), U.S. Army Command Management School (1959), the Army War College (1960), and the University of Pittsburg Management Edgewood (Md.) Arsenal for two years. Course (1963).

Kudos

MERITORIOUS SERVICE. *Dr. John P. Penhune* is a recent winner of the Department of the Army Meritorious Civilian Service Award (MCSA). He was cited for performance as assistant director and chief of the Discrimination Technology Division, U.S. Army Advanced Ballistic Missile Defense Agency (ABMDA), Office of the Chief of Research and Development.

Dr. Penhune is credited with exceptional contributions from March 1968 to April 1969 in formulating the ABMDA research and development program in discrimination technology and in providing outstanding leadership in the implementation and execution of the program.

Marvin C. Hillsman, assistant to the Inspector General (IG) for the U.S. Army Strategic Communications Command-Continental U.S. (STRATCOM-CONUS), received the MCSA for performance of duty from May 1966 to February 1969.

An 11-year Civil Service employe and a retired U.S. Army colonel with almost 20 years experience with the IG and related activities, he was cited for organizing an IG office and achieving high standards of performance at HQ STRATCOM in Suitland, Md. Maj Gen Walter E. Lotz Jr., STRATCOM CG, presented the award.

Colin M. Giorgi, a physicist with the U.S. Army Electronic Proving Ground (USAEPG) at Fort Huachuca, Ariz., received the MCSA for improving the Army's capability to test tactical infrared surveillance systems.

USAEPG Commander Col Maynard C. Raney presented the award and a citation that credits Giorgi with providing the test and evaluation program with "an excellent basic bench-test facility, a unique array of field targets, and an advanced test methodology for airborne infrared systems."

The U.S. Army Aviation Materiel Laboratories at Fort Eustis, Va., awarded the MCSA for bravery, the first of its kind presented at AVLABS or Fort Eustis, to *Thomas G. Mangrum Sr.* for. . . "demonstrating courage far beyond the call of duty."

While serving as a member of a ground instrumentation team during an aircraft test, Mangrum is credited with extinguishing the flames when the plane crashed and the engine caught fire, thereby preventing the plane from being destroyed and avoiding possible loss of lives.

BRONZE STAR MEDAL. *CWO Billy E. Kraft* was recently awarded the BSM for meritorious service in Vietnam from November 1967 to November 1968. Kraft is now serving as a maintenance officer in the Mechanical Division, U.S. Army Mobility Equipment R&D Center (MERDC), Fort Belvoir, Va.

SERVICE MEDAL. *Lt Col Walter C. Daniels*, serving with the recently established Joint Logistics Review Board headed by General Frank S. Besson Jr., received the first Meritorious Service Medal (a newly established noncombat award ranking with the Bronze Star) awarded in the Army Materiel Command (AMC).

The award citation recognized his service as AMC assistant secretary of the General Staff: "As Command briefing officer and the principal coordinator for public affairs and historical functions, he made significant contributions toward maintenance of a highly respected public and military image for the Command."

SPECIAL ACT AWARD. *Fred Hendricks Jr.*, a Sp/5 until his recent release from active duty, received a certificate and $300 Special Act Award for service during his tour of duty at the U.S. Army Mobility Equipment R&D Command.

The award honored him for successfully testing and evaluating mine clearing rollers under combat conditions in Vietnam, and for training unit operators in equipment use.

CERTIFICATE OF ACHIEVEMENT. *First Lt James C. Wilson* was presented a Certificate of Achievement citing him for "significant contributions to the Army's advanced electric power program" at MERDC.

Certificates of Achievement were presented recently to *Michael N. Zabych*, Management and Evaluation Division, and *Albert T. Finnell*, Programs and Budget Division, Office of the Chief of R&D, HQ DA. Zabych also received an Outstanding Performance Rating and a 30-year Length of Service Certificate and Pin.

OUTSTANDING PERFORMANCE commendations for service with OCRD were awarded recently to *Dr. Marvin E. Lasser*, chief scientist; *Robert S. Williamson*, Management and Evaluation Division; *Mrs. Nora L. Comer*, Office of the Executive for Administration; *Mrs. Bernice M. Greene* and *Mrs. Cathy L. Balistreri*, Communications-Electronics Division. Mrs. Balistreri also received a Certificate of Appreciation.

SSPA CITATIONS. Sustained Superior Performance Awards for OCRD service were presented to *Mrs. Marylee M. Norton*, Air Mobility Division, and *Mrs. Mildred N. Kern*, Office, Executive for Administration.

LENGTH OF SERVICE. *Miss Pauline Dorman*, OCRD, received a 40-year Length of Service Certificate and Pin. *Dr. Harry Kaplan*, U.S. Army Behavioral Science Research Laboratory, OCRD, was awarded a 30-year Certificate and Pin.

Women's Federation Selects Delegate From Natick Laboratories

Selection as "Young Career Woman Delegate" by the Massachusetts Federation of Business and Professional Women's Clubs recently honored Miss Louise Dusablon, employed in the Army Natick (Mass.) Laboratories.

Miss Dusablon will attend the 50th Anniversary National Convention of the Business and Professional Women's Clubs, July 18–25 in St. Louis, Mo., as the representative of the Massachusetts Federation.

Employed as the only woman research chemical engineer at the Natick Laboratories, Miss Dusablon has worked for three years in the Advanced Projects Division, Clothing and Personal Life Support Equipment Laboratory.

Currently she is engaged on research on an experimental climate-controlled clothing system for the soldier of the future, as well as studies on an air-supplied clothing system for tank crewmen and advanced space suit concepts.

One of the four scientific papers she has authored was presented as one of the 96 in-house laboratory research papers featured on the program for the 1968 Army Science Conference at the United States Military Academy, West Point, N.Y.

A native of Woonsocket, R.I., now residing in Providence, she is a graduate of the University of Rhode Island, where she received a BS degree in 1964 and an MS degree in 1967, both in chemical engineering. She is continuing her studies there for a doctoral degree.

Louise Dusablon

Picatinny Research Teams Share R&D, R&E Awards

Three scientific teams at Picatinny Arsenal (Dover, N.J.) selected for HQ Department of the Army 1969 R&D Achievement Awards also are among six Picatinny groups honored recently with the arsenal's annual Research and Engineering Achievement Awards.

One team of dual winners consists of Dr. Jean P. Picard, chief, Propellants Laboratory, Robert G. Wetton and Robert P. Baumann, supervisory chemical engineers, Benjamin D. Lehman and Joseph S. Stack, research chemists, and Eugene Bozza, chemical engineer.

This group was selected for developing a new class of chemically bonded nitrocellulose rocket propellants that are smokeless, possess high energy and density, can be bonded to the motor case, and are not affected to any great extent by temperature changes.

Another team of dual-award winners is comprised of Feltman Research Laboratory physicists Drs. Samuel Trevino and Henry Prask, both with duty at Watertown (Mass.) Arsenal. They were honored for preliminary work and development of a new type of neutron scattering spectrometer to study properties of atoms in various materials.

The third team of double winners, Paul J. Kisatsky and Louis R. Szabo of the Feltman Research Laboratory, was honored for research that led to development of a technique for the precise measurement of color used in combat signal flares based on a Chromaticity Coordinate System.

Other winners of Picatinny Research and Engineering Achievement Awards for 1969 include three former Ammunition Engineering Directorate (AED) employes, cited for contributions to the development of improved fragmentation warheads and fuzes for the 2.75-inch, low-spin, folding-fin aircraft rocket system.

Brian D. Walters, Raymond Goldstein and Michael Esposito, the former AED employes, teamed with six current AED employes—Paul Petrella and John F. Grant, general and mechanical engineers, respectively; John W. Herman Jr. and Alfred J. Fiorentino, supervisory mechanical engineers; Kenneth Bramble and Joseph F. Kiernan, mechanical engineer technicians.

Walters is now assigned as a mechanical engineer, R&D Directorate, HQ U.S. Army Munitions Command (MUCOM). Goldstein is a general engineer, Office of the Army Materiel Command Project Manager for 2.75-inch Rocket at HQ MUCOM. Esposito is with the MUCOM Commodity Management Office.

Another R&E Award went to three AED employes for conceiving and designing a new fuze head that allows high-velocity projectiles to be fired through heavy rain, penetrate a jungle canopy and then function on soft ground.

The fuze head was the work of Joseph Matt Jr., acting chief of the Ammunition Development Division, William Lohninger, electrical engineer, and Lewis Cole, electronic engineer.

Two members of different directorates share an R&E Award for contributions to the life-cycle development of thermal batteries for nuclear warhead sections, particularly in the area of test-to-failure techniques.

The new testing procedures are the work of Augustine E. Magistro, supervisory mechanical engineer with the Nuclear Engineering Directorate, and Alonzo Bulfinch, supervisory mathematician and statistician with the Quality Assurance Directorate.

Mallard Project Advances to Phase Two Development

Agreement to continue Phase Two advanced development of the Mallard Project joint tactical international communication system for the armies, navies and air forces of the United States, United Kingdom, Canada and Australia was announced June 2.

Phase One of the unprecedented international undertaking to design and develop a system for long-range communications requirements was started in 1967 and is nearing completion.

Intensive study and system design by both government and industry teams have produced a solid base for further effort. Two major systems studies in the United States and one in the United Kingdom have been completed—augmented and complemented by 58 studies of techniques.

In the United States one team of contractors was led by Radio Corp. of America, working with Litton Industries and Operations Research, Inc. Headed by Sylvania Electric Products, Inc., the other team included International Business Machines Corp., Planning Research, Inc., and Georgia Institute of Technology. The United Kingdom team was comprised of Plessey, Inc., Standard Telephones and Cables Co., General Electric Co., and Marconi, Inc.

Phase Two will cover about two years of effort devoted to modeling and simulation of the selected Mallard system design, as approved by the Program Management Board.

Mallard Project control is centered in a Program Management Board located near Fort Monmouth, N.J. Each nation furnishes a board member, namely Brig Gen Harold W. Rice, U.S. Army; Brigadier H. Roper, Royal Army, U.K.; Col D. Coughtry, Canada; and Lt Col D. McMillan, Australian Army.

Lt Col Snyder Earns PhD Under Joint Education Program

Under a pilot doctoral education program sponsored jointly by the U.S. Army Natick (Mass.) Laboratories and the University of Massachusetts, with support from the National Institutes of Health, Bethesda, Md., Lt Col Oscar P. Snyder Jr. recently became the first to receive a PhD degree.

Dr. Hamed M. El-Bisi, chief of the Natick Microbiology Division, acted as his supervisor during Col Snyder's thesis laboratory work in microbiology to earn his PhD in food science and technology.

Col Snyder completed the necessary graduate courses and served a one-year academic residence at the university. A fellowship from the National Institutes of Health, Department of Health, Education and Welfare, paid for part of the program costs.

Lt Col Oscar P. Snyder Jr.

The son of retired Army Maj Gen Oscar P. Snyder Sr., he received a BS degree in hotel and restaurant management (1952) at the University of Denver and an MS degree in food technology from Massachusetts Institute of Technology (1959).

A distinguished ROTC graduate from the University of Denver, he entered the Army in 1952 and served in Germany, Korea, the Quartermaster Food and Container Institute in Chicago, and the Natick Laboratories. He recently was assigned to duty in Saigon, Vietnam.

Col Snyder is the coauthor of three scientific papers. One was presented in 1966 in Moscow at the International Microbiology Congress.

DDR&E Discusses Safeguard System as Essential Defense

Conflicting viewpoints on President Nixon's decision to deploy the Safeguard Ballistic Missile Defense System still were being spiritedly debated in Congress as this edition of the Army R&D Newsmagazine *went to press. Director of Defense Research and Engineering Dr. John S. Foster Jr., in addressing the Aviation Space Writers Association, discussed the Safeguard issue as follows:*

This evening I would like to discuss the Safeguard Ballistic Missile Defense System. My purpose is to describe briefly why we need it; the issue before Congress and what it turns on; and then to attempt to set the record straight on some of the technical questions that have tended to dominate public debate. I'm certain you have not failed to note the great number of writers who are now experts in your business.

First, the "why's" of Safeguard. During the last four years we have observed a rapid growth in the Soviet Union's strategic forces. This growth has resulted in an improvement and expansion of their already massive antiaircraft defenses, the deployment of a small ABM system, the start of more than 1,000 ICBM launchers, and the rapid deployment of more advanced nuclear submarines—both attack and ballistic missile launching. The expansion is continuing.

As we have watched this expansion during the last few years, most of us assumed that the Soviet Union was attempting, logically, to gain strategic parity with the U.S. We have not significantly expanded our forces during this period.

However, more recently the character and number of Soviet offensive weapons have tended in directions which cause us now to doubt most seriously our previous less disturbing assumptions. A continuation of these trends could constitute a threat to our strategic forces—to our land-based ICBM's and to our strategic bombers. The phased deployment of Safeguard is intended to give us a minimum necessary "hedge" to protect against these contingencies.

Phase I of this deployment is limited to the location of Safeguard components at two Minuteman wings. Deployment of these two sites provides an opportunity to "shake-down" such a system—to find and remove those technical and operational bugs not likely to show up in research and development efforts. We will be prepared to move to Phase II should the threat continue to increase. We could move in the direction of giving greater coverage to the ICBM force, or to protect our alert B–52s against an SLBM (submarine-launched ballistic missile) attack, or to protect the National Command Authority, or to protect our population against a Communist Chinese ICBM attack, or some combination of these options.

It is extremely important that we understand clearly the issue before the Congress, and the consequences of its decision one way or the other.

The question of Phase I deployment rests on three key points. First, is the matter of incremental funds associated with deployment. We are requesting just under $900 million in FY 1970 to continue development, test and deployment. About half of the money is for development, test and the necessary supervision. The remainder is for deployment. So the deployment decision involves the authorization and appropriation of an incremental $450 to $500 million—less than 1 percent of the DoD budget request. In fact, expenditures for FY 1970 would be reduced by only about $250 million, but the ultimate over-all DoD cost for the completed Phase I would increase some $250 million.

Second, it is important to maintain continuity of this hedge against the still evolving threats. You should realize that ever since the approval by Congress, and Secretary McNamara's decision in 1967, we have been building up our capability to produce and deploy these components.

If authorization to continue deployment were delayed until next year, the current capability would decay, and we would lose not just one year but two or more years. Without authority for production and deployment, we would have to close our developmental production lines, discharge our production personnel and cease our engineering on sites.

Later, when authority was granted to reinitiate production, site acquisition, and on-site engineering and con-

77 Foreign Officers Tour U.S. Army Installations

Seventy-seven foreign military officers representing four continents and 13 nations recently toured White Sands (N. Mex.) Missile Range.

Among the visitors were 54 faculty members and students of the Belgium War College in Brussels and 23 participants in a Modern Weapons and Tactics course at Fort Bliss, Tex.

General officer visitors included Maj Gen Kyong Won Bang, Korean Army; Maj Gens Baedcharoen Samridh and Chitpatima Sun, Thailand Army; and Brig Gen Bjorn Axel Hedberg, Swedish Air Force. All members of the weapons and tactics group.

Heading the Belgium War College group was Col A. Blondiau, commandant. Other nations represented were Brazil, Venezuela, Canada, United Kingdom, France, Germany, Japan, Iran and Lebanon.

Maj Gen H. G. Davisson, WSMR commander, welcomed the group and was host at a special luncheon, attended by 11 members of his staff.

The Belgium War College group has inspected a number of military installations throughout the United States. While in Washington, D.C., they toured the National War College and received a series of briefings at the Pentagon.

Their tour included visits to Fort Knox, Ky.; HQ Strategic Air Command in Nebraska; North American Air Defense Command near Colorado Springs, Colo.; the Miramar Naval Air Station in San Diego, Calif.; and other installations.

RANKING MEMBERS of two groups of foreign officers who recently visited White Sands (N. Mex.) Missile Range are (l. to r.) Maj Gens Baedcharoen Samridh and Chitpatima Sun; Thailand Army; Brig Gen Bjorn A. Hedberg, Swedish Air Force; Maj Gen Kyong Won Bang, Korean Army. The visitors also participated in a course on Modern Weapons and Tactics at Fort Bliss, Tex.

struction, we would re-engage the necessary personnel and train them before productive work could be accomplished. This means that the first two sites could not be in operation until 1976 at the earliest, instead of 1974.

If at the same time, the Soviets continue on their present course, they could have another hundred SS–9 missiles, making a total perhaps of 600, with up to 1,800 warheads to attack our 1,000 Minutemen. We would then be defending with too little too late.

The third and final key point on which the ABM issue rests is our desire to negotiate with the Soviet Union and end the strategic nuclear arms race. President Nixon has been quite clear on this point. He said:

"I have taken cognizance of the view that beginning construction of a U.S. ballistic missile defense would complicate an agreement on strategic arms with the Soviet Union.

"I do not believe that the evidence of the recent past bears out this contention. The Soviet interest in strategic talks was not deterred by the decision of the previous administration to deploy the Sentinel ABM system—in fact, it was formally announced shortly afterwards. I believe that the modifications we have made in the previous program will give the Soviet Union even less reason to view our defense effort as an obstacle to talks. Moreover, I wish to emphasize that in any arms limitation talks with the Soviet Union, the United States will be fully prepared to discuss limitations on defensive as well as offensive weapons systems."

In summary, then, the President has decided that we should take this minimum step consistent with preserving our security and enhancing the chances for meaningful negotiation with the Soviet Union. Failure to take the step could not only endanger our security in the mid-seventies, but also weaken our negotiation position in the immediate future.

The Safeguard issue is complicated by genuine uncertainties over Soviet intentions, and unnecessary confusion over technical and tactical problems. What is most remarkable in the public debate is the high level of confusion and misunderstanding existing in the minds of some professionals as well as some nonprofessionals.

For example, regarding the Soviet threat, the following quotation is from the recent book *ABM* edited by Professors Chayes and Wiesner.

"It is important to understand that these assertions by Secretary Laird are not based on any intelligence about new Soviet weapons systems. They represent his interpretation of facts that have, in the main, been known for some time. but have not been viewed heretofore by the responsible officials as signaling a Soviet attempt to attain a first-strike capability."

Secretary Clifford concluded in his January 1969 Posture Statement:

"It is quite apparent from the foregoing review of the threat that the Soviet Union is moving vigorously to catch up with the United States at least in numbers of strategic missiles both land-based and sea-based."

Implicit in Secretary Clifford's conclusion is that the Soviets would level off when they "catch up." The subsequent evaluation of intelligence obtained earlier than his statement and intelligence received subsequently reveals that the Soviets are moving even faster than anticipated and that, having passed the assumed leveling-off point, their expansion programs are continuing unabated.

Mr. Laird's statements are based upon agreed intelligence data. I know of no disagreement on the approximate number of SS–9s being built by the Soviet Union, nor of any significant issue in size of its payload. We all agree upon the existence of new submarines and upon their approximate rate of deployment. No person who has seen the data objects to the conclusion that the SS–9 has been tested with multiple warheads and the community agrees upon an approximate weight of the RVs (reentry vehicles).

We do not know just how effectively these RVs could attack Minuteman silos since we do not know precisely their accuracy. Indeed, their testing is continuing. Further, we do not know how many SS–9s the Soviets will finally build. Perhaps the Soviets themselves haven't decided. But, we do have a good idea of the number they could build in any given time at the recent rate, and we do have a good idea of the accuracy they might achieve.

President Johnson and Secretary McNamara saw only the beginning of the SS–9 buildup when the Sentinel system was started two years ago, but even at that time the option to defend Minuteman missiles was designed into that deployment. To quote Mr. McNamara in September 1967:

"Further, the Chinese-oriented ABM deployment would enable us to add—as a concurrent benefit—a further defense of our Minuteman sites against Soviet attack."

Mr. Clifford requested, and the Congress granted, funds to maintain that option. Other statements in the ABM book seem to play a strange numbers game. At one point the book states:

"With our Minutemen in hardened silos, it would take at least two attacking ICBMs to be reasonably sure of destroying one Minuteman."

An ICBM with three independently aimed warheads can attack three silos. The U.S. has designed, but not deployed, a system that allows a missile to signal the launch-control point if it has launched its reentry vehicle properly. With this system, the control point could reprogram another missile to make up for failures.

For example, a missile system having a 20 percent failure rate and carrying three reentry vehicles per missile, would require only 420 missiles to attack 1,000 silos.

If the yield of each reentry vehicle was a reasonable 5 MT (megatons) and the accuracy a reasonable ¼ of a mile, about 95 percent of the silos could be destroyed. This would mean

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Col Davis Assigned as CDC Concepts, Plans Director

Assignment of Col Ernest H. Davis as director, Concepts and Plans, was announced recently by HQ Army Combat Developments Command (CDC).

In this capacity he will analyze and monitor, from inception to completion, the combat developments actions in the concept phase of each CDC program.

Col Ernest H. Davis

Until recently he was deputy assistant chief of staff for Military Assistance, HQ Military Assistance Command Vietnam.

An Infantry officer, he has attended the U.S. Army Command and General Staff College, the U.S. Army War College, and the Strategic Intelligence School. He has an MA degree from George Washington University, Washington, D.C., and has served as professor of military science at Davidson College, U.S. Army attache in Ethiopia, and commanding officer, Support Command of the 3d Infantry Division.

Col Davis wears the Silver Star, Legion of Merit, Bronze Star with OLC, Bronze Star with "V" Device, Joint Overseas Service Commendation Medal, Army Commendation Medal, Purple Heart, and Vietnamese Army Distinguished Service Order, 2d Class.

DDR&E Discusses Safeguard System as Essential

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50 of the 1,000 Minutemen survive. It would be foolish to attack half of the silos twice as the book advised, rather than all of them once.

The same strange numbers game is played relative to defense. To quote:

"It would take three missiles with 30 percent failure probability to destroy an incoming warhead with 97 percent certainty. Some such requirement must be incorporated into the firing doctrine for any ABM defense of cities, radars or bomber bases, and this uses up the defensive missiles at a fearsome rate."

Prof. Weinberg indicates in his contribution to this book that sequential firing of the interceptors would eliminate this problem. He considers this very difficult. However, this is just the tactic which we will use and we have planned to use for many years. It is feasible.

Furthermore, we expect missile failure rate considerably less than his assumed 30 percent, and results of firings to date support our expectation. Of those missiles that fail, almost all occur early in flight. Should one fail, we would fire another. Sufficient time is available.

We also find in the book the statement: "But that system (Sentinel) was designed for a wholly different purpose. . ."

This quotation is part of a much longer charge implying that the Safeguard components were not designed to defend Minuteman. This is just not true. The Nike-X R&D program, upon which both Sentinel and Safeguard were based, always had a Sprint missile for point defense of targets, specifically Minutemen and cities. We have, from time to time, examined specialized systems, designed only to hard-point defense, with the hope that we could find something much cheaper or much better. But we haven't found it.

Another statement reads: "It has been authoritatively suggested that it just may be impossible during the next years to write a computer program for dealing with the various forms of attack that can be anticipated."

Programing of large computer-controlled systems is difficult. We have had considerable relevant experience, and our experience shows us that it can be done. The systems cited as horrible examples were pioneering new ground, but they eventually worked quite well.

An example is the Air Force Space Track radar recently completed. It is very similar to the PAR radar in its operation; it has one of the largest real-time computer programs ever written and contains almost a million instructions. It was built on schedule and within cost estimates, including the computer programing.

The PAR radar and its computer program are now operational, and the system is being operated and maintained by Air Force crews. In the case of Safeguard, we are allowing a year for shake-down of the Phase I installations.

The book in many spots also claims that the defense can be easily countered by simple penetration devices or by "blackout" attacks.

These "simple" devices simply are not simple. We know that the United States has attempted to field operational penetration aids for the last decade, and we are only now beginning to have workable ones in our forces. We use them to force the Soviets to install a complicated and more expensive defense. We do not depend on them to assure our penetration capability. The devices and the tactics will require more resources than the Communist Chinese will have available for a considerable time.

With regard to the Soviets, the penetration tactics are not very useful for an attack upon the Minuteman force. For that reason the Soviets would be wasting their time with them. Light penetration aids and the extensive high-altitude blackout do not have much effect on a Sprint defense which takes place in the atmosphere.

With regard to the Chinese, they have yet to achieve their first-generation ICBM. They don't know and don't yet have what it takes to develop and deploy penetration aides and tactics against the Safeguard system. Prof. Panofsky asked recently how many Minutemen could be saved by Phase I of Safeguard.

There are attacks for which Phase I will save a respectable number of missiles. The maximum number is associated with the number of interceptors—a number which is classified for obvious reasons. However, I think it is a mistake to consider Phase I in just such terms.

Phase I has two basic functions. It is first a step that will prepare us to react rapidly to a further development of the threat. It prepares sites and production facilities for increasing the number of interceptors and possibly radars, if a threat continues to develop.

Secondly, it provides a checkout, a shake-down of an integrated ABM system—our first opportunity for such experience. What we learn here will affect improvements of the system.

Prof. Panofsky recently inquired whether the Safeguard system forms an economically feasible defense against a heavy threat to the Minuteman force. Various estimates of the cost of an interceptor, including its assigned fraction of the radar and other systems cost, have varied between $2.5 and $7 million. The present cost to the U.S. and probably the Soviet Union for an offensive reentry

MICOM Develops XM-200 2.75-inch Rocket Launcher

U.S. Army Missile Command researchers and engineers at Redstone Arsenal, Ala., have developed and are testing an improved helicopter-mounted launcher to fire the 2.75-inch rocket.

The XM-200, a 19-tube reusable launcher, is lighter in weight, will have a longer service life than the XM-159C it will replace, and will be used with other weapon systems to arm Army aircraft.

Developed by MICOM's Ground Support Equipment Laboratory, Research and Engineering Directorate, the launcher is undergoing vibration tests conducted by its Test and Reliability Evaluation Laboratory. Helicopter flight tests include firing of other armament systems, such as grenades and machineguns. Data will be analyzed and vibration specifications derived that can be used in the laboratory for conducting vibration tests.

The XM-200 is being produced for the Army by AC Electronics in Huntsville under a $1 million contract. Initial production tests on these launchers are scheduled at Redstone (Ala.) Arsenal. MICOM's Aircraft Weapons Commodity Office is responsible for XM-200 development, procurement and deployment.

FRAMED by XM-200, a 19-tube 2.75-inch rocket launcher, are Corbet Cornelison (left) and David Kennamer.

vehicle is in excess of $10 million.

The advances which we expect in our forces over the next few years may reduce these costs to about $3 million. There is little hope they will ever get as low as $2 million. In other words, the costs to attack and to defend in the 1970 time frame are roughly one to one.

Whether or not it turns out in, say 1975, that costs favor the offense or the defense depends on just what improvements the Soviets achieve as well as our own experience with the actual production and operation of our defensive system.

The Safeguard system has been designed by competent people, and the best that are available. Its design has been reviewed by outside experts. Those who do, in fact, study the aspects of the system that are within their area of technical expertise are convinced it will do what it is designed to do.

Some eminent scientists, for one reason or other, claim it won't work. On that, I'd like to say, first, that they have offered no problem which we have not long since addressed and resolved. Second, I want to point out that one does not obtain a meaningful technical judgment by taking a vote of the scientific community or even of Nobel Laureates. This would go to the second warning against misplaced power mentioned by President Eisenhower in his often quoted Farewell Message:

"Yet, in holding scientific research and discovery in respect as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite."

I have attempted to treat some technical objections that have been raised; I have not treated all of them. Perhaps you have found or read objections which you consider more serious. If so, I would welcome an opportunity to answer them here and now.

Rock Island Arsenal Testing Long-Tube Version of Howitzer

Performance and service-life tests of the long-tube version of the standard M109 self-propelled howitzer are being conducted at Rock Island, Ill., HQ U.S. Army Weapons Command (WECOM).

The longer tube (7 feet 10 inches longer) will reduce blast effects on the crewmen and enable them to fire 155 millimeter rounds to ranges exceeding 18,000 meters, more than the current maximum range. Col James K. Hoey, a 10-year veteran of Army R&D activities, is the project manager for Close Support Weapons, with responsibility for the M109E1.

Brig Gen Rice Takes Command of U.S. Mallard Project

Command of the U.S. Mallard Project, a multimillion-dollar 4-nation international strategic communications development program, headquartered at Fort Monmouth, N.J., changed June 25, with Brig Gen Harold W. Rice taking over from Maj Gen Paul A. Feyereisen.

General Feyereisen, who has doubled as deputy CG for Tactical Communications of the U.S. Army Electronics Command in addition to serving as U.S. program and project manager for Mallard activities, is the new U.S. Army Materiel Command Director of Materiel Requirements.

In this position, he succeeds Brig Gen William W. Stone, whose new assignment is director, Chemical-Biological-Radiological and Nuclear Operations, Office of the Assistant Chief of Staff for Force Development (OACSFOR), HQ DA. Brig Gen James A. Hebbeler vacated this position June 27 when he retired.

Identified with the Mallard Project since its inception, General Feyereisen took command of the U.S. Mallard Project office in June 1966 and became ECOM deputy CG for Tactical Communications in 1967.

Brig Gen Rice has been trained to succeed him in this capacity by a series of high-level assignments in communications and electronics. Until reassigned, he was deputy to the Assistant Chief of Staff for Communications-Electronics, HQ DA.

Dr. Lemons Gets Assignment With European R&D Group

Dr. Hoyt Lemons, one of the members of the original staff of the U.S. Army Research Office, Office of the Chief of Research and Development, HQ DA, departed in June for a 3-year assignment with the U.S. Army R&D Gp (Europe), Frankfurt, Germany.

Chief of the Geophysical Sciences Branch, Environmental Sciences Division from 1959 until assigned to his new duties, Dr. Lemons started his Civil Service career in 1945 as a consultant on environmental protection problems in the Office of the Quartermaster General.

In his new position he succeeds James Appleby, who will return to his former employment with the Army Atmospheric Sciences Office, Fort Huachuca, Ariz., a a 3-year tour of duty in the Frankfurt office.

Dr. Lemons has a BE degree from Southern Illinois University and MA and PhD degrees from the University of Nebraska, plus graduate work (1938–39) at Northwestern University. He was an assistant professor of geography at Oklahoma State University (1940–42) and at Washington State University (1942–45), and part-time professor of climatology (also a member of the graduate faculty at the University of Maryland (1951–65).

Known for about 30 articles in geographical, meteorological and military journals, he has served on numerous Army and Department of Defense boards, committees and working groups. He was a member of The Army Research Council (1965-68).

Isolated Heard Island Research Aids NGSP

Remoteness of a scientific duty station has a new depth of meaning for a small group on Heard Island making about an 8-month study for the National Geodetic Satellite Program.

Heard Island is isolated in the vast ocean expanse about midway in the 5,000-mile stretch between the southern tip of Africa and Australia, approximately 4,300 miles south of the tip of India. Except for the 6-man group of Americans tentatively scheduled to depart in November, the island is uninhabited.

Discovered in 1853 by John J. Heard, an American for whom it is named, the island is about 30 miles long, 10 miles wide and is dominated by an inactive 9,000-foot volcano in the Big Ben mountain range. Moss and tussocks are the only vegetation, and the average mean temperature range is from 17° to 56° Fahrenheit.

The research team now stationed on the island was taken there in March by an American Coast Guard cutter that departed from Australia, to which the island was ceded in 1947.

Radio communication is maintained with Heard Island by the U.S. Army Typographical Command from a main transmitter station in Beltsville, Md., through either Ascension Island or Diego Garcia Island in the Chages Archipelago.

By this means the Army Surgeon General's Office in Washington, D.C., recently was informed, "All personnel in good health, no major medical problems. . . ." The message was sent by Sgt George Brennan, a medical aidsman, who is responsible for the health of five others—two geodesists, an electronic technician, a mechanic and a cook.

If a real medical emergency occurred, Sgt Brennan would fill the air waves with an appeal, and hope that some ship within a few thousand miles would come to the team's rescue.

Army Medical Biomechanical Research Lab Serves Many Needs

By Lt Col O. C. Oestereich, Dr. Fred Leonard

Lt Col Orlyn C. Oestereich, assigned as director of the USAMBRL since September 1968, served with WRAMC as assistant troop commander of the Forest Glen (Md.) Section (1953–56) and another tour (1956–64) with USAMBRL (then the Army Prosthetics Research Laboratory) prior to assignment to Vietnam. He attended the Medical Field Service School at Fort Sam Houston, then was assigned as executive officer of the U.S. Army Medical Unit at Fort Detrick, Md. He has a military science degree from the University of Maryland and completed the Army-Baylor University Hospital administration program.

* * *

Dr. Fred Leonard, scientific director of the U.S. Army Medical Biomechanical Research Laboratory (USAMBRL) since 1961, serves as consultant to the National Heart Institute on blood compatible materials. He received a BS degree from the University of Arkansas (1938), MS (1942) and PhD (1947) from the Polytechnic Institute of Brooklyn. He did post doctorate work at Princeton University (1946–48) prior to joining the staff of highly skilled specialists at the Walter Reed Army Medical Center (WRAMC). Among his numerous awards, Dr. Leonard received the Department of Defense Exceptional Civilian Service Award in 1968.

Man's desire to understand more fully the living processes, particularly with regard to medical applications, and his growing interest in broadening the limits of his environment, have led to sophisticated developments in monitoring systems, man-machine systems, communication devices and biomaterials—as well as to a body of knowledge in a multidisciplinary area encompassing the physical and biological sciences.

This information is to be found in the engineering, scientific and medical journals under such terms as bionics, biophysics, medical physics, bioastronautics, bioengineering, biomechanics and biomedical engineering.

As a result of popular usage, biomedical engineering, which is the application of scientific and engineering methodology to problems in medicine and biology, has become the ubiquitous term used to describe such research.

The U.S. Army Medical Biomechanical Research Laboratory (USAMBRL) is a Class II Activity assigned to the Army Medical Research and Development Command, Office of The Surgeon General. Attached to Walter Reed Army Medical Center, the USAMBRL is engaged in several areas of research in the biomedical engineering field. These may be broadly categorized as research toward the development of:

- Surgical repair materials to effect hemostasis and repair of tissues or organs damaged as a result of trauma or disease.
- The most efficient means of communication at the man-machine interface leading to the design of controls, and prosthetic and orthotic systems for the severely handicapped patient.
- Biomedical devices and maxillofacial prostheses.

USAMBRL is staffed with chemical, electronic and mechanical engineers, chemists and research veterinarians. When required, medical support for the evaluation of the developed materials and devices is provided by Walter Reed General Hospital, Walter Reed Army Institute of Research and selected civilian medical institutions.

HEMOSTASIS. When the continuity of living animal tissue is broken and blood escapes from a bleeding vessel, the body is able to control bleeding through a complex hemostatic mechanism, the result of which is the formation of a fibrin-reinforced platelet aggregate known as a hemostatic plug.

In cases of severe trauma, where the body's own mechanism is insufficient to prevent exsanguination, man has devised means for lending nature a helping hand. These include the use of pressure and cold, hot iron or cautery, ligatures and oxidized, regenerated cellulose products.

All of these techniques may operate by inducing reduction in the rate of blood flow by vessel blockage and constriction, thereby permitting platelet adhesion, aggregation and the formation of a clot.

In addition to these techniques, chemicals involved in the clotting cascade at certain phases have been used to hasten hemostasis, such as thrombo-plastin and thrombin.

The capability of rapidly polymerizing monomeric 2-cyanoacrylates to adhere firmly to moist tissue substrates has more recently evoked considerable medical interest in their potentialities as hemostatic agents and tissue adhesives for closure of wounds in place of, or adjuncts to, conventional surgical sutures.

Directed basic research on the 2-cyanoacrylates carried out at USAMBRL has resulted in the synthesis, elucidation of the mechnaism of polymerization, and depolymerization *in vivo* and *in vitro* of these rapidly polymerizing materials.

Surface characteristics of the monomers, e.g., wetting, spreading and adhesivity, have been described. Structure-tissue activity relationships have been detailed. Effect of the monomers on wound strength and healing has been delineated. Experiments to study tissue absorption of the homologous series of alkyl 2-cyanoacrylates and LD_{50} have been conducted.

This research has culminated in the development of a 2-cyanoacrylate homolog, whose properties represent a compromise between minimal toxicity and rate of degradation. Successful application in effecting hemostasis (Fig. 1) resulted in the saving of lives of severely wounded soldiers in Vietnam.

Further research at USAMBRL, in an effort to develop an ideal rapidly polymerizing hemostatic agent, is concerned with the synthesis of more rapidly degradable, minimally histotoxic homologs based on the alkyl 2-cyanoacrylates.

A new approach to achieve hemostasis is under study. It is proposed to trigger the body's own clotting mechanism at the thrombin-fibrogen-fibrin phase, utilizing thrombin adsorbed on metabolizable powders, which would act as reinforcing agents to form strong, coherent fibrin clots. This method is reminiscent of the techniques utilized by the polymer chemist

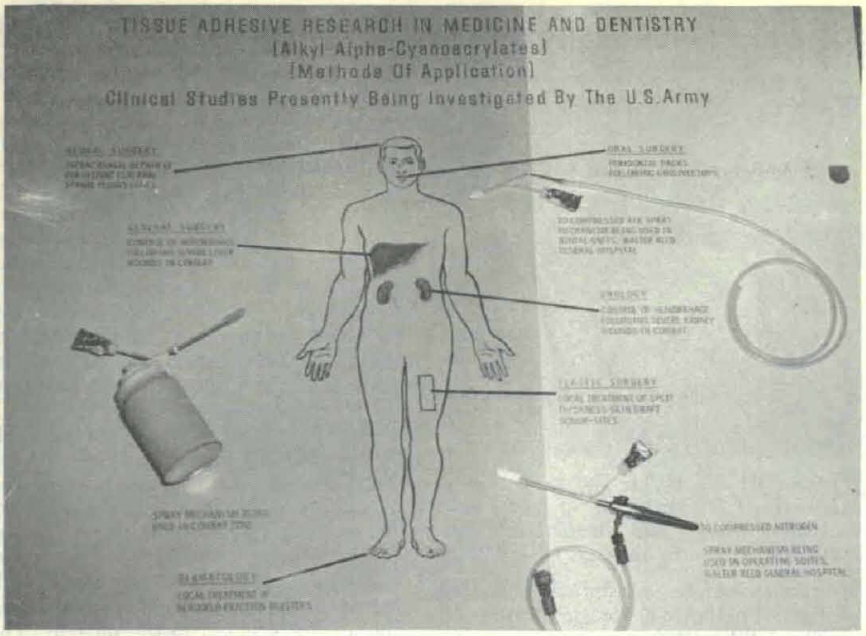

Fig. 1. TYPICAL AREAS of applicability and some spray applications of the n-alkyl 2-cyanoacrylate homologs being studied by Army medical researchers.

and physicist in the reinforcement of polymeric matrices.

BLOOD COMPATIBLE MATERIALS. The present consensus concerning thromboresistant polymeric materials for use in vascular repair is that they must, perforce, be negatively charged. Some materials so treated, such as an elastomer prepared at USAMBRL (Fig. 2), have shown outstanding thromboresistance when implanted in the inferior vena cava of dogs in a chronic 2-week test. Other negatively charged surfaces have not shown thromboresistance.

The rationale evolved at USAMBRL to investigate the reasons for the anomalous results and to attempt to develop thromboresistant materials is as follows:

As a first approximation, it is not unreasonable to postulate that distribution of negative charges along the polymer chain, rather than negative charges, per se, is important. Certain distributions favor thromboresistance; others either do not or, indeed, enhance the possibility of thrombus formation.

It can be theorized that if the negative charges are sterically arrayed so that no free calcium valence (or other multivalent ion) is available for forming a bond between the surface and platelets (e.g., intramolecular calcium bridging), platelet adhesion would not be expected to occur and the material would demonstrate thromboresistance.

On the other hand, if the negative charges are so distributed that a calcium bridge will not form intramolecularly, platelet adhesion to the surface and aggregation leading to thrombus and clot formation can occur and the surface will be thrombotic.

In accordance with this argument, a truly neutral surface (one that will not combine with calcium ions or adsorb calcium ions from solution) will have a greater potential for being antithrombotic than a surface with improperly placed negative charges.

USAMBRL research is probing this hypothesis. Model compounds are being studied with specific distributions of negative charges, as well as neutral compounds. The goal is to evolve design criteria for preparation of thromboresistant blood-compatible materials that can be utilized in repair of vascular trauma.

Calcium sequestration and its possible role as defined by theoretical consideration developed at this laboratory in influencing the design of blood-compatible materials has had two immediate spin-offs of military medical applicability:

- A mechanism based on calcium sequestration was invoked to explain some of the physiological activities of heparin. As a result, a detailed experimental program is being set up to investigate the process of anticoagulation of blood.
- A second mechanism based on calcium complexing has been devised in which it is possible to write stoichiometric equations to explain the calcification of skeletal tissue.

A pilot program is being carried out to test the mechanism and to determine whether calcification rate can be increased for possible enhancement of the rate of bone healing.

BIODEGRADABLE POLYMERS. This program is aimed at development of tissue-compatible, absorbable materials whose degradation products would also be tissue-compatible and nontoxic for surgical repair. Poly (lactic acid) should have such desirable properties. USAMBRL has successfully prepared poly (L (+) lactic acid) and poly (d,1- lactic acid). Sufficient material has been synthesized for the preparation of discs for use in the surgical repair of a fracture of portions of the skull, for use as an absorbable substitute for stainless steel pins in the repair of mandibular fractures, and as a suture material for soft tissue repair.

Preliminary evaluation of pins and sutures has indicated that both poly-(d,1-lactic acid) and poly (L (+) lactic acid) are equivalent to stainless steel in tissue compatibility, both in suture and pin forms. Plans are under way to study the surgical "nuts and bolts" aspect of this material in a variety of hard and soft tissue repair.

From a basic research viewpoint, measurements of the degradation rate of poly (lactic acid) using ^{14}C tagged polymer *in vivo* have been carried out and a mean degradation rate of 5%/month was observed (Fig. 3). Studies of the degradation rate of the d,1 polymer are now being carried out. A detailed kinetic study is seeking to elucidate the mechanism of degradation of poly(lactic acid).

MYOSONIC CONTROLS. Present technology permits fabrication of prosthetic and orthotic devices which would return many of the lost functions to the very severely handicapped upper extremity amputee or severely paralyzed patient. The limiting factor is the paucity of control sites useful

(Continued on page 34)

Fig. 2. CASTING caval rings, tubes, and ventricular assist pumps from the USAMBRL elastomer latex for use in testing thromboresistance qualities.

Medical Biomechanical Research Lab Serves Many Needs

(Continued from page 33)

for controlling such devices.

USAMBRL has accomplished a major breakthrough in the design and demonstration of the feasibility of a new concept utilizing voice and muscle control. Called myosonic control, this system requires two transducers. One detects sonic vibrations of speech. The second, a 3-level switch (O + V — V), detects two levels of muscle tension and relaxation.

In operation, the myosonic control detects sonic command frequencies of common words (Fig. 4), such as "hand," "wrist," "elbow" to actuate the desired joint, or combination of joints (by a word such as "coordinate") and muscle tension to control direction and duration of joint motion.

The concept has been reduced to practice by constructing an arm with the following functions: hand opening and closing, elbow flexion and extension, and coordinated hand and elbow motion. With the myosonic control system, more functions can be added without burdening the patient with the need for involving further control sites.

Other control modes which are under study involve the possible utilization of physiological signals that can be voluntarily generated by the patient. These include thermic, optic, electrical and chemical signals.

BIOMEDICAL DEVICES. Hands. USAMBRL has developed a hand that provides automatic control of grasp for the severely handicapped patient and thereby obviates the possibility of under-grasp or excessive over-grasp (Fig. 5.).

Actuation of a switch controls finger opening and closing. The device is so constructed that a minimum prehension force of two pounds is obtained on initial contact with the object. If a greater force than two pounds is required, attempts to raise the object result in slippage, which is immediately detected by a control sensor in the thumb.

The sensor, a piezoelectric crystal, generates a control signal amplified, detected, integrated and fed into a transistor switch, permitting motor operation that forces the fingers to close more tightly on the object until slippage is zero.

With this system, automatic proportional control of grasp is thus achieved in a closed-loop system incorporating the object to be lifted, the hand, motor, piezoelectric crystal and associated electronics.

The system is independent of the amputee once contact is made and the design principle is applicable to the design of orthotic devices as well.

Fig. 3. MEASURING the rate of disappearing ^{14}C tagged L(+) lactic acid polymer which had been implanted subcutaneously in rats at USAMBRL.

The USAMBRL hand, which is the only electromechanical hand developed in the United States, is being clinically evaluated on a national scale under the sponsorship of the Committee on Prosthetics Research and Development, National Research Council, National Academy of Sciences.

Elbows. USAMBRL has invented an electromechanical elbow, providing active extension and flexion, internal and external rotation, and free swing in the fully extended position. It has been selected as one of seven electromechanical elbows for clinical evaluation on a national scale by the Committee on Prosthetics Research and Development, National Research Council, National Academy of Sciences.

Braces. The laboratory has pioneered in the application of modern materials to the development of lower extremity braces. A recent significant laboratory accomplishment is the development of a strong, lightweight, drop-foot brace prepared from reinforced plastic prepregs, thereby eliminating the necessity for expensive metallic parts. Because the brace relies on elasticity of the plastic material, requirements for precise alignment of mechanical and anatomical axes are obviated. Plans are under way to evaluate these braces on a national scale in conjunction with the Veterans Administration.

Myoelectric Monitor. This portable device (Fig. 6) has been developed for ward use by the therapist interested in achieving normal muscle activity by sensing the myoelectric potential developed as a function of exercise. When the potential exceeds an adjustable threshold, a 600 Hz audio signal is presented to the patient. The adjustable threshold, a training aid, permits the therapist to require greater muscle activity, as the muscle becomes stronger for the production of the audio signal.

The system utilizes differential input, enabling the device to be used in a clinical environment without the necessity for elaborate electronic screening and shielding.

Traction Exercise Device. To obviate the drawbacks inherent in therapeutic exercise equipment, a self-contained traction and exercise unit has been developed in which force is provided by an adjustable spring-powered retriever reel. A 5-foot cable length, which winds into a reel when not in use, provides adequate active excursion for both trac-

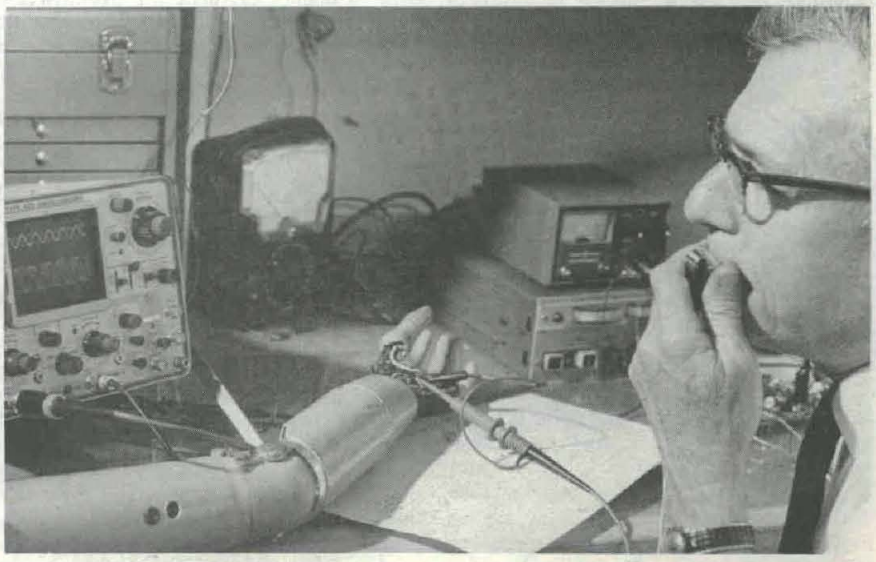

Fig. 4. OBSERVING frequency response of the audio bandpass filters used in the mysonic control system for function selection in USAMBRL research.

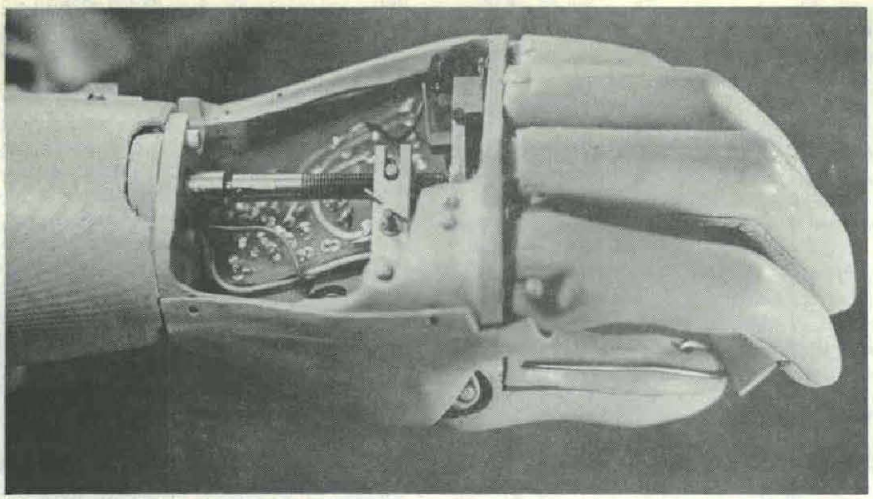

Fig. 5. USAMBRL HAND with automatic grasp control. The slippage sensing loop, visible on the thumb, is designed to provide a multiplane approach for grasp and is coupled to the piezoelectric crystal in the thumb. The signal-processing printed circuit can be seen in the back of the hand. Separation in the drive-screw indicates that initial prehension has been achieved for the sensing mode.

tion and exercise. Compact, self-contained and lightweight, the unit permits application of traction regardless of patient location, whether in transit, clinic, ward or at home.

Several thousand units are being procured for use in field, station and general hospitals.

Maxillofacial Prostheses. The laboratory has excelled in development of materials and techniques for fabrication of extra-oral maxillofacial prosthetic devices for use in fitting patients with unsightly facial wounds.

Among significant accomplishments of this research are new elastomeric materials that have outstanding outdoor weathering and stain resistance. Tinting techniques utilize pigments whose spectral characteristics duplicate those of melanin, hemoglobin and carotene. Prostheses change in color as the human skin does under varying modes of illumination.

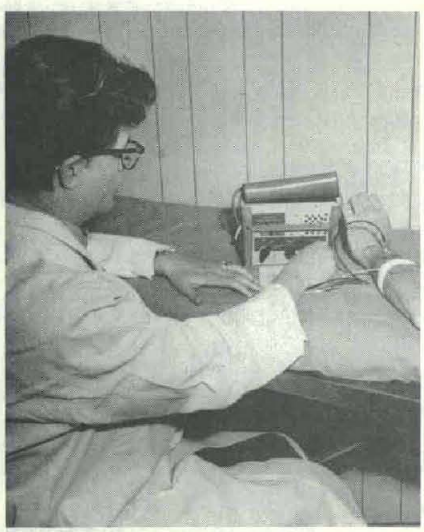

Fig. 6. THERAPIST using portable USAMBRL audio EMG myoelectric montior to test myoelectric potential.

COOPERATIVE PROGRAMS. Laboratory personnel serve as consultants to the National Heart Institute in the program on the development of blood-compatible materials, to the U.S. Navy on the development of underwater adhesives, and to the Social Rehabilitation Service in the establishment of research programs in prosthetics and orthotics on an international scale. A cooperative research program has been undertaken with the Medical Research Laboratory, Edgewood (Md.) Arsenal on the development of skin-protective materials.

Cooperative research programs have been undertaken with The Johns Hopkins University School of Medicine, Baltimore, Md., for development of antithrombotic materials and with the University of Strathclyde, Edinburgh, Scotland, in biomedical research.

In summary, USAMBRL is carrying out research in a variety of biomedical areas, including materials for surgical repair, man-machine communications, biomedical devices and maxillofacial prostheses. While the program is directed primarily toward areas of military medical potential, "spin-off" results from this research generate keen civilian interest leading to applications in academic and industrial developments.

CDC Approves Trailer To Move Aircraft Parts

Transportation of high-value parts for Army aircraft without the damage risks currently encountered has proved feasible in tests of a new aircraft maintenance trailer.

The U.S. Army Combat Developments Command reported this month that a developer's model of the basic trailer, oxygen adaptor and engine adaptor has been recommended for type classification. The trailer is six feet wide, nine feet long, three feet high, and can be hauled by any standard military vehicle. Weighing 650 pounds, it can carry two tons.

Intended for transport of such aircraft parts as engines, rotors, propellers, transmissions, main gear boxes and similar components, the trailer features an "articulated suspension system." Any of the four wheels can go over obstacles as high as one foot in its path without disturbing stability of the carrying platform.

The trailer is designed to transport aircraft components that are currently being carried between maintenance areas and stock rooms by forklift and other carrying equipment offering far less protection.

Sets of horizontally adjustable rails, easily and quickly attached along the top of the trailer, will adapt to the irregular shapes and sizes of parts. Adapters will fasten the parts to the rails for movement without shifting.

Lt Col Theo C. Watkins of the CDC Airmobility Division said the system will include a portable hoist to lift parts on and off the trailer. The hoists will have a fail safe feature to prevent load drop in case of any malfunction. Another feature is design for rapid disassembly of the trailer into a small package for storage and shipment.

Constructed of corrosion-resistant parts for use in a variety of environmental conditions, the trailer is designed for at least 10 years service.

PROVOCATIVE PONDERABLES

"Today's younger generation are no worse than ours. We were just as ignorant and repulsive as they are, but nobody *listened* to us!"

"If you would be pungent, be brief. For it is with words as with sunbeams—the more they are concentrated, the deeper they burn."—R. Southey

"Flattery is 'soft soap' and soft soap is 90 percent lye."

Ancient Greek Tragedy, Present-Day Ethics

Coldness of scientific logic, fathered by the penetratingly precise power of modern mathematics, has occasioned many a spirited discussion of the proper role of "The Humanities" as applied to, or at least moralistically related to, military research and development activities.

As befitting to molding the minds of many of the nation's brightest high school students, the Army's Junior Science and Humanities Symposia (JSHS) Program continually addresses this important consideration. Each year at the National JSHS, an eminent scholar gives the keynote or featured address on a topic dealing with The Humanities.

In discussing "Ancient Greek Tragedy and Present-Day Ethics" at the recent Seventh National JSHS at the United States Military Academy, Dr. Harry L. Levy raised fundamental questions regarding the basic laws of good and evil, light and darkness, in the ethics of human conduct. His thoughtful address carried a message pertinent to our times, as follows:

By Dr. Harry L. Levy

Earlier this morning you were privileged to hear Mr. Willis Hawkins speak on "The Growing Need for Innovation—An Engineering Challenge." Though I was not able to get here in time to hear his speech, I am sure that it was illuminating and informative, for I know his deservedly great reputation. But I am grateful to him, even though I did not hear him, for having provided, so to speak, a springboard for my own remarks. For when the engineer in particular, and the scientist in general, innovates, he changes the world as we have known it up to the time of the innovation.

Does he change it for the better, or for the worse? Some will answer, "Of course, for the better—a new thing is better than an old thing even if it's only just as good." That answer satisfied generations of Americans, and it is well that it did, for it was responsible for more than a hundred years of undeniable progress.

More recently, as the age of technology has become more and more complex, some of us have begun to have doubts. Is change, is innovation, is technological development necessarily an unmixed blessing? Who is to judge? Is the engineer, the scientist, as a scientist, capable of giving an answer?

Prof. Charles Coulton Gillespie, professor of the history of science at Princeton, in a work published nearly 10 years ago, raised serious doubts on this score. Says he, "Neither in public nor in private life can science establish an ethic. It tells us what we can do, never what we should."

As if to bring my topic down to earth from the realms of pure speculation, the *New York Times* published just three days ago an article entitled, "Technology and Environment: Senators hear Gloomy Appraisals."

Two very reputable scholars informed a Senatorial Subcommittee on Intergovernmental Affairs that a grave peril has come to our nation from uncontrolled technology. In the process of creating new goods and services, they explained, technology is destroying the country's "capital" of land, water, and other resources as well as injuring people.

Obviously, science itself has not provided the scientists responsible for the developments in question with any sound guide as to what *should* be done, as contrasted with what *can* be done. If the men directing our scientific enterprises, and those working over them, with them, and under them, cannot look to their scientific treatises for guidance, where can they look?

Far be it from me to claim any monopoly of wisdom for the humanities. Moral theology has many answers to offer. Philosophy and sociology, psychology and anthropology —on the borderline between the sciences and the humanities, and therefore strategically located to be of service in this delicate area—have other answers. Tomorrow night you will hear Dr. Margaret Mead, an eminent anthropologist, a beloved and esteemed colleague of mine, give you some of her judgments on the problems of mankind.

I shall merely attempt to show how, by encouraging broad and deep thinking about basic human problems, differing in detail but not in essence from those plaguing us today, the humanities can help the scientist, and particularly the growing scientist, to see his world steadily and to see it whole.

I shall choose for discussion a series of plays—or perhaps it might better be called one long play in three acts—which deals with the problem of evil. This is a problem with which we as Americans find it particularly difficult to deal. Once the Puritan period in American history was past—and that period, I may say, did indeed concern itself deeply, perhaps too deeply, with the problem of evil—once that period was over, the American answer seemed to be, "Treat evil as if it didn't exist, and it will not exist."

The warm-hearted post-Puritan American, in an expanding country of apparently limitless opportunities and seemingly limitless resources, took comfort in the thought that all human beings are essentially good—that people are people the world over, and that if you will be reasonable, virtuous and benevolent, so will the rest of mankind.

It has taken several wars and various upheavals at home and abroad to disturb this comfortable assumption. If evil in the world cannot be neutralized merely by an outpouring of neighborly goodness, how are we to cope with it?

As I said before, a trilogy of Aeschylus, for trilogy is what we call the

Dr. Harry L. Levy has served at Fordham University since 1967 as professor of the Liberal Arts College. Since 1968 he also has been emeritus vice-chancellor and professor emeritus of classics at City University, New York.

A member of the Junior Science and Humanities Symposia (JSHS) Advisory Council, he served as acting chairman in 1962. He earned his BA degree from the City College of New York (1925) and MA and PhD degrees from Columbia University (1926 and 1936).

Dr. Levy is a Greek Language lecturer for "Voice of America," U.S. Department of State, and a delegate, American Council of Learned Societies. An authority in various languages and classical studies, he is a member of numerous professional organizations and has authored several articles in professional journals.

During World War II he served in the China-Burma-India Theater of Operations. In 1963–64 he was acting and deputy commanding officer of the 1332d Research and Development Unit, U.S. Army Reserve.

three plays in one, devotes itself to the problem of good and evil. I refer to the *Oresteia* of Aeschylus, composed of the *Agamemnon*, the *Libation-Bearers*, and the *Eumenides*.

The story of the trilogy is simple. It commences with the return of Agamemnon from Troy and his slaughter by his queen and her paramour, tells us in the *Libation-Bearers* of the vengeance taken by Agamemnon's son Orestes, now grown to manhood, and ends with Orestes' persecution by the Furies of his mother, and his final release from the hounding of these monsters, who, changed to Eumenides, "The Kindly Ones," become a pillar of the Athenian polity state.

That in brief, is the story, but what is the meaning of it as Aeschylus presents it? I hold that the problem presented by the trilogy may be formulated as a question: When evil comes into being, and harms or threatens to harm the lives of men, how are they to meet it? Shall they return evil for evil?

This is the ancient law of the Near East, an eye for an eye and a tooth for a tooth, the *lex talionis*, the law of retaliation. To the ancient Near Easterner, an eye for an eye and a tooth for a tooth seemed as obviously right, proper and unquestionable as the right to exploit our natural resources to the full seemed to our American forebears. Our trilogy is a study of the actual operation of the law of retaliation in the first two plays, and of its partial setting-aside in the third.

The first play, the *Agamemnon*, centers upon a double retaliation: a single act of violence intended by each of its two perpetrators to avenge a different wrong. Clytemnestra, Queen of Argos, and her lover Aegisthus, as we have seen, murder Agamemnon, returning victorious from the Trojan war. The murderer-in-chief is not the man Aegisthus, but the woman Clytemnestra.

Let us dispose at once of the minor retaliator, Aegisthus. He was avenging the horrible murder of his own brothers by Agamemnon's father, Atreus: one explosion in what we may call in modern terms a chain-reaction of evil, into the details of which it would be beside our point to go.

But what of Clytemnestra? What does she avenge by the killing of Agamemnon? It is retaliation for the ritual slaughter of her and Agamemnon's daughter Iphigenia, whom Agamemnon had killed at Aulis as a sacrifice to angered divinities. The sacrifice was performed in order that the Greek fleet might have safe passage to Troy.

Let us break into the chain at this point and consider this single link. Had Agamemnon not killed Iphigenia, he would not have been slain in turn by Clytemnestra. Then the specific chain-reaction of which we are speaking would not have occurred.

Could Agamemnon have avoided the killing of his daughter, when the prophet had told him that this was the only way to secure the safe-conduct of the fleet to Troy? Yes, he could. But it would have meant renouncing the *lex talionis* at this point; he would have had to forego the revenge which he felt he and the other Greek princes were in duty bound to exact from Paris, the seducer of Helen.

Here, then, we have in this chain of events what seems to me the first clear instance of the decision of human will in the face of evil. That Paris' act had been evil, a breaking of the laws of gods and men, those primary laws governing the sanctity of the family and of the host-guest relationship, none could deny. That Paris' crime deserved punishment, none could gainsay. But who was to punish him?

The wronged one, says old Near-East tradition, the wronged one, if he is still alive; the wronged one, supported if he is alive, and replaced if he is not, by his kinsmen. Had it been simply a matter of exacting penalty for an abominable crime, who, according to the morality of that early time, would have raised an objection?

But here the gods intervene: to accomplish his mission of retaliation, Agamemnon must sacrifice one of his own blood, his beloved daughter, who had often joined with her clear maiden voice in his sacrifices to the gods. Agamemnon's anguish at the need for the choice is narrated by the Chorus. But anguished or not, he made his choice between his duty as a father and his duty as a ruler and warrior; he killed his daughter.

The girl is killed. The fleet sails. Agamemnon's host is victorious over the Trojans. Our heroic general returns in glory, to boast to the people of Mycenae that he has avenged the wrong done to Menelaus. In the vainglorious speech, there is no word of pity for the death of his innocent daughter; this is forgotten.

Well, then, evil for evil: Paris has done wrong, Troy has been destroyed, Iphigenia has been cut down. Evil for evil, and there an end. But no: there is the seed of new evil here, for Clytemnestra, a woman with a man's will, does not accept Agamemnon's choice. He has killed her daughter; he must die in his turn. He dies, and Clytemnestra exults: "This is Agamemnon, my husband: he is dead; his death is the work of my own right hand, the work of a righteous craftsman. And that is that!"

To the avenger, that is always that—the wrong is requited, the game is over. Nowhere does Clytemnestra show any wavering, any sense of a need for choice between slaying her king and husband, or leaving unavenged the evil of her daughter's death. Her womanliness comes out only in the fervor of her desire—vain hope—to have peace, now at last, to have an end of bloodshed.

So ends the *Agamemnon*, the first great act of the trilogy: but just before the close, the Chorus foreshadow the next act. They speak of their longing for the return of Orestes, Agamemnon's young son, who has been sent away to stay with a prince in mainland Greece. Let him come back, they pray, to avenge his father's death. Upon whom? Upon the pair of murderers, they say. What of the fact that one of them is his mother? They take no note of that directly.

The middle play of the trilogy, the *Libation-Bearers*, is so called because its first half takes place at the tomb of Agamemnon—this at a time when, alarmed by a dream, Clytemnestra has sent her daughter Electra to pour libations on the tomb. These are drink-offerings intended to propitiate the spirit of Clytemnestra's slain husband, who is of course Electra's beloved father.

But Orestes, grown now and returning to his native land in disguise, has already left an offering on the tomb. Now Orestes has come back to seek revenge: but there is this difference, that he comes at the behest of Zeus' radiant son, the god of light and healing, Apollo.

Apollo has done more than urge Orestes to avenge his father's death; he has threatened him with the unseen but dreadful wrath of the father, which if unappeased by exacted vengeance will end by estranging the son from gods and men. This is the difference in the motivation: and there is a corresponding difference in the attitude displayed, not only by Orestes but by his sister Electra.

Near the beginning of the play, Electra, for all her grief and hatred, has misgivings about calling down immediate and unqualified retributory death upon the head of her mother and Aegisthus. Should she pray that they be judged, or that they be punished out of hand?

When the Chorus of attendant women, representing her elders and public opinion generally, tells her simply to pray that someone come to kill them for the life they took, she asks whether she may pray thus without transgressing the reverence

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due the gods. Yes, says the Chorus, invoking the law of retaliation, and she accepts their judgment.

The important thing is, I suggest, not that she accepts the *lex talionis* in the end, but that she questions it in the beginning—a questioning that brings a new element into the story of the accursed house of Pelops. Agamemnon, to be sure, had hesitated before killing Iphigenia, but his was no ambivalence about inflicting vengeance on the guilty. It was rather reluctance to make a victim of the innocent.

In the *Agamemnon*, we are with Clytemnestra before, during, and after her awful homicide; yet, as we have said, never do we hear of a word of doubt, or of the slightest countervailing impulse. Now, in this new generation, we find Electra pausing to reflect, to wonder if the gods are on the side of blood vengeance. And for all his brave words about Apollo's command and Apollo's support, Orestes too, a member of Electra's generation, pauses to reflect before he brushes aside his mother's piteous plea to be spared.

Again, the voice of public morals, here uttered by his comrade Pylades, is needed to harden Orestes' heart. But does the son rejoice, as Agamemnon had rejoiced at Troy's downfall, and Clytemnestra at Agamemnon's? No—for all that he feels certain that her punishment was just, he sorrows for it. "I grieve for what I have done, and for the suffering, and for our entire race, I who bear the unenviable stains of this victory!"

So now—a victory in a vendetta can stain the victor, we learn! And both Chorus and Orestes feel that this is not the end; that there is trouble yet to come. Nor is it slow in coming.

In a clear portrayal of the mind-shattering onset of unbearable feelings of guilt, Orestes speaks of defending himself before his friends while yet—and here I translate literally—"I am in possession of my senses," for he feels his senses slipping even before the dread phantasms of his mother's Furies, visible to him and to no one else on the stage, appear in their gory horror.

The last play opens with a scene before the temple of Apollo in Delphi, to which temple Orestes, hounded by the Furies, has come for refuge. Here the symbolism of the conflict between Apollo, who is Orestes' protector, and the Furies, who are his would-be destroyers, requires some comment.

Apollo, son of the sky god, Zeus, represents Light, the light of the sun, of the upper air where his father reigns; here at Delphi above all is the center of Apollo's worship as the destroyer of the symbol of darkness, of the mighty snake Python.

Apollo is truly his father's son, the spokesman of the new regime, which, having defeated Kronos and the earth-born Titans, wishes now to rule with reason and with justice, with the proviso that Justice would be defined by the victor. Scarcely has the play begun when Apollo foreshadows the end by speaking of judges and of words that soothe.

On the other side, the Furies, as they never tire of telling us, are the daughters of Night; they represent the dark powers below the earth, and the older generation of gods which has been overthrown by Zeus and his fellow Olympians. They are bitterly hostile to the new, bright gods.

All their resentment is, as the play opens, directed against the God of Light, who would protect against their dark punishments a slayer of his own mother. Matricide, matricide, they call Orestes again and again. For they are the champions of the right of the mother in the family—the supremacy of her from the darkness of whose womb, as if from the bowels of Mother Earth, the child has emerged.

To the obligation of the child toward his father, they give mere lip-service. But the concept of obeisance to the mother, the queen of her offspring, arouses all their emotions. They are primitive; they belong to the early days of the world. Apollo calls them old, old women who are at the same time children. They stand for direct vengeance, with no intermediator between the wrong-doer and his punisher—to a stage of development, if one thinks in evolutionary terms, before society has organized to protect its members by group action.

Here then, we have the elements of a dualistic conflict: light against darkness, the sky-father against the earth-mother, or, in terms of other cultures, of *yang* against *yin*, of Ahura-Mazda against Ahriman. Yet we know that Greek religion was not dualistic. How, then, is the conflict to be resolved? This is the cosmic question which looms over and magnifies, though it is never permitted, please note, to obscure, the human travail of Orestes.

I told you a moment ago that Apollo foreshadowed the solution by a reference to judges and to soothing words. I have waited until now to tell you that he also referred to another divinity, to Pallas Athena, the goddess of war and of wisdom. It was to her shrine that Orestes was to travel, to Athens, the city which bears Athena's name.

Ammo Foreman Wins 1968 Zornig Award at BRL

Proof that "Opportunity is where you seize it" is furnished by the winner of the 1968 Zornig Award, one of the two highest civilian honors presented annually at the U.S. Army Ballistic Research Laboratories at the Army's Aberdeen (Md.) Proving Ground.

Leroy Stansbury Sr. started his career at the BRL as a janitor in 1943 and is honored by the Zornig Award for his outstanding individual achievements in technical, administrative, mechanical and related fields.

Employed as an ammunition/explosives lead foreman with the BRL Terminal Ballistics Laboratory, Stansbury was cited for "significant factors contributing to the timely completion of novel, high-priority experimental airblast programs conducted at the TBL."

Established in 1959, the Zornig Award honors the memory of Col H. H. Zornig, BRL commander from 1935 to 1941, who is credited historically with planning and organizing much of the current structure of the BRL.

Present for the ceremony, along with dignitaries and numerous fellow employes of the recipient, were his wife Ruth, his son Leroy Jr., a mathematician with the Interior Ballistics Laboratory at BRL, and daughter Eunice, a psychologist with the Department of Vocational Rehabilitation in Washington, D.C.

ZORNIG AWARD WINNER Leroy Stansbury receives citation from Dr. R. J. Eichelberger, director of the Ballistic Research Laboratories at Aberdeen Proving Ground, Md. Sharing husband's honor is Mrs. Stansbury.

The solution, then, is to come through the active intervention of a divinity. Let us look at Athena's qualifications as a solver of the conflict that we sketched above. How does she fit into a situation in which a dominant motif is the conflict of mother-right and father-right? She is peculiarly fitted for this role: for, though female, she is not born of a female: she sprang, the myth tells us, mature and fully armed from the brow of her father Zeus, the dazzling god of the skies. Not for her is the emergence from the darkness of the womb. Yet she is a woman, and the patroness of woman's crafts.

What we have then is the nearest approach to an impartial arbiter in the cosmic dispute—a female divinity sprung solely from a male parent, an exponent of the masculine art of war who is also the patroness of the feminine arts of the household; Our Lady of Battles who is also Our Lady of Wisdom.

Yet it is deeply significant of the relationship between gods and men, in the grand Greek tradition, that Athena does not attempt to judge the case unaided. She summons a court of human beings, Athenians; they are to sit as judges on the hill of Ares, the Areopagus. It is the first supreme court in Western Europe, and Athena's charge to it could stand as a clarion call to every tribunal in the world:

"No anarchy, no rule of a single master. Thus I advise my citizens to govern and to grace, and not to cast fear utterly from your city. What man who fears nothing at all is ever righteous? Such be your just terrors, and you may deserve and have salvation for your citadel, your land's defence, such as is nowhere else found among men . . . I establish this tribunal. It shall be untouched by money-making, grave but quick to wrath, watchful to protect those who sleep, a sentry on the land.

"These words I have unreeled are for my citizens, advice into the future. All must stand upright now, take each man his ballot in his hand, think on his oath, and make his judgment."

This charge comes after argument and counter-argument, rebuttal and sur-rebuttal, with the Furies as plaintiffs, and Orestes as defendant, having Apollo as his mighty witness and attorney. The argument is sophistic: Orestes admits the killing of his mother, but pleads Apollo's command, and his obligation to his father.

The Furies insist he will be condemned by the Court. "Why," says Orestes, "did you not hound my mother for having killed my father?" The Furies: "The man she killed was not of kindred blood." Orestes: "Am I the blood-relative of my mother?" "Yes," say the Furies, "she nourished you within her body."

"No," interposes Apollo, "the mother is no parent; it is the father who is the parent, while the mother is merely the fosterer of an implanted seed, an alien preserver of an alien spore. And here is proof that there can be a father without a mother: my mighty evidence is the daughter of Olympian Zeus, never nourished in the darkness of the womb!"

The arguments are over. Athena speaks to render her judgment. She presumes, or perhaps divinely foreknows, that the vote of the human judges will be a tie: in other words, that the claims of father-right and of mother-right are so evenly matched that the mind of man, unaided by divinity, could not reach a decision. Thus, before the ballots are counted, she casts the President Justice's deciding vote for Orestes, saying frankly that, save for marriage, she is always for the male, and strongly on her father's side.

Now she orders the ballots counted. Orestes calls out to the shining Apollo. The Furies summon the Darkness of Night, their Mother, to be there to watch. The ballots are counted; they are equal for each side; the vote of Athena serves to acquit Orestes.

For Orestes and his protector Apollo, the action is over; they have won; they depart. But what is in many ways the most dramatic part of the play is yet to come: the colloquy between the defeated, bitter Furies and the gleaming Athena who has encompassed their fall.

For Athena does not regard a decision imposed from above as a complete solution; she embarks with deep earnestness on what one of our social scientists has called the "engineering of consent." I can do no better in an attempt to communicate to you the quality of her persuasion than to quote you Lattimore's translation of one portion of the colloquy. Orestes and Apollo have departed in triumph; the Furies speak:

"Gods of the younger generation, you have ridden down the law; of the elder time, torn them out of my hands. I disinherited, suffering, heavy with anger shall let loose on the land the vindictive poison dripping deadly out of my heart upon the ground; this

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APG Test Director Earns Three Fuze-Suggestion Cash Awards

Three suggestions relating to testing of mortar fuzes earned Kenneth M. Davis $1,935, the largest combined sum including also the highest single amount awarded to an individual under the suggestion program at Aberdeen (Md.) Proving Ground (APG).

Col George C. Clowes, APG commander said that the suggestions made by Davis, a director with the Materiel Test Directorate, will save more than $100,000 during the first year of operations.

TRIPLE AWARD WINNER Kenneth M. Davis, wife, Gloria, and Col George C. Clowes, Aberdeen Proving Ground CO, hold awards presented for $1,935 suggestions on mortar fuze testing.

The first suggestion, to replace the plywood target used in testing mortar fuses with a specially fabricated absorbing blanket, considerably reduced damage to the projectiles, thereby making them reusable.

A sampling of each fuze lot is fired, using inert components to insure that mortar fuzes destined for Army use will detonate on impact.

Davis was awarded $980 for this idea, the largest single amount awarded under the suggestion program at APG. The Army estimates the idea will save around $65,000 annually.

Davis found that because of the nominal damage to the projectiles, the fuze body could be reused. This led to his second suggestion—reusing acceptance test fuzes to evaluate metal parts, propellants, ignition cartridges, primers and all other test requiring an inert fuze.

This innovation brought him an award of $825 and is expected to save the Army about $34,000 the first year.

His third suggestion resulted in the design and fabrication of a gauge that is used to determine if the mortar fin assembly can be reused in the continuing test firings. This suggestion won him $130 and the Army expects savings of about $2,500 annually.

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from itself shall breed cancer, the leafless, the barren to strike, for the right, their low lands and drag its smear of mortal infection on the ground. What shall I do? Afflicted I am mocked by these people. I have borne what cannot be borne. Great the sorrows and the dishonor upon the sad daughters of night."

Athena answers: *"Listen to me. I would not have you be so grieved. For you have not been beaten. This was the result of a fair ballot which was even. You were not dishonored, but the luminous evidence of Zeus was there, and he who spoke the oracle was he who ordered Orestes so to act and not be hurt.*

"Do not be angry any longer with this land nor bring the bulk of your hatred down on it; do not render it barren of fruit, nor spill the dripping rain of death in fierce and jagged lines to eat the seeds. In complete honesty I promise you a place of your own, deep hidden under ground that is yours by right where you shall sit on shining chairs beside the hearth to accept devotions offered by your citizens."

In the speech immediately following, Aeschylus has the Furies repeat their long tirade verbatim, stubbornly, just as if Athena had not spoken at all. Athena takes their intransigence calmly. She says that she will bear their anger, for they are older than she, and thereby much wiser; yet, says she, "Zeus has given me too the ability to make no mean use of my brain." And so, in different language, she repeats the substance of what we just heard her say.

The Furies reply with a shorter outburst, still bitter, but shorter. They are becoming convinced, albeit against their will. A reprise by Athena; they reply *da capo* with their shorter blast, again verbatim.

Athena paraphrases her rebuttal. And then: the unmistakable sign of the once-rigid who will now yield. They cease to rant, and ask a question: "Lady Athena, just what post do you promise me?" She patiently explains that they will be the guardians of Athenian marriage, in which, we may observe, the mother-right and the father-right are conceived of as blended, not separate and opposed. "Without you no house will flourish."

They say openly that they feel themselves yielding; she encourages them further; they capitulate. Henceforth they will be the Eumenides, the kindly-minded ones, protectors of the sanctity of the family hearth, protectors of the City against internal strife. And as such they utter a prayer of deep significance:

"This is my prayer: Civil War fattening on men's ruin shall not thunder in our city. Let not the dry dust that drinks the black blood of citizens through passion for revenge and bloodshed for bloodshed be given our state to prey upon. Let them render grace for grace. Let love be their common will; let them hate with single heart. Much wrong in the world thereby is healed."

The play closes with a recessional in which the women of Athens escort their newly inaugurated goddesses to their new abodes, welcoming them as the great, honored, aged children of Night, who will abide in state in the dark recesses of the earth, venerated by the Athenians with sacrificial rites. Chanting, all depart and clear the stage.

Let us reflect for one last moment on what has happened. Within the state, the chain has at last been broken: the chain of evil inflicted and evil repaid, only to lead to further infliction and further repayment, has been brought to a close in an atmosphere of deep reconciliation. But only within the state—only the blood feud between clans within the state; it is only civil war that has been abrogated.

Hatred between states is still envisaged as inevitable. All that is asked of citizens is that they have the same friends and the same enemies. In other words, if we make allowance—a great allowance, to be sure—for the growth of city-state into a nation-state, then Aeschylus has taken us as far as modern civilization has gone: to a situation in which the society tries to use collective sanctions to protect citizen against citizen.

But what of protecting state against state? There I fear we remain where Aeschylus *Eumenides* left us. We have tried feebly and failed wretchedly to establish a world tribunal in which weak nation and strong nation may be equal before the law. *Where is mankind's Areopagus, the world's defense, untouched by money-making, grave but quick to wrath, watchful to protect those who sleep, a sentry on the Earth?*

'Gunga Dins' Provide Water at Isolated WSMR Center

Mechanized "Gunga Dins," named after the regimental water boy immortalized in Rudyard Kipling's poetic tribute, finally are yielding to progress in serving isolated stations on the 400-mile-wide expanse of the White Sands (N. Mex.) Missile Range.

Stallion Range Center, the largest of the outlying stations of WSMR, is bustling with construction workers in the initial phase of the more than half-million-dollar water system development project.

The center is more than 100 miles from the WSMR main post and some 28 miles southeast of Socorro, N. Mex. For more than two years, over 200,000 gallons of potable water a month have been hauled from a distant well on the Bosque del Apache National Wildlife Refuge.

For many years prior to that time, however, potable water was hauled from various wells, including one that, as far back as 1960, involved a 136-mile round trip. More recently, water was hauled from a well in Mockingbird Gap in the mountains some 22 miles south of WSMR. In 1967 that source began testing nonpotable.

Since 1960, a 750-well has been providing nonpotable water to Stallion Range Center. Phase A of the 4-phase project includes, at a cost of $174,800 under a contract with Burn Construction Co. of Las Cruces, N. Mex., installation of water mains and connecting lines, pumps and the pumping of water for testing and sterilizing the system. Phase B will provide an additional 750-well, pumps, storage tanks, etc.

Phase C involves installation of two desalination plants at a cost of $266,931 by Ionics, Inc., Watertown, Mass. They will be installed in a new building, along with chlorination equipment, a vertical turbine pump, 20,000-gallon storage tank, water lines, control system and power supply.

The desalination plants will treat chemically and filter nonpotable water from both 750-foot wells to produce up to 100,000 gallons of pure water daily.

Phase D, scheduled for completion Dec. 5, provides for a 100,000-gallon elevated storage tank at a cost of $61,300. Work will be done by the Pittsburgh-Des Moines Steel Co. of Santa Clara, Calif.

Work on the $532,111 water system project is directed by the Albuquerque, N. Mex., District Office of the U.S. Army Corps of Engineers, headed by Col J. H. Hottenroth. Locally, the project is supervised by the WSMR Resident Engineer's Office.

Assuming that the four phases of the contract are completed on schedule, the mechanized Gunga Dins serving Stallion Range Center will pass into WSMR's colorful history shortly before 1969 draws to a close.

Armed Forces Day Talk Answers 'M-I Complex' Critics

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internal moral fiber. One of my favorite authors, George Santayana, once wrote: "He who cannot remember of the past is condemned to repeat it." And in front of the door of the U.S. Archives Building in Washington is Shakespeare's line from *The Tempest*, "What's past is prologue."

So, let's take a hard look at the direction in which we want to go. Do we want to abdicate the role of responsibility and withdraw into the false, never-never-land of Fortress America. To follow such a course as that could be fraught only with danger, as I'm sure most knowledgeable people realize. Such a course of action will not do away with the threats that exist today. The more likely probability is that the threats would grow and become, if anything, more diverse. To consider seriously any such course as a pragmatic solution to some of our problems is as foolish as believing aspirin will cure cancer.

Our policy, therefore, is to maintain our deterrent posture adequately and at the same time to seek by peaceful means to improve the relationships between the Free World and the Communist World, and especially between the United States and the Soviet Union. That some progress has been made toward better relations is shown by the existence of important new areas of agreement, such as the Limited Test Ban, the agreement against placing weapons in outer space, and the pending Non-Proliferation Treaty.

Let me conclude my remarks, then, by reminding you that your Armed Forces, collectively and as individuals, have always been servants of the people of this Republic. Indeed we are of the people, and we do what you bid us. We do want you to know that we are grateful that the people of this Nation will take the time to reflect, as you have here today, that the men and women in uniform represent you, and that you deserve and have their loyalty and devotion to duty. It is a pleasant thing these days for the serviceman to hear words of praise and gratitude.

I might add, it was heartening to learn the other day of the actions of the people of the city of Winchester, Va. Every Saturday now, they put U.S. flags out along their city streets, as a way of saying to our men in Vietnam, "We remember you and we honor you."

This is a hopeful sign of a resurgence of visible patriotism, an outward reflection that the normally quite responsible American—the vast majority of us—do recognize our national responsibility as a leader in the Free World.

If we do not, it may be that the Washington correspondent and intimate of 11 Presidents can be prophetic: "That the tenure of the United States as the first power in the world may be one of the briefest in history."

Army Plans for German Measles Inoculation

Plans for the U.S. Army's German measles (rubella) inoculation program announced recently by the Office of the Surgeon General are consistent with the recommendations of the U.S. Public Health Service.

Army dependents will be given the vaccine on a "children first" basis. The Public Health Service program calls for inoculation of all children from the age of one to puberty, since the disease is most prevalent during these ages. The incidence of rubella is slight among adults.

Emphasized in the Army announcement is a policy of administering the vaccine only to children over one year old, because of the possibility that maternal antibodies would prevent the development of immunity.

The Army played an important role in the discovery of this effective immunization. Two Army researchers, Capts Paul D. Parkman, and Malcolm Artenstein, while stationed at Walter Reed Institute of Research in 1961, were the first to isolate the virus.

Since then researchers everywhere have been testing and retesting for a vaccine that will prevent rubella. Now, eight years after the Parkman-Artenstein discovery, the vaccine awaits licensing.

Following this approval, standardization processes for the three military services must be agreed on before the contracts will be let and the vaccine furnished Army medical facilities.

During the 1964 rubella epidemic, an estimated 20,000 defective babies were born, and another 50,000 abortions or stillbirths caused. It is believed that the new vaccine will blunt an expected epidemic in 1971, if rubella continues in the 7-year cycle displayed in the past.

Corps of Engineers Announces District Assignments

Col Charles I. McGinnis will become district engineer for the Army Corps of Engineers at St. Paul, Minn., in July, succeeding Col Richard J. Hesse, who is being assigned to U.S. Army Europe.

Col Robert J. Malley, who was earlier designated to become St. Paul district engineer in July, has been assigned to succeed Col Norman E. Pehrson as district engineer for the Army Engineers at Los Angeles, Calif., when Col Pehrson retires from active service in September.

The St. Paul District, part of the North Central Division of the Army Corps of Engineers, is responsible for Corps water resource activities in a major portion of Minnesota and Wisconsin, and parts of Michigan, North Dakota, South Dakota and Iowa.

Col McGinnis was commissioned in the Army Corps of Engineers in 1949, following graduation from Texas A&M College, and received a master's degree in civil engineering from the same college in 1950. His military education includes graduation from the Command and General Staff College and the Armed Forces Staff College. He is now a student at the Army War College, Carlisle Barracks, Pa.

Col Malley, a native of Nashwauk, Minn., was commissioned in the Army Corps of Engineers in 1946 upon graduation from the U.S. Military Academy, West Point. In 1953, he received a master's degree in civil engineering from the University of Minnesota. His military education includes graduation from the Command and General Staff College, Fort Leavenworth, Kans., and the Army War College, Carlisle Barracks, Pa.

Computer Systems Command Announces Expansion Plans

Two new field organizations of the U.S. Army Computer Systems Command will be established in the Presidio of San Francisco, Calif., and Fort Eustis, Va., effective July 1.

Brig Gen Wilson R. Reed, USACSC commander, said the Support Group at the Presidio will consist of 78 civilians, 10 officers and 16 enlisted men to be transferred from the Sixth U.S. Army Stock Control Center.

The Presidio group will be responsible for continued development, fielding and support of the COSMOS (Centralization of Supply Management Operations System) Project. COSMOS is a centrally designed system utilizing computerized data processing techniques and communications via the AUTOVON and AUTODIN systems.

The Support Group at Fort Eustis will include 120 civilians, 6 officers and 10 enlisted men transferred from the U.S. Continental Army Command Automated Systems Support Agency (CASSA) at Fort Eustis.

This group will continue to be responsible for development, fielding and support of the COCOAS (Continental Army Command Class I Automated System) Project. The system, currently operative in prototype form at Fort Sill, Okla., is designed to provide standard automatic data processing programs and hardware at installation level to meet management reporting requirements for financial, logistical and personnel data.

General Reed said the Computer Systems Command, charged with a broader scope of ADP systems responsibility than has ever been brought together in a single Army agency, will establish four more field support organizations and assume four additional major ADP systems this year.

Exploitation of Metals Solidification Research

By Leonard S. Croan

Leonard S. Croan is a materials engineer assigned to the Science and Technology Division of the Research, Development and Engineering Directorate, Army Materiel Command, Washington, D.C.

Croan is a 1943 graduate from MIT with a BS degree in metallurgy. In 1955 he joined the research staff at Watertown Arsenal Laboratories after employment with various industrial organizations. His work at Watertown Arsenal was concerned mainly with alloy development and processing research on high-strength steel, titanium and uranium alloys.

Since 1959 he has been an Army employe in Washington, first with the Office of the Chief of Ordnance and since 1962 with the AMC.

Research leading to development of technology for solidification of metals has progressed gradually over the past 10 years and has now reached proportions of a major breakthrough.

Improved understanding and control of metal solidification—demonstrated in laboratories through joint efforts of the Army's Frankford Arsenal, Philadelphia, Pa., the Army Materials and Mechanics Research Center (AMMRC), Watertown, Mass., and their contracted research at the Massachusetts Institute of Technology (MIT)—has had its effect upon the basic building block for the entire metals field.

Impact of this program is being felt, or will be felt, not only on the shaped castings used by industry and the government, but also on all wrought metals which are extruded, forged or rolled from cast ingot.

Casting techniques resulting from this research involve rapid solidification and a very high thermal gradient during the process. Molten metal may be poured into a casting cavity having a chilled surface at one side, such as water-cooled copper, and insulation or even heat input by means of exothermic material at the other.

The technique results in a columnar microstructure with fine (close) dendrite arm spacing (DAS). Essentially free of porosity (both macro and micro), the metal has high chemical homogeneity after heat treatment. When a casting or ingot solidifies, the metal normally suffers from microsegregation that impairs mechanical properties such as ductility, toughness and fatigue.

Involving a thermal homogenization treatment after solidification, the new procedure has demonstrated a 100 percent increase in ductility in both aluminum and steel alloys with no loss of strength. Treatment is successful because the as-cast chemical inhomogeneities are closely spaced and diffusion during the process is more effectively accomplished.

Fine dendrite arm spacing has been produced in heavy sections of continuously cast aluminum ingot that has been rapidly cooled. Steel ingots of various cross sections might also be made, using electroslag or other melting techniques, with melting parameters controlled so as to produce required fine dendrite arm spacing.

Examination of forged 175mm gun tubes had disclosed, in some cases, an alarming nonuniformity of structure and properties. Tests made at either end may be unreliable indicators of true properties at another location.

The level of properties, and particularly uniformity through the thickness and along the length of the tubes, is among the critical factors urgently requiring improvement. Although much progress has been made recently, current practice in manufacture of gun tubes is to forge a large round ingot, unavoidably containing porosity, chemical microsegregation and sometimes foreign inclusions.

An interesting investigation would involve evaluating the feasibility of casting a vacuum or slag-melted ingot or slab with fine dendrite arm spacing, by giving it a homogenization heat treatment, and then forging and machining this metal to produce a tube with a high level of properties —one that is uniform from end to end, due to its relative freedom from porosity, segregation and inclusions.

This technique would be expected to increase the useful strength and fatigue life of the tube, as well as to improve markedly its reliability, and decrease inspection problems and cost.

Use of these controlled casting techniques is expected to have a significant influence over the response of steel and aluminum armor to ballistic impact from small-arms projectiles and fragments from grenades and shells of various types.

Effectiveness of steel armor, it is a well-known fact, increases essentially as a straight-line function of its hardness or strength. The harder the steel, the more effective it is. This is true up to a point, reached when the toughness of the steel, or its resistance to cracking, fracture or delamination and spall, is not satisfactory.

The steel fails at this point and is penetrated despite its higher hardness, which accounts for the success of the new dual-hardness steel concept —a very hard steel frontal plate joined to a lower hardness (more ductile and tougher) backup plate. Alone, the frontal plate would be too hard (or really too brittle) to be effective. When joined to the tough backup plate, however, any cracks that might be initiated in the hard frontal steel are arrested, due to the metallurgical bond with the more ductile backup.

Controlled solidification appears to be another way of extending the steel armor hardness to a higher level without brittle failure occurring. Limited tests now indicate that a single plate might be used, obviating the need for the roll-bonding fabrication procedure necessary for dual-hardness steel. Or it may be possible to improve significantly the effectiveness (decrease the weight) of the dual-hardness steel by processing specially cast slabs or ingots.

Another real possibility is in heavy sectioned cast-steel armor used in tanks. Because of the normally poor toughness properties of cast-steel armor, it is procured at lower hardness levels than rolled steel armor of the same thickness and is therefore less effective.

Previous attempts to increase the hardness of cast-steel armor have failed due to the decreased ductility and toughness at the higher hardness levels. The Army Materials and Mechanics Research Center has cast some inch-thick plates in its foundry, using these new casting techniques.

Ballistic testing of these plates, at a high hardness level (500 Brinell), indicated resistance was the same as that to be expected from that hardness if cracking and fracture of the steel did not occur. There should be no insurmountable problem in scaling up this technique to produce 4-inch and 5-inch-thick sections.

Some of the inch-thick cast plate has been rolled down to half-inch and quarter-inch thickness to investigate the feasibility of application for lightweight vehicles and for frontal or

rear plates of dual-hardness steel. The preliminary data are promising.

Forged gun tubes and armor are but two examples of the projected usefulness to Army of this recent development in metal solidification. Any application where weight savings could be achieved by using metals of higher-strength level—but where such applications are currently restricted by the low toughness, poor ductility or short fatigue life of presently available high-strength metals—now becomes a possibility by judicious application of these research results.

EVENTS LEADING TO EXPLOITATION OF METAL SOLIDIFICATION RESEARCH

1964—Initial review and discussions with Canada and the United Kingdom in TTCP.
1964—Agreement reached with the Steel Founders Association of America (SFAA) to review AMC research results on a continuing basis, enabling commercial applications to be effected as quickly as possible.
1965—TTCP Symposium on Solidification in London.
1966—First applied research study initiated by SFAA with their own funds.
1969—U.S./Italy Cooperative Research Agreement on Aluminum.
1969—Proposed agreement under consideration with other nations, involving exploitation of controlled solidification.

CDC Planners Consider ABLES For Quick-Mount on Helicopter

The U.S. Army Combat Developments Command (CDC) is considering the development of ABLES (Airborne Battlefield Light Equipment System) to strip away concealment of the enemy in darkness by lighting an area 300 meters in diameter from an altitude of 1,500 feet.

CDC planners envision a self-contained lighting system, weighing 800 pounds (including lights, power source and fuel supply), that can be mounted on a helicopter in 20 minutes without special tools.

In its role of "providing effective support to the ground commander when and where he needs it," the CDC foresees use of the illumination system in tracked and wheeled vehicles for ground operations and in air search and rescue operations.

MODIFIED BUTTSTOCK of M16A1 containing a built-in compartment for rifle cleaning gear is being tested by the Infantry Materiel Test Board, Fort Benning, Ga. Demonstrating the innovation is S/Sgt Roy Noland.

Mock-up 'Copter Trainer Demonstrates Merit

Performance qualities of a 4-cockpit Army UH–1H (Huey) helicopter instrument flight simulator being developed with the objectives of saving substantially in time and costs of training pilots were demonstrated impressively June 10 to high-level Army, Navy and civilian officials.

The formal mock-up demonstration of the Synthetic Flight Training System (SFTS) being developed for the Army Aviation School, Fort Rucker, Ala., under a $3.5 million contract with the Naval Training Device Center (NTDC), Orlando, Fla., was staged at Silver Spring, Md.

Initial feasibility studies by the Army in 1966 resulted in estimates that a high-quality simulation system could reduce instrument training from 50 to 40 hours, and that net savings in flight training for one year at the Army Aviation School alone would be $1,711,000.

This reduction in flight training time, it was estimated, would release for other uses 47 helicopters valued at more than $10 million being used in the current program. To meet requirements of manning the Army's fleet of about 8,000 helicopters, more than 3,000 of which are in Vietnam, Fort Rucker is graduating over 600 rotary-wing pilots a month.

Another area considered highly significant through SFTS development is aircraft accident reduction—in that better-trained pilots will be more ready to evaluate emergencies as they occur and take proper corrective action to save lives and aircraft.

Major components of the SFTS include four trainee cockpits, an instructor station and a high-speed, large-capacity digital computer. Virtually all manual functions previously required of an instructor can be handled automatically. The instructor thus is able to give better personal guidance to pilot trainees while the system provides direction and an objective analysis of trainee performance.

Link Division of Singer Co. is scheduled to deliver an initial engineering development model of the SFTS in October 1970, incorporating modifications suggested during the recent 3-day review conference and demonstration.

Col O'Brien Reassigned to AMC For Second Tour as Info Officer

Col James H. O'Brien, information officer of the U.S. Army Materiel Command for three years following its establishment in 1962, has returned for another tour in that position.

A veteran of more than 20 years in Army public information activities, since he was graduated from the United States Military Academy in 1945, Col O'Brien was until reassigned the commanding officer of the Command Information Unit, Washington, D.C. He succeeds Col Joseph E. Melanson Jr., reassigned recently as information officer, HQ U.S. Army Europe in Heidelberg, Germany.

The Atomic Energy Officer Program

(Continued from page 25)

mates that there should be approximately 425 officers in certain grades participating. The present strength is less than half that.

The Deputy Chief of Staff for Personnel (DCSPER), HQ Department of the Army is responsible for the AE Program. The Chief of Personnel Operations (COPO) operates the program under the guidance of the DCSPER.

Technical assistance is provided by the Assistant Chief of Staff for Force Development (ACSFOR) in the formulation of policy, determination of standards of selection of members, and designation of key positions for the program.

In addition, the ACSFOR has established an AE Program Consultant Board with senior AE officers as members to advise the ACSFOR and COPO on measures for developing and maintaining an effective program.

This board is now preparing to review comments from program members responding to its request for suggestions on program improvement. Additional comments from any source are welcome at any time.

In sum, no officer should join the AE Officer Program solely to insure breaking into the general officer ranks at the appropriate time. Few officers will be so attracted by the prestige of being a member that they will want to overlook other advantages.

The advantages are really not quantifiable nor do they apply to every officer in the Army. Nonetheless, if you are interested in the military applications of nuclear energy, want interesting and challenging assignments in that field, desire to compete for high-level policy-making positions, and yet do not want to become a narrow *specialist*—then you belong in the Atomic Energy Officer Program. Look over AR 614–131, now.

Defense Secretary Cites 3 Men Among 6 Distinguished Civilian Service Awards

Secretary of Defense Melvin R. Laird honored three Army employes, two engaged in R&D activities, when he presented six annual Department of Defense Distinguished Civilian Service Awards June 10 in the Pentagon.

Dr. Robert S. Wiseman, Dr. Lorenz E. Zimmerman and Gerald B. Russell are the Army winners. In recognition of his 14-year effort in development of Army night-vision devices, currently serving a critical need in Vietnam, Dr. Wiseman received a $5,000 honorarium (under the Army Incentive Awards Program) and the Exceptional Civilian Service Award on Dec. 19, 1968.

As director of the Combat Surveillance, Night Vision and Target Acquisition Laboratories, HQ U.S. Army Electronics Command, Fort Monmouth, N.J., Dr. Wiseman initiated the R&D image intensification program in 1954. The accelerated program he developed in response to Vietnam requirements was credited with producing results of significance similar to World War II development of radar.

DR. ZIMMERMAN's DoD Distinguished Civilian Service Award recognizes his achievements as a world-renowned authority in ophthalmic pathology. He is chief, Ophthalmic Pathology Branch, Armed Forces Institute of Pathology, Washington, D.C., and was a recipient of the Army Decoration for Exceptional Civilian Service in 1967. That year he also was the Pocklington Memorial Lecturer, Royal College of Surgeons of England.

Known as a prolific contributor to professional literature in his field, as a gifted teacher and consultant, and as a research scientist with numerous significant achievements to his credit, Dr. Zimmerman is much in demand as a lecturer in the U.S. and abroad.

Listed among his honors are: Charles H. May Memorial Lecturer, New York Academy of Medicine, 1964, Jonas S. Friedenwald Award Lecturer, Association for Research in Ophthalmology, 1964; Billings Bronze Medal for exhibit, "Lesions Mistaken for Malignant Melanoma of the Ciliary Body and Choroid," American Medical Association, 1965; Walter W. Wright Memorial Lecturer, University of Toronto, Canada, 1966; Mark J. Schoenberg Memorial Lecturer, New York Society for Clinical Ophthalmology, 1966; William Hamlin Wildin Memorial Lecturer, Institute of Medicine of Chicago, 1967; Smith-Reed-Russell Lecturer, George Washington University, 1967.

GERALD RUSSELL received the DoD Distinguished Civilian Service Award for his achievements as director, International Logistics, Office of the Deputy Chief of Staff for Logistics, HQ Department of the Army from Jan. 1, 1966 to May 18, 1968.

Under his guidance, a new management system was conceived and put into effect, his citation states, "which provides the Department of the Army staff a complete overview of the worldwide international logistics problem, and results in more efficient program execution."

After graduating from the National War College in 1958, he earned the Army Meritorious Civilian Service Award in 1960 and 1965, Outstanding Performance Ratings in 1960, 1963, 1964, 1965 and 1966, and the Army Decoration for Exceptional Civilian Service in 1967.

FROM LEFT: Gerald B. Russell, director of International Logistics, Office of the Deputy Chief of Staff for Logistics, HQ DA; Dr. Robert S. Wiseman, Deputy for Laboratories, U.S. Army Electronics Command, Fort Monmouth, N.J.; Secretary of Defense Melvin R. Laird; Dr. Arsham Amirikian, chief engineering adviser to the commander of Naval Facilities Engineering Command; Dr. John Craven, chief scientist, U.S. Navy Deep Submergence Systems Project; Dr. Lorenz E. Zimmerman, chief, Opthalmic Pathology Branch, Armed Forces Institute of Pathology, Walter Reed Army Medical Center, Washington, D.C.

DEFENSE SECRETARY Melvin R. Laird presents Department of Defense Distinguished Civilian Service Award to USAECOM Deputy for Laboratories Dr. Robert S. Wiseman. Secretary of the Army Stanley R. Resor observes.

Newly Designated CEI Serves Many Defense, Army Agencies

The engineering and installation arm of the U.S. Army Strategic Communications Command-CONUS, formerly known as the Communications Facilities Department, has been renamed the Communications Engineering and Installation (CEI) Department.

Directed by H. R. Randall, the CEI Department has an Administrative Services Office, an Engineering Management Office and three divisions—Systems Engineering, Test and Evaluation, and Installation.

Located in Suitland, Md., the CEI Department provides technical support to the Department of Defense, Defense Communications Agency and Department of the Army for all major communications systems in the Continental United States.

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