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SENLOG Slates Move To Alabama; Clifford Asks Sentinel Speedup

Relocation of HQ U.S. Sentinel Logistics Command (SENLOG), a major subordinate command of the U.S. Army Materiel Command, from Washington, D.C. to Huntsville, Ala., is expected to be completed between Aug. 15 and Sept. 1.

Charged with responsibility for providing logistical support to the Sentinel System, the Communist Chinese-oriented ballistic missile defense system approved for deployment last September, SENLOG was established in January 1968. Known originally as the Sentinel Materiel Support Command, it was redesignated Apr. 15.

SENLOG is operating under the command of Brig Gen Mahlon E. Gates and during its planning phase has been located in the Nassif Building, Arlington, Va. The Sentinel System Command is headquartered at Huntsville. Collocation of SENLOG will facilitate its mission of inventory management and maintenance of

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Army Science Conference Acclaimed For Excellence of Major Presentations

Sure-thing bettors might logically lay strong odds that the sixth Army Science Conference, June 18–21, at the U.S. Military Academy, West Point, N.Y., will be long recognized as a high point of success. Army Chief of Staff Harold K. Johnson (since retired) and Dr. William G. McMillan helped to assure that as the banquet and keynote speakers.

Army Chief Scientist Dr. Marvin E. Lasser, presiding chairman, joined with other conference officials in acclaiming the overall quality of the 96 technical papers as "exceptionally outstanding." Assistant Secretary of the Army (R&D) Dr. Russell D. O'Neal presented Army Incentive Awards Program prizes totaling $3,500 for nine prize-winning papers.

Accolades were general also for two panel discussions featuring the views of experts recently in the combat zone of Vietnam—one on medical

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Westmoreland Takes Role As 25th Army Chief of Staff

Maj Gen K. E. Wickham, Adjutant General U.S. Army, gives oath to General W. C. Westmoreland as the 25th Army Chief of Staff, July 3, at the Pentagon.

AMC Realigns Headquarters; Reduces Directorates to 11

Realignment of HQ U.S. Army Materiel Command organizational structure was effected July 1, in line with recent expansion of responsibilities and further streamlining of operations.

General Frank S. Besson, who has commanded the AMC ever since it was activated Aug. 1, 1962, said the changes would be accomplished within existing manpower ceilings and would not require separation of employes.

Discontinuance of three directorates and establishment of two new directorates reduced the total from 12 to 11. The number of separate offices remained at 12, but the Technical Data Office was redesignated

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'Death March' Comrades Meet at Science Conference

Memories of a friendship born of the Battle of Bataan and the "Death March" ater its fall in World War II came back to Army Chief of Staff General Harold K. Johnson, Col M. H. Rosen and Dr. K. C. Emerson at the Army Science Conference, June 20, at the United States Military Academy.

Poignancy was provided also by a fresh aspect. General Johnson was there to make his farewell major address prior to his retirement from the Army 11 days later. Few had more cause to be regretful than Dr. Emerson and Col Rosen, whose friendship has endured through the years.

Dr. Emerson is now special assistant to Dr. Russell O'Neal, Assistant Secretary of the Army (R&D). Col Rosen is director, Environments and Threats, Institute of Land Combat, HQ Army Combat Developments Command, Fort Belvoir, Va.

Prior to the outbreak of World War II, all were stationed together at Fort McKinley in the Philippines. General Johnson was executive officer, 57th Infantry Regiment. Col Rosen was a Field Artillery battery com-

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General Harold K. Johnson, Chief of Staff (Ret.), flanked by Col M. H. Rosen and Dr. K. C. Emerson at Army Science Conference reunion.

Featured in This Issue . . .

Army R&D Newsmagazine

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General Johnson Gives Farewell Address at ASC

The editor of the Army Research and Development Newsmagazine was among those privileged to hear Army Chief of Staff General Harold K. Johnson's farewell major address prior to his retirement from the Army. In voicing his views as the first Army Chief of Staff ever to address the biennial Army Science Conference at the U.S. Military Academy, as guest speaker at the banquet June 20, General Johnson impressed more than 500 listeners as a man of passionate sincerity of purpose and dedication, as well as a man of rare compassion and humility. His address follows:

A year ago I took it upon myself to go down to The Judge Advocate General's School at Charlottesville, Va., to talk to a worldwide conference of our Command Judge Advocates. Speaking to them about some of the things I thought they should be doing, I startled them a little by asking them what they were doing about our people who were absent without leave.

The very obvious answer was that they were participating in the trials. Some of them were defending, others prosecuting the defendants.

So I asked how many had been in a company orderly room in the last year talking to soldiers to find out why they were absent without leave. Very few could say they had because the Judge Advocates did not apparently look upon their job as one of prevention: They took action after the event had occurred. Too late.

Consequently, I decided to take the same approach with the research community. But as the day approached, I reminded myself that I would be clearly out of my bailiwick if I were to try to talk to you about things that you understand and I don't. I am frank to acknowledge a high level of ignorance on my part—probably the highest level here in the room.

So I am going to talk about two—perhaps two and a half—things. I want to give you a very quick summary of things as I see them in Vietnam today. I know you have had some detailed explanations of some of the programs, although the ladies, I guess, have not had—except second-hand.

Then I will talk to you a little bit about what the Army is doing on the problems in our cities, because in these last days of my active service one of the most distressing things is the poison in our public attitude. I wonder sometimes if we really have an antidote for it. It is difficult to think of this country proceeding on the path that we have followed for the past months. *One wonders where we will wind up. Why?*

The first source of poison in public attitudes arises from Vietnam. We have had a picture that presents somehow almost everything that is bad. I suppose there is a minor satisfaction in the thought that they haven't presented everything that is bad—just almost.

But we have seen very little of what is good, even though many favorable events are occurring in Vietnam. I am not going to dwell tonight on just the things that are good, but rather take a broad look at the prospects. To do this I go back to the first trip that I made out there in the spring of 1964. At that time one could travel all over the land. I landed in a helicopter a little west of Khe Sanh, got in a jeep, and went out to the Laotian border. Admittedly, we went pretty fast, but you could still drive it in a jeep in those days. The same thing was true throughout the rest of the country.

I went back in December of '64, March of '65, December of '65, April of '66, August of '66, December of '66, July of '67, and December of '67. I have spent the last three Christmases out there. My most recent trip was in April this year.

It is well for us to remember that in 1966, at the time the struggle movement occurred out there, that there were significant defections, politically and militarily. As a consequence of that struggle movement, two significant things occurred: First the central government, for the first time, established dominance over a major subordinate element of the country.

Elections were held; following that event the constitution was written; it was promulgated; national elections were held; and the president and the vice president were installed.

Now this is basic to the events during Tet, which I will refer to in a moment.

In August of 1967, traveling all over the country, admittedly with rather elaborate security precautions, getting on rivers and canals that hadn't been opened up for a couple of years, and that had been recently opened, and on roads over which there had been no regular traffic, and moving over them with a relative ease, I came away persuaded that at

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24 Reservists at ASC Indicate High Caliber of USAR R&D Units

Searchers for scientific, engineering and administrative talent of a high order of excellence can find it in abundance within nearly 1,200 members of U.S. Army Reserve Research and Development Units, 24 of whom were selected as participants in the 1968 Army Science Conference.

Often termed the "Standby In-Depth Strength" for Army research and development activities in any national emergency, the USAR R&D Units are comprised substantially of men who have highly responsible positions in academic, industrial and private research organizations.

Consistently over a period of about 20 years, the USAR R&D Units have received strong high-level support, from the Secretary of the Army down through the various Army R&D administrative echelons. The program is sponsored by the Chief of R&D, Department of the Army, with Lt Col Kenneth G. Herring as assistant for Reserve Affairs.

Admittedly, the program has suffered occasionally from periods of lagging interest as many members became more preoccupied with their increased professional responsibilities as they grew older. However, an effort to stimulate an influx of fresh talent from ROTC and other university graduates in science and engineering is producing results.

When the policy of selecting about 25 USAR R&D Unit members to attend the Army Science Conference was initiated in 1966, the *Army R&D Newsmagazine* published a feature article detailing some of their impressive qualifications and achievements.

Some readers may have suspected that the first selectees were well above the average, but the 1968 choices are no less outstanding, as the following brief sketches indicate:

COL HARRY L. WILLARD, commander of the 1114th R&D Unit, New York City, has been a leader in the USAR R&D Program since 1948, which he helped to establish, and served as executive officer of the 2201st Unit in Pittsburgh, Pa. Until he moved to New York in 1957, he held appointment as a senior and administrative Fellow of Mellon Institute (now Carnegie-Mellon University).

Graduated from the University of Illinois with a BS degree in chemical engineering, he did graduate work at the University of Pittsburgh, Fordham and George Washington Universities. His 30 years of industrial experience has ranged from laboratory and administrative positions to senior management, for the past 10 years with Union Carbide Corp.

U.S. ARMY RESERVE R&D UNIT MEMBERS, selected from nearly 1,200 enrolled in the program to provide a highly competent "Standby In-Depth Strength" of professional scientists, engineers and administrators for any national emergency, attended the sixth Army Science Conference at the United States Military Academy, June 18–21. Posed (left to right) are: *First row,* Lt Col John V. Perry Jr., Lt Col Chester B. Shapero, Maj Phillip J. De Ivernois, Lt Col Edward H. Lynch, Capt Salvador L. Camacho, Col Louis H. Kristof and Lt Col Kenneth G. Herring. *Second row,* Capt Ronald Stricklett, Lt Col Martin P. Hines, Lt Col George R. Jungerman, 1st Lt Bythel K. Cooper Jr., Lt Col Lester L. Reagan and Col George C. Howard. *Third row,* 1st Lt Richard D. McCormick, Maj Robert R. Perry, Capt Eichen (not an R&D Reservist), Maj Thomas J. Parisot and Col Sidney L. Loveless. *Fourth row,* 1st Lt Reverdy E. Wright, Col Harry L. Willard, Capt Gerald M. Leigh, Col Jaroslav V. Klima and Col Paul H. Weswig. Lt Col John Neiler and Capt Edmond D. Neuberger missed picture.

Licensed as a professional engineer, associated with important advances in coal processing, petroleum, chemical and agricultural products, he is a member of the American Chemical Society, American Institute of Chemical Engineers and the New York Academy of Sciences. He serves on the council of judges for New York City's School Science Fair.

MAJ E. W. HARTSOOK is with the 1617th R&D Unit at State College, Pa., and has been active in USAR R&D Unit activities since shortly after discharge from active duty in World War II. He participated in D-Day operations on Omaha Beach and the Normandy Campaign, Northern France and the Ardennes.

Maj Hartsook has a BS degree in chemistry from West Virginia University and MS and PhD degrees from the University of Illinois, where he majored in nutrition and minored in biochemistry and physiology. Since 1965 he has been professor of animal nutrition at Pennsylvania State University, where he has been on the faculty since 1954.

Known for more than 30 publications in professional journals, the *Proceedings of the Society of Experimental Biology and Medicine, American Journal of Physiology,* and *Archieves of Biochemistry and Biophysics,* he has centered his research on nutritional biochemistry.

LT COL JOHN V. PERRY is an associate professor of mechanical engineering and member of the graduate faculty at Texas A&M University. Affiliated with the 4004th R&D Unit in Bryan, Tex., he served on the Army Panel of Judges for the 19th International Science Fair in Detroit, Mich., in 1968.

Col Perry has a BS degree from Virginia Polytechnic Institute, MS and PhD degrees from Texas A&M, and is a graduate of the U.S. Army Command and General Staff College. Known as a teacher, researcher, director of research in the fields of machine design, vibrations and stress analysis, and as a consultant, he has worked as an engineer for Boeing Aircraft Co., General Dynamics, Douglas Aircraft Co., and Houston Lighting and Power Co.

Registered as a professional engineer in Texas, he is a member of the American Society of Mechanical Engineers, American Society of Electrical Engineers, Tau Beta Pi and Pi Tau Sigma.

LT COL J. H. NEILER has BS, MS and PhD degrees in nuclear

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SENLOG Slates Move to Alabama; Clifford Asks Sentinel Speedup

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SENLOG Commander Brig Gen Mahlon E. Gates (right) visits Maj Gen Charles W. Eifler, CG of the U.S. Army Missile Command, Redstone Arsenal, Ala., where SENLOG is relocating.

engineering functions to support the Sentinel System, an official explained.

Completion of the move to Huntsville by Sept. 1, it was stated, is contingent upon availability of adequate permanent facilities for the expanding staff. Until recently, a small group of officers was concerned with planning-phase activities.

Actual operations are now beginning and daily additions are being made to the staff of highly skilled civilian specialists. Because of the specialized requirements, recruitment is expected to continue for an extended period. Authorized strength of 109 personnel, military and civilian, is expected to be augmented substantially in Fiscal Year 1969.

Col James W. Gilman was assigned recently as deputy to Brig Gen Gates. Other key officers are Col James F. Prewett, director of Maintenance; Col Cecil W. Hospelhorn, director of Materiel Requirements; Lt Col John P. Downey (listed for early promotion to colonel), director of Management Systems and Data Automation; Lt Col Robert E. Bundy (listed for promotion to colonel), comptroller; Lt Col Thomas L. Stovall, director of Distribution and Transportation; and Charles L. Blue, administrative officer.

Clifford States Sentinel Views

Secretary of Defense Clark M. Clifford advocated a speedup in developing the Sentinel System antiballistic missile defense, oriented against the Chinese Communist threat, at a recent press conference.

The time has come to get the Sentinel System off the drawing boards and into actual development, he said. Among reasons he advanced are:

"It's also my view that if the Soviets are developing the ABM system, and we know they are developing it, and we know they are deploying it, I believe we are in a better posture to reach agreement with them on an ultimate step toward disarming if we also go about deployment of a system.

"I think our negotiations over the past decades would indicate that this is the better position for us to be in if we hope to achieve some type of resolution of this problem with the Soviets."

Secretary Clifford said the Sentinel System "constitutes and will constitute a defense against the Chinese system. I attach particular significance to this, because in the years that lie ahead, I believe we should have a defense against the Chinese system other than just a massive retaliatory attack.

"I believe that we are in a stronger posture if we have this kind of defense so that we can't be blackmailed or forced into a certain position for fear of the type of attack that China could launch."

Explaining also that the Sentinel System will be useful in the protection of the U.S. ballistic missile offensive capability, as well as for the defense of American cities, Secretary Clifford stated:

"Although, of course, as you know, it will not prevent a massive attack from a nation that launches one, it can prove to be of importance in protecting our retaliation.

"It is possible—we would hope not probable—that some time there could be an accidental launching. Too, it seems to me that not sufficient attention has been given to the fact that another nation could possibly over the next few years acquire some nuclear capability, even though minor in nature. I believe this type of defense system [Sentinel System] would prove to be very valuable to us under those circumstances."

Estimates in 1967 of the possibility of the Chinese Communists developing an operational ICBM capability by the early 1970s he said, have been tempered by the fact that they have not yet test-launched an ICBM and are not expected to launch one "until late this year at the earliest."

'Death March' Comrades Meet at Science Conference

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mander and Battalion S–3 in direct support of the regiment. Both of these organizations were part of the Philippine Division (Philippine Scouts) and Dr. Emerson (Col. USA, Ret.) was in HQ II Philippine Corps.

When Bataan fell to the Japanese, General Johnson, Col Rosen and Dr. Emerson all participated in the Death March and were interned in Camp O'Donnel and Camp Cabanatuan. Dr. Emerson was shipped to Japan, via Formosa, and after confinement in Japanese prison camps was liberated in 1945.

General Johnson and Col Rosen were passengers on the *Oryoku Maru* being transported to Japan when it was hit by U.S. Navy dive bombers. Both swam to shore and were recaptured. They were on the *Brazil Maru* when it met a similar fate Jan. 14, 1945, in Formosa. Finally, as passengers on the *Enoura Maru*, they arrived at Moji, Kyushu, Japan, Jan. 30, 1945, with some 300 of the survivors of the 1,600 that started the trip.

Transported to Inchon (then called Jinsen), Korea, in April 1945, General Johnson and Col Rosen were liberated from there in September 1945. Their paths crossed again when Col Rosen served from 1959 to 1961 as a member of the faculty at the U.S. Army Command and General Staff College when General Johnson was the commandant.

General Johnson visited Col Rosen in April 1966 when the colonel was commanding the area in which their former prison camp was located. They visited the old compound and reminisced about the experience.

MICOM Activates New Company To Provide Calibration Services

Activation of the 95th Composite Service Company (Calibration), Metrology and Calibration Center, was announced this past month by the U.S. Army Missile Command.

Most of the approximately 100 men to be assigned to the 95th will be calibration specialists. Calibration services will be provided for all equipment the Army uses in the United States and overseas.

Worldwide calibration support responsibility was transferred from Frankford Arsenal, Philadelphia, Pa., to the Missile Command in 1967. Lt Col Peter L. Horne is director of the Army Metrology and Calibration Center.

AMC Realigns Headquarters; Reduces Directorates

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the Logistics Data Management Office because of assignment of additional functions.

Eliminated were the Directorate of Major Items, the Directorate of Materiel Requirements and the Directorate of Distribution and Transportation. The Directorate of Development was redesignated the Directorate of Development and Engineering.

General Besson said further studies during the ensuing year will aim to streamline the remaining headquarters elements which perform administrative and support functions. The realignment was in consonance with recommendations for organizational changes made by the Department of the Army logistical study group headed by Lt Gen Frederick J. Brown (USA, Ret.).

The Brown Board called for new standard organizational structure for the Army Materiel Command's subordinate major commands. The realignment also coincided with assumption by the AMC of responsibility and accountability for selected high-dollar secondary items in overseas areas, and with the assumption of maintenance program responsibility worldwide for Army equipment.

Because the HQ AMC staff elements are rather widely separated in Building T–7 near the Washington National Airport, the Nassif Building at Bailey's Crossroads, Va., and the Naval Gun Factory, in southeast Washington, the realignment required some relocation of personnel. Every effort possible was made to place employes in positions of comparable responsibility and grade.

Work on Sentinel Shock Tube Test Facility Nears End

Effects of nuclear blast on the operation of air-breathing engines of the Sentinel System will be studied in a shock tube facility nearing completion at the U.S. Army Ballistic Research Laboratories (BRL), Aberdeen Proving Ground, Md.

The Sentinel System, oriented for defense against a threat of a missile attack by Communist China, receives its precise power requirements from generators capable of producing large amounts of current within strict voltage and frequency limits. The system must be able to operate under the most adverse conditions, including the environment of a nuclear explosion.

BRL scientists will study the effects of simulated nuclear blasts on both diesel and gas-turbine engines. Two shock tubes, which are the world's longest of their type, will be used in experiments.

One tube, 5½ feet in diameter and 610 feet in length, will connect to the intake of the test engine. The engine will exhaust into a tube 8 feet in diameter and 500 feet long.

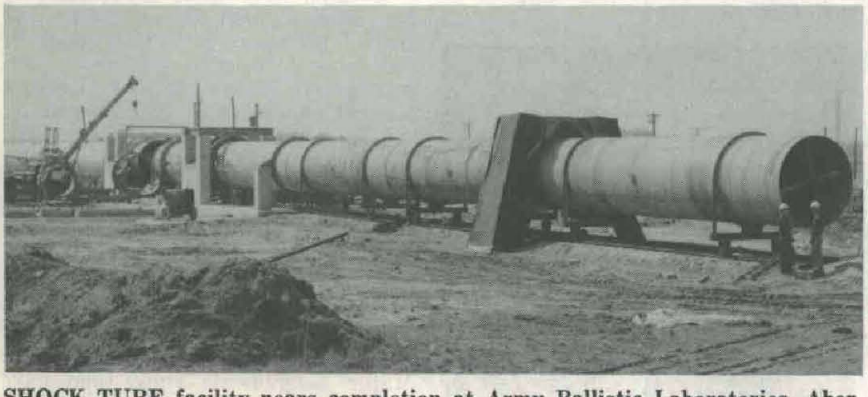
While in operation, air is compressed in the "driver" sections of the tubes. To simulate the heat of a nuclear blast, the air is heated to 400° F. While one of the engines being tested is running, an explosive ruptures thin metal diaphragms which hold back the superheated air; thus a blast is simulated.

The blast causes a recoil or "kick" of the tubes greater than that of a massive gun. The tubes are anchored to a reinforced concrete pier set deep into the ground.

To compensate for the expansion of the metal tubes, the facility is supported by wheels which move on a railroad track.

During the entire test cycle, test data will be recorded on tape and fed into a computer for analysis.

The Shock Tube Facility is being constructed by Arnold M. Diamond, Inc., under the auspices of the U.S. Army Corps of Engineers. The facility will undergo tests later this year.



SHOCK TUBE facility nears completion at Army Ballistic Laboratories, Aberdeen (Md.) Proving Ground. It will be used to study simulated nuclear-blast effects on air-breathing engines of Sentinel System antiballistic missile defense.

ATAC Releases New Signals For Military Wheeled Vehicles

Release of a new taillight and front signal light for military wheeled vehicles was announced in June by the Army Tank-Automotive Command (USATAC), Warren, Mich.

Called the composite taillight, the new unit adds federal safety standard requirements to military lighting specifications. Made entirely of injection-molded polycarbonate plastic, the unit represents the first widespread application of this plastic for an important military item.

Mechanical properties of the polycarbonate plastic are considered excellent, based on intensive tests, including high impact strength and deformation temperature. Significant optical properties of polycarbonate are its high (80 to 90 percent) transmission in the visible spectrum and its low (2 to 3 percent) haze value. It is intrinsically corrosion- and fungus-resistant.

The new taillight will be incorporated in the M656 vehicle scheduled for production in late 1968 and subsequently will be incorporated on other vehicles.

Dr. Eccleshall to Supervise NDL Accelerator Operations

Dr. Donald Eccleshall, a nuclear scientist, has joined the staff of the Nuclear Defense Laboratory at Edgewood Arsenal as director of the Cockcroft-Walton and Tandem Van de Graaff accelerators.

Until he changed positions, he was scientist-in-charge of the Tandem Accelerator facility at Aldermasten Research Center in England. He will supervise the activities of scientists utilizing the accelerators.

Dr. Eccleshall received his BS degree from the University of Liverpool and remained at the University to complete work on his PhD in the field of meson physics in 1955, when he joined the Aldermasten staff.

He received a leave-of-absence from 1966–67 to accept an offer from the University of Pennsylvania to serve as a research associate in the university's Tandem Accelerator facility. His main area of research has been in high-energy physics and the field of fission and electromagnetic properties of nuclei.

Maj Gen Izenour Takes TECOM Command

HQ U.S. Army Test and Evaluation Command (TECOM) ceremonies July 15 at Aberdeen Proving Ground, Md., made Maj Gen Frank M. Izenour successor to Maj Gen Leland G. Cagwin, who replaced him in Korea as CG of the 2d Infantry Division.

General Izenour now commands the Army's primary materiel testing organization, one of eight subordinate elements of the Army Materiel Command. Reporting to him are some 20,000 military and civilian engineers, scientists and technicians who man TECOM's 15 proving grounds, service test centers and special test activities. Their test stations are located from coast-to-coast, in Alaska and Panama and include some of the nation's most extensive military reservations. Among them are Aberdeen, Jefferson and Yuma (Ariz.) Proving Grounds, White Sands (N.M.) Missile Range and the Deseret Test Center, Utah.

Born in New Brighton, Pa., in 1913, General Izenour was graduated from the U.S. Military Academy with the Class of 1938. Commissioned in the Infantry, he served at Fort Devens, Mass., and in Panama before joining the 3d Infantry Division at Fort Lewis, Wash., in 1941. He accompanied the division overseas in November 1942 and participated with it in eight campaigns in North Africa, Sicily and Italy. He was commanding the division's 7th Infantry Regiment in France when wounded in 1944 and evacuated to the U.S.

Maj Gen Frank M. Izenour

From April 1964 until April 1967, when he was sent to Korea, he was assigned to HQ Department of the Army in the Office of the Deputy Chief of Staff for Personnel. Other major assignments in his 30-year Army career have included Trieste, Korea and Germany. In Washington, he served in the Office of the Assistant Chief of Staff, Personnel, from 1953 to 1955.

General Izenour is a 1947 graduate of the Command and General Staff College and a former instructor. He graduated from the Armed Forces Staff College in 1950 and completed the Army War College course in 1953. At Fort Benning, Ga., from 1957 to 1960, he directed the Infantry School Tactics Department and, later, served as deputy assistant commandant and director of instruction.

His decorations include the Silver Star, Legion of Merit, Bronze Star Medal (Valor), Army Commendation Medal (Oak Leaf Cluster) and the Purple Heart (Oak Leaf Cluster).

DoD Approves JSHS Charter, Advisers

Renewal of the U.S. Army Junior Science and Humanities Symposium (JSHS) charter, appointment of Dr. Bryce Crawford to the Advisory Council, and reappointment of other council members were approved recently by the Department of Defense.

Created in 1961, the JSHS Advisory Council provides continuing evaluation of the program. Members serve without reimbursement for time and travel in advising the Assistant Secretary of the Army (R&D) and the Chief of Research and Development regarding JSHS objectives.

Dr. Crawford is dean of the Graduate School, University of Minnesota. He received degrees in chemistry from Stanford University (AB in 1934, AM in 1935 and PhD in 1937), then studied under a National Research Foundation Fellowship at Harvard (1937–39).

After a year as a chemistry instructor at Yale University, he was assistant and associate professor in physical chemistry at the University of Minnesota from 1940 to 1946, when he was promoted to full professor. In 1950–51, he studied at the California Institute of Technology and at Oxford University in England under Guggenheim Foundation and Fulbright Fellowships.

Two-year appointments to the Army JSHS Advisory Council are approved by the assistant Secretary of the Army (R&D) and at Department of Defense level. Lt Gen A. W. Betts, Chief of R&D, invited Dr. Crawford to serve as a member.

The 12-member council consists of two military representatives, an executive secretary, and eight non-government representatives.

Brig Gen Charles D. Y. Ostrom Jr., Director of Army Research, Office, Chief of Research and Development, and Col Donovan F. Burton, commander of the U.S. Army Research Office-Durham (ARO-D), are the military members. Mrs. Grace Boddie, ARO-D, is executive secretary.

Dr. Ernst Weber, president of the Polytechnic Institute of Brooklyn, N.Y., is chairman of the council. Other members are Dr. S. C. Donnelly, director of Nike-X Project Operations, Western Electric Co.; Dr. Ralph Gibson, director, Applied Physics Laboratory, Johns Hopkins University; and

Dr. Sherwood Githens Jr., professor of science education, Duke University; George F. Leist (Col, USA, Ret.), Research and Engineering Technical Center, Owens-Illinois Co.; Dr. Harry L. Levy, professor of humanities, Fordham University; Dr. George R. Seidel, professor of chemistry, Delaware State College; and Dr. M. H. Trytten, director, Office of Scientific Personnel, National Academy of Sciences.

Dr. Bryce L. Crawford Jr.

Deseret Merges With Dugway PG; Col Watts Takes Deputy CO Post

Merging of Dugway (Utah) Proving Ground with the Deseret Test Center coincided with retirement of Col John F. Mitchell as deputy commander of Yuma (Ariz.) Proving Ground and the July 31 takeover by Col James H. Watts as his successor. Col Watts was CO of Dugway P.G.

Col Armistead R. Harper, commander of Yuma Proving Ground, announced the assignment of Col Watts, a native Missourian with a 1942 BA degree in chemistry from the University of Nebraska. Col Watts served in the United States and Europe during World War II. Major assignments since then have taken him to England, Brazil and HQ U.S. Army Materiel Command, Washington, D.C.

ECOM Labs Develop New Generation of Night-Vision Devices

"Taking the night from Charlie," a continuingly important U.S. Army stratagem in the Vietnam conflict, is being accomplished with image intensification night-vision devices disclosed by HQ Army Electronics Command (ECOM).

Maj Gen William B. Latta, commander of the Fort Monmouth (N.J.) installation, stated at a major press conference that he considers the heretofore classified starlight scopes "the greatest untold story of the Vietnam war."

Many of these advanced electronic night-detection scopes have been in South Vietnam since early 1966. Unclassified details of the devices, however, were not released to the public until the press conference.

The new generation of night-vision devices, ranging from hand-held starlight scopes to larger night sights for crew-served weapons, was developed mainly by the ECOM Night Vision Laboratory, Fort Belvoir, Va.

The systems amplify the dim glow of the moon, stars, or even faint skyglow, and intensify it within the target area of the scope. Soldiers using the amplifier do not generate a light source, such as the earlier infrared versions for night vision, and thus do not give away their position to an enemy using a near-infrared viewer.

LOOKING AT THIS SCENE AT NIGHT, unaided, you could see as much with your eyes shut as open but, when viewed through the starlight scope, a soldier and a tank stand out clearly from the wooded background.

ECOM reports that thousands of night-vision devices have been fielded, mostly to Southeast Asia, and that the electronic viewers have enabled troops to spot enemy movements in the dark on countless occasions.

Three night-vision devices, all first-generation, currently in use are the Small Starlight Scope, AN/PVS–2; Crew-served Weapon Sight, AN/TVS–2; and the Night Observation Device, Medium Range, AN/TVS–4.

The Image Intensifier Tube, also first-generation, is the prime component of the three devices and has been produced in 25mm and 40mm.

Proficiency of the U.S. rifleman at night in South Vietnam has been enhanced by the night-vision devices to the point where he needs to carry only a fraction of the ammunition burden he had to tote before, it was announced at the press conference.

Success of the devices in Southeast Asia has stimulated efforts for further improvements. Work is progressing rapidly at ECOM's Night Vision Laboratory to expand the capabilities of the Army's research facility and to advance the state-of-the-art of seeing the enemy in the dark.

Dr. Robert Wiseman, director of ECOM's Combat Surveillance Night Vision and Target Acquisition Laboratories, said development of the technology of night vision is one of the fastest growing of all the Army's tactical applications of electronics.

Fort Belvoir Expands Night-Vision Facilities

Construction of two new facilities to expand research in night vision at Fort Belvoir, Va., where the Army Night Vision Laboratory is located, was initiated at ceremonies in mid-July by officials of the U.S. Army Electronics Command (ECOM).

The 2-story facilities, a night vision simulator building and a far-infrared laboratory are expected to be completed in 14 months as part of ECOM's Combat Surveillance, Night Vision and Target Acquisition Laboratories complex.

The main feature of the 37,000-square-foot simulator building will be the world's largest 3-dimensional terrain model (6,000 square feet). It will incorporate faithful reproduction of both the spectral reflection—and heat—emission characteristics of terrain features and military targets.

The terrain model will permit the evaluation of even airborne imaging sensors at simulated altitudes up to 20,000 feet and under controllable brightness conditions, from twilight down to deep starlight, incorporating the effects of atmospheric haze and fog where warranted.

The simulator building, with office space for 80 ECOM management and research personnel, also will feature high resolution projection and display equipment and an IBM 360–44 computer control and analysis facility.

The Far Infrared Laboratory building will provide offices and research facility areas for 60 members of ECOM's Night Vision Laboratory staff in its 19,000 sq. ft. of floor space.

Congressman William L. Scott (R–Va.) was guest of honor at ground-breaking ceremonies presided over by Maj Gen William B. Latta, ECOM commander, and Maj Gen Arthur W. Oberbeck, commanding the U.S. Army Engineering Center and Fort Belvoir.

Taking part in the ceremonies were Dr. Robert S. Wiseman, director of ECOM's Combat Surveillance, Night Vision and Target Acquisition Laboratories complex; Benjamin Goldberg, deputy director of ECOM's Night Vision Laboratory; John Johnson, who will direct the simulator building's operations; and Dr. Werner K. Weihe, director of the Night Vision Lab's technical area.

NIGHT OBSERVATION SIGHT is the largest of any of the family of sights developed by the ECOM Night Vision Laboratory at Fort Belvoir, Va. Mounted independent of a weapon, the device can detect activity in faint skyglow, moonlight or starlight at distances extending to 1,200 meters.

Pamphlet 70-1 Reports FY-67 Behavioral, Social Science Research

Specific applications of behavioral and social science research findings during FY 1967 by three agencies of the Chief of Research and Development (CRD), Department of the Army, are outlined for the first time in a single publication.

Pamphlet 70–1 published by the HQ U.S. Continental Army Command (USCONARC), is titled "Utilization of Behavioral and Social Science Research Products," and cites reports for the 1958–1967 period. About 135 items are described.

The CRD allocates a portion of the total Department of the Army R&D effort for the investigation of variables which influence selection, classification, and assignment of personnel, and actual performance of the individual during training and on the job. The human element is considered within the total environment, taking into account training, job requirements, and the equipment used by personnel in performing their tasks. This research produces programs, procedures, and techniques for improving human performance and influencing motivation and leadership in the military environment.

The three research organizations and their areas of effort are: The Behavioral Science Research Laboratory (BESRL), personnel measurement and utilization; the Human Resources Research Office (HumRRO) of George Washington University, a contract agency conducting research in training, motivation and leadership; and the Center for research in Social Systems (CRESS), American University, also a CRD contract agency conducting research in the social sciences.

Findings by these organizations are used in development or revision of Army education and training programs.

The Army wishes to promote wide distribution of behavioral and social science research reports and to further the application of new knowledge by providing assistance to users.

Readers of Pamphlet 70–1 are encouraged to report other specific examples of utilization to HQ USCONARC, ATTN: ATIT-RD-RD, Fort Monroe, Va. 23351.

USCONARC agencies desiring assistance in applying behavioral and social science research findings should address requests to the Fort Monroe HQ. Others should send requests to Chief of Research and Development, Department of the Army, Washington, D.C. 20310.

Research utilization reported in the USCONARC pamphlet is arranged into eight categories:

- Selection and Classification.
- Individual Training and Performance.
- Training for Leadership, Command and Control.
- Language and Area Training.
- Training Technology.
- Training Management.
- Unit Training and Performance.
- Special Operations Training.

HumRRO is the largest and has the most widespread activities of the three research agencies reported in Pamphlet 70–1 and thus can show the greatest utilization of research products.

HQ USCONARC assigns research units to support HumRRO divisions at Fort Knox, Ky.; Fort Ord, Calif.; Fort Benning, Ga.; Fort Bliss, Tex., and Fort Rucker, Ala. Following are some representative cases of research utilization by each of the agencies:

4 MICOM Scientists Earn S&E Achievement Awards

U.S. Army Missile Command Scientific and Engineering Achievement Awards for 1968 were presented recently to four scientists of the Research and Development Directorate.

Maj Gen Charles W. Eifler, CG of MICOM, presented the awards to Robert L. Sitton, Dorwin L. Kilbourn and Teddy J. Peacher, all of the Advanced Sensors Laboratory, and Dr. Thomas Roberts, Physical Sciences Laboratory.

Sitton, Kilbourn and Peacher were selected as a team for development of a vastly improved optical beacon for use in command-guided missile systems at no increase in cost over contemporary systems. Dr. Roberts was honored for his research in high-energy electron physics and high-power laser technology.

A graduate of Auburn University, Kilbourn joined the Missile Command in 1961 after having been employed as a research physicist by Rohm and Haas. Sitton began his Missile Command employment in 1960 after studying at Auburn and worked on infrared and optical techniques for detection, acquisition, discrimination and guidance.

Peacher joined MICOM following graduation from the University of Tennessee and has been assigned continuously to the Electro-Optical Branch of the Advanced Laboratory.

Dr. Roberts, a research physicist, has played a very active role in the laser research that has conducted by MICOM in recent years. Since joining the Redstone research team in 1958, he has authorized a number of reports and papers in his field and has appeared before several scientific and professional organizations.

He received his bachelor and master of science degrees from the University of Georgia and was granted his doctorate by North Carolina State University last year.

Dr. Thomas G. Roberts

MICOM SCIENTISTS Teddy Peacher, Robert Sitton and Dorwin Kilbourn display optical beacon that earned them Scientific and Engineering Awards.

BESRL. A study of the procedure of selecting candidates for warrant officer flight training (WOFT) by interviews did not indicate success in training. A flight-aptitude screening test (FAST) was found to be a more definitive measure of success than a GT score. Consequently, the reception station program for accepting WOFT applicants reduced the GT score from 115 to 110, allowing a greater input to the flight-aptitude screening system. Approximately four office man-hours are saved for each applicant through elimination of the interview board.

Similarly, a BESRL study showed that the administration of board interviews of candidates for the Officers Candidate School program and U.S. Military Academy cadets did not follow a standard pattern. This variation reduced the validity of scores. Doubtful validity of board interviews led to the establishment of a single-officer interview system. The interviewing officer at reception stations either accepted or rejected applicants, saving four manhours per applicant.

HumRRO. In connection with the preparation of FM 23-17 "Redeye Guided Missile System," the U.S. Army Air Defense School had a requirement to establish visual search and scan procedures and to establish target-detection ranges. Two HumRRO reports provided a basis for establishing a visual target detection range and the initiation of steps in Redeye firing procedures.

Under HumRRO Work Unit LEAD, two programed booklets to train leaders of small-infantry units were prepared and used by ROTC instructor groups at Canisius College, Hampton Institute, Kansas State College of Pittsburgh, Louisiana State University and the Agricultural and Mechanical College, New York University, Ohio State University, Ouachita Baptist University, University of Illinois, University of Mississippi and the University of Missouri. Usage reported varied from references to principal texts.

The booklets are said to be helpful in assisting ROTC candidates to develop a better awareness of the knowledge and skills required by the successful infantry rifle platoon leader. One ROTC group reported the texts particularly useful in illustrating, in a simple manner, some of the basic principles of small-unit tactics. The texts also are considered models for programed texts that would be of great assistance to ROTC cadet studies of all types of tactics and operations.

CRESS. The pamphlet devotes Section IX to a listing of some 30 CRESS publications and their reported usefulness to various Army schools. Principal users and the number of publications in the programs of instruction are: U.S. Army Special Warfare School—32; U.S. Army Civil Affairs School—7; and U.S. Army Military Police School—4.

The U.S. Army Command and General Staff College also listed several CRESS publications as supplemental material and background reading. One publication on the mechanics of subversion was prepared for the U.S. Army Intelligence School.

Brig Gen Foster Takes Dual Command at STRATCOM

Dual command responsibility was assumed by Brig Gen Hugh H. Foster Jr. when he recently became deputy CG for Systems Acquisitions, Army Strategic Communications Command HQ, Fort Huachuca, Ariz., in addition to CG of the Communications Systems Agency (CSA), Fort Monmouth, N.J.

The action was taken to streamline management policy for Systems Acquisitions. It recognizes the close relationship between STRATCOM's staff at Fort Huachuca and CSA, which concurrently functions as the Army Materiel Command project manager for the Strategic Army Communications Project. Activated in March 1967, CSA is a major subordinate command of STRATCOM.

STRATCOM officials said the appointment emphasizes the Army's role for accomplishing Defense Communication System/Strategic Army Communications (STARCOM) projects and systems implementation.

Graduated from the U.S. Military Academy in 1941, and a veteran of Signal Corps service, General Foster has completed graduate studies at Harvard University, the Massachusetts Institute of Technology (MIT) and holds a master's degree in engineering from Purdue University.

A former commander of STRATCOM's operations in Korea, he has the distinction of serving on the faculties at both the U.S. Military Academy at West Point, N.Y., and the U.S. Naval Academy.

Prior to assignment to STRATCOM in Korea, he served there concurrently as signal officer of the United Nations Command and also of U.S. Forces and as the assistant chief of staff, Communications Electronics for the Eighth U.S. Army.

Earlier in his career he was with the Electronics Proving Ground at Huachuca, serving from 1954 to 1958 as chief, Operations Research Division, Combat Development Department.

General Foster has twice been awarded the Legion of Merit and the Army Commendation Medal.

Brig Gen Hugh H. Foster Jr.

Former DASA (R&D) Chairs Harry Diamond Labs' SAC

Appointment of W. S. Hinman Jr., former Deputy Assistant Secretary of the Army (R&D), as chairman of HDL's Scientific Advisory Committee (SAC) was announced recently by Col L. C. Callahan, commander of the U.S. Army's Harry Diamond Labs, Washington, D.C.

Since his retirement from government service in 1964, Hinman has been a consultant to the HDL. He was the first technical director of HDL (then DOFL) from 1953 to 1962 and has served on SAC as a member for the 14 years the installation has been in existence.

The 11-member advisory group, composed of leaders in industry, universities, and professional organizations, advises the installation and its parent Army Materiel Command on scientific, technological and general matters pertaining to its mission.

Members appointed for the year beginning July 1 are Harry Davis, Deputy Assistant Secretary of the Air Force for Special Projects; Martin Goland, president, Southwest Research Institute; Dr. G. K. Hartmann, technical director, Naval Ordnance Laboratory; Dr. Jack A. Morton, vice president, Bell Telephone Laboratories; Dr. Daniel E. Noble, vice chairman of the board, Motorola, Inc.; Dr. Joseph E. Rowe, director, Electronic Physics Laboratory; Dr. Everard M. Williams, head of the Department of Electrical Engineering, Carnegie Institute of Tech-director, HDL; Donald G. Fink, general manager, Institute of Electrical and Electronic Engineers, and Dr. James D. Meindl, associate professor, Stanford University.

Clifford Approves THEMIS Contract Awards

Project THEMIS second-year contract awards for 43 new research programs in FY 1969 at academic institutions in 24 states and the District of Columbia have been approved by Secretary of Defense Clark M. Clifford.

Established by direction of President Johnson, Project THEMIS was initiated in September 1967 with contracts for 48 research programs in 28 states and the District of Columbia.

The objective is twofold: to create new centers of scientific excellence responsive to Department of Defense (DoD) solution of problems in the future; and to achieve a wider geographical distribution of Defense research funds, giving preference to institutions that receive little or no DoD support of science.

The 43 programs selected for support were picked from 412 proposals submitted by academic institutions. The number was reduced to 96 by preliminary screening by groups of scientists. On-site visits then were made for in-depth evaluation of each of the 96 programs to select the 43. Work on 16 programs will be performed for the Navy, with 14 for the Air Force and 13 for the Army.

Institutions selected, the area of research in which work will be performed and sponsoring agencies are:

ARMY—University of Cincinnati, internal aerodynamics and air-breathing engines; Drexel Institute of Technology, powder metallurgy; Florida State University, prediction of tropical weather phenomena; University of Iowa, vibration and stability of military vehicles; Lehigh University, nonlinear wave propagation; North Dakota State University, control of vectors of diseases of military importance; and

Rensselaer Polytechnic Institute, electrochemical power sources; Medical College of South Carolina, resuscitation and treatment of wounded; Stevens Institute of Technology, evaluation of terrain-vehicle systems; Texas A&M University, aircraft dynamics for subsonic flight; Texas Technological College, human performance under stress; Vanderbilt University, coating science and technology; University of Louisville, studies of performance assessment and enhancement; and University of North Dakota, control of arthropods of medical importance.

AIR FORCE—University of Arizona, precision optical systems; State University of Arizona, detection devices, techniques and theory; University of Connecticut, structural fatigue; Drexel Institute of Technology, forcasting by satellite observations; University of Hawaii, online computer systems; Illinois Institute of Technology, V-STOL aerodynamics; Kent State University, liquid crystal detectors; and

University of Kentucky, metal deformation processing; University of Mississippi, biocontrol systems; North Carolina State University, digital encoding systems; University of Tennessee, MHD power generation and (separate program) remote sensors for environmental systems; University of Vermont, isolation and sensory communication; University of Virginia, atomic interactions in gases.

NAVY—Catholic University vitreous state structure and dynamics and (separate program) dynamics of cable systems; Colorado State University, tropical weather disturbances and surface effects and (separate program) predictability of low-altitude winds; Florida State University, computer-assisted instruction and training; University of Iowa, application and theory of automata; Jefferson Medical College, pathogenesis of acute diarrheal disease; and

Kansas State University, electronic components in nuclear radiation environment; Lehigh University, low-cycle fatigue in joined structures; University of Missouri (Rolla), effect of aqueous aerosols on atmospheric processes; University of North Dakota, high-pressure physiology; Rensselaer Polytechnic Institute, radiation effects on electronic materials; Rice University, coherent and incoherent EM radiation; Southern Methodist University, statistics in calibration methods; West Virginia University, V/STOL aerodynamics.

Chaparral to Undergo Arctic, Tropic Tests

The Chaparral air-defense system initial production testing by the U.S. Army Air Defense Board was started in July at Fort Bliss, Tex.

Modifications not previously tested, usually specified as a result of earlier testing and development, will come under special scrutiny. The Chaparral system is part of the larger Chaparral/Vulcan air defense system the Army plans to field with battalion-size units. It uses the Navy's infrared (heat-seeking) air-to-air Sidewinder missile modified for a surface-to-air role.

Under current concepts, Chaparral complements the Vulcan system, a 6-barrel, 20mm weapon operating on the Gatling gun principle. Together, they provide a low-altitude air defense capability for commanders in forward battle areas.

The U.S. Army Test and Evaluation Command has been testing the Chaparral system since 1965. The Air Defense Board, one of the 15 major elements of the Army's primary materiel testing organization, conducted military potential tests at the Naval Weapons Center, China Lake, Calif., and the subsequent service tests at Fort Bliss and other test sites of the command.

Chaparral Air Defense System

Before Chaparral is approved for issue, the effects of arctic and tropic environments on the system and its associated components will be evaluated by the board. Preparations are being made to move test crews and their equipment to the U.S. Army Arctic Test Center at Fort Greely, Alaska, and to the U.S. Army Tropic Test Center at Fort Clayton in Panama for tests under extreme climatic conditions.

Air Defense Board test officers say the Chaparral system is capable of sustained operations in the field with nominal resupply. It is mounted on a single self-propelled tracked vehicle, a modified M548 cargo carrier, which is able to carry its launching station, 12 guided missiles and 5-man crew with their combat gear and rations for a minimum of three days.

The firing detail consists of one man; other crew members assist him in detecting hostile aircraft.

The maintenance vans for use with the Chaparral system are being studied by the Air Defense Board at the same time. One van, designed for organizational maintenance, provides necessary utility requirements and carries all maintenance tools. The second van is intended for maintenance at the support level; it includes a subassembly test set for testing and repairing the launch and control unit subassemblies.

McBride Takes Deputy CG Post at AVCOM

Brig Gen George H. McBride, 47, who commanded the Army Support Command at Da Nang, Republic of Vietnam, until January 1967, is the new deputy CG of the Army Aviation Materiel Command (AVCOM), St. Louis, Mo.

A 1962 mechanical engineering graduate of Alabama Polytechnical Institute, General McBride was commissioned there from the senior ROTC. He served in several major campaigns in Europe in World War II and returned to civilian life for some 15 months following the war, as a design engineer with the General Electric Co.

General McBride's basic branch is the Ordnance Corps and he has served in a wide variety of top staff positions with the Chief of Ordnance, the Ordnance School and Aberdeen Proving Ground, Md. He served for roughly six years at Huntsville, Ala., with the Army Ballistic Missile Agency, and at Redstone (Ala.) Arsenal in the Army Ordnance Guided Missile School and, most recently, with the Army Missile Command. In 1964–66, he was project manager for the Hawk missile.

He is a graduate of the Antiaircraft and Guided Missiles course at Fort Bliss, Tex., the Command and General Staff College, Fort Leavenworth, Kans., and the Air War College, Maxwell Air Force Base, Ala.

The general's decorations include the Distinguished Service Medal, the Legion of Merit with Oak Leaf Cluster (OLC), the Air Medal with three OLCs, and the Army Comendation Medal with two OLCs.

Brig Gen George H. McBride

Environmental Services Agency Nears Full Operational Status

Full operational status of the new Environmental Services Agency, acting for the Director of Defense Research and Engineering under the Joint Chiefs of Staff, is expected to be achieved by late summer.

The ESA will coordinate and develop the DoD position for interagency and international environmental services affairs; it also will provide DoD representation on committees for these agencies and military treaty organizations.

Brig Gen Roy W. Nelson Jr., U.S. Air Force, is special assistant for the agency. He is charged with providing support through the Air Force Air Weather Service to the Army and Navy requirements for special meteorological data for land and sea operations. His deputy is Capt Richard M. Cassidy, U.S. Navy.

More than 35,000 personnel are concerned with environmental sciences services within the Department of Defense. Operations of the new agency, it was explained, are of vital concern to the commander "who must give the order to launch an air strike, execute an amphibious assault, or cross a rain-swollen river under enemy fire."

Deputy Secretary of Defense Paul Nitze has stated that the Special Assistant for Environmental Services is expected to "have an important role and exert a strong influence in improving our military and defense capability . . . and to maintain effective communication with all DoD components involved."

Environmental services have been defined by the Secretary of Defense as "the various combinations of scientific, technical and advisory activities (including modification processes) required to produce and supply information on the past, present and future states of space, atmospheric, oceanographic and terrestrial environments for use in military decision-making processes."

Luczak Succeeds Burba as MBT-70 Manager

When Maj Gen Edwin H. Burba became deputy CG of the First Army at Fort Meade, Md., July 1, Brig Gen Bernard R. Luczak succeeded him as U.S. program manager for testing and evaluation of the U.S.-Federal Republic of Germany joint developmental Main Battle Tank 1970 program.

General Burba had served since October 1966 at HQ U.S. Army Materiel Command, Washington, D.C., as manager of the MBT-70 program. General Luczak was CG of the U.S. Army Ammunition Procurement and Supply Agency, Joliet, Ill., until he assumed his new duties.

Prior to the MBT-70 assignment, General Burba was chief of the Joint Military Assistance Advisory Group (MAAG) in Korea. Remembered as CG of the "Big Lift" in 1963 of the 2d Armored Division from Fort Hood, Tex., to Germany, he served there as CG of the Seventh Army Training Center until reassigned to Washington, D.C., as deputy director, Operations (J–3), Joint Chiefs of Staff.

General Luczak has devoted about 18 of his 22 years of Army service to assignments in Army missile R&D activities. From 1962 to 1964, he was deputy to the CG of Air Defense Systems at HQ U.S. Army Missile Command, Redstone (Ala.) Arsenal, and also served as chief, Nike Nercules Office. He has a BS degree in industrial engineering from the University of Pennsylvania and a master's degree in business administration from Stanford University.

Brig Gen Bernard R. Luczak

Maj Gen Edwin H. Burba

Col Peter G. Olenchuk

Col Ephraim Mayper Gershater

MUCOM Announces CofS, Fort Detrick CO Changes

Assignment of Col Peter G. Olenchuk as chief of staff, effective July 1, was announced by HQ U.S. Army Munitions Command, Dover, N.J. Col Ephraim Mayper Gershater succeeded him as CO at Fort Detrick, Md.

Following graduation from the Command and General Staff College in 1959, Col Olenchuk was assigned to the Office of the Chief of Research and Development (OCRD).

After two years in the Life Sciences Division, Army Research Office, he was deputy chief, OCRD Chemical-Biological Division until he became a student at the Industrial College of the Armed Forces. His next assignment was on the Joint Staff of the U.S. Military Assistance Command, Vietnam, as chief, Chemical Operations.

Backed by 23 years of Army service, he has a BS degree in chemistry from Lebanon Valley College, a master's degree in chemistry from the University of Wisconsin and a master's degree in business administration from George Washington University.

COL GERSHATER at 46 is an outstanding example of an officer who has taken advantage of his military career opportunities to acquire higher education. While assigned as an instructor at the University of Nebraska, he earned BS, BA and MA degrees in chemistry and French.

After graduating with honors from the Advanced Course of the Chemical Corps School at Edgewood (Md.) Arsenal he received a BS in military science from the University of Maryland. Graduation from the Command and General Staff College in 1957 was followed by four years as assistant professor of chemistry at the United States Military Academy.

A tour of duty as service training adviser to GHQ, Chinese Army with the Military Assistance Advisory Group, China, was followed by his return to Edgewood Arsenal in 1963, first as chief of the Special Operations Division and then as deputy commander.

Graduated from the Industrial College of the Armed Forces, Washington, D.C., in 1965, he then was assigned to HQ U.S. Army Combat Developments Command, Fort Belvoir, Va., as chemical-biological systems analysis officer. Meanwhile he continued his studies at George Washington University and received an MSBA degree in June 1966.

From July 1, 1966 until assigned to his present duties, he was a plans officer in the Requirement and Development Division, Plans and Policy Directorate, Joint Chiefs of Staff, Washington, D.C. During this period he studied at American University and is a candidate for an MST degree in education.

Col Brown Takes Command of U.S. Army Engineer WES

Command of the U.S. Army Engineer Waterways Experiment Station (WES) at Vicksburg, Miss., was assumed recently by Col Levi A. Brown, who succeeds Col John R. Oswalt, Jr., now assigned to the U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Va.

Col Brown, who has been deputy director for the past year, will be in charge of an organization of 1,360 employees with a total work program of over $33 million scheduled for 1968. The WES laboratory complex is the principal research, testing, and consulting facility of the Corps of Engineers in the scientific fields of hydraulics, soil mechanics, concrete, mobility of military vehicles, nuclear weapons effects, flexible and prefabricated pavement design, and related fields.

Graduated in 1946 from the U.S. Military Academy at West Point, Col Brown also has a master's degree in civil engineering from California Institute of Technology, a civil engineer's degree from Columbia University, and is a graduate of the U.S. Army Command and General Staff College and the Army War College.

During a one-year tour in Vietnam, he served successively as engineer adviser to Vietnamese Army Headquarters and as logistics plans officer in the Headquarters of the U.S. Military Assistance Advisory Group. Other overseas assignments include two tours of duty in Japan and one in Germany.

Col Brown is a registered professional engineer in the states of Michigan and Mississippi, a Fellow of the American Society of Civil Engineers, and a member of the Society of American Military Engineers, National Society of Professional Engineers and the American Concrete Institute.

Col Levi A. Brown

Manufacturers Support Work On Precious-Metal Circuits

Ten manufacturers and users of electrical contact materials have agreed to continue a large research program directed toward improved precious-metal contacts for low-energy circuits.

In progress for three years at the Columbus Laboratories of Battelle Memorial Institute, the program will have the companies' joint financial support for two more years.

Current sponsors of the work are: Automatic Electric Laboratories, Inc.; Bell Telephone Laboratories; Engelhard Industries, Inc.; Filtors, Inc.; General Electric Co., Specialty Control Department; Globe-Union, Inc.; International Business Machines Corp.; Micro Switch Division of Honeywell; Northern Electric Co., Ltd.; and Univac Division of Sperry Rand Corp.

Collins Named Army Deputy Surgeon General

Brig Gen Glenn J. Collins, chief surgeon, U.S. Army, Vietnam, has been named Army Deputy Surgeon General, effective in September, when he will succeed Maj Gen James T. McGibony, who will become chief surgeon, U.S. Army, Europe.

Prior to the Vietnam tour, he was commandant of the Medical Field Service School, Fort Sam Houston, Tex., where he interned in 1935–36, followed by duty at Oklahoma University Hospital in 1936–37. He then entered private practice at the McAlester Clinic, McAlester, Okla.

A native of Elmore City, Okla., General Collins received his BS degree in 1933 and his PhD in medicine in 1935 from the University of Oklahoma. In June 1939, he was commissioned a first lieutenant in the Medical Corps, U.S. Army Reserve, and received his Regular Army commission in November 1939.

After a tour of duty in the Philippines, General Collins served in Germany from January 1946 until November 1948. Then he was at Brooke General Hospital for residency training in general surgery. He was assigned to the Office of The Surgeon General from November 1951 until he was transferred to Germany, in September 1955, as chief, Operations Branch, Medical Division, HQ USAREUR.

General Collins joined the newly activated U.S. Army Hospital Center, Germany, July 1, 1957, and served as its deputy commander and chief of Plans and Operations until his return to the U.S. in July 1958 to attend the hospital administration course at the Medical Field Service School, Brooke Army Medical Center. In June 1959, he began a 2-year tour at Fort Leonard Wood, Miss., as post surgeon and hospital commander, then was assigned to Brooke Army Medical Center as assistant commandant, Medical Field Service School.

In August 1963, General Collins was assigned to the Office of The Surgeon General as executive officer and served there until returning as commandant, Medical Field Service School.

Brig Gen Glenn J. Collins

Noble Succeeds Woodbury As Director of Civil Works

Newly appointed Director of Civil Works for the U. S. Army Corps of Engineers, Brig Gen Charles C. Noble succeeded Brig Gen Harry G. Woodbury Jr. when he retired recently after serving in that position since February 1967.

General Noble, deputy director since June 1967, serves under Army Chief of Engineers Lt Gen William F. Cassidy. His responsibilities include nationwide water resources investigation, planning, construction and operations involving an annual budget of approximately $1.2 billion.

The general has served in Korea for two years as engineer, Eighth U. S. Army, assigned concurrently as engineer, United Nations Command and for U. S. Forces, Korea.

He also served as director, Southeast Asia Construction Division, Office of the Assistant Secretary of Defense (I&L). During a 1960–1963 tour of duty as an engineer with the Ballistic Missile Construction office in Los Angeles, Calif., General Noble directed the construction of more than a thousand ICBM facilities in the western U. S.

Graduated from the U. S. Military Academy in 1940 and the National War College in 1964, he has a master's degree in international affairs from George Washington University, Washington, D.C., and a master's degree in civil engineering from Massachusetts Institute of Technology.

Franz, Friar Take Posts at Edgewood, Pine Bluff

The new director of the Defense Development and Engineering Laboratories at Edgewood (Md.) Arsenal is Lt Col Robert Francis Franz Jr., who took over from Col Clyde L. Friar when he finished a 3-year tour and became commander of Pine Bluff (Ark.) Arsenal.

Until he assumed his new duties, Col Franz was assigned to the Office of the Chief of Research and Development, HQ Department of the Army, Washington, D.C. He served the last two years of a 4-year tour as chief of the Chemical-Biological Branch, Nuclear, Chemical and Biological Div.

After receiving an MS degree in bacteriology from the University of Wisconsin in 1956, Col Franz served a 4-year tour in the Biological Laboratories, Fort Detrick, Md. He received a BS degree from Xavier University in 1951. He also has completed the Chemical Officer Advanced Course, the CBR Weapons Orientation Course (serving later as instructor) and the Command and General Staff College.

COL FRIAR is backed by 26 years of Army service for his new assignment at Pine Bluff Arsenal. Commissioned in 1945, he served first as company commander at Rocky Mountain Arsenal, Denver, Colo., then was assigned to the 147th Chemical General Service Co. in Korea, and from 1951 to 1953 was at Fort Detrick.

Following graduation in 1955 from Massachusetts Institute of Technology with an MS degree in chemical engineering, he served at Rocky Mountain Arsenal until he attended the Command and General Staff College. His next assignment was assistant chemical officer, HQ U.S. Army Pacific.

Returned to the U.S. in 1962, he attended the Armed Forces Staff College, Norfolk, Va., and then was assigned to the Office of the Chief of Research and Development as chief, Defense Branch, CBR Office in 1963–64.

Col Clyde L. Friar

Lt Col Robert F. Franz Jr.

STRICOM Appoints New Concepts Study Group

Determination of joint operational concepts for the strategic mobility of the U.S. Armed Forces in the 1970–75 time frame is the mission of a special study group appointed recently at HQ Strike Command (STRICOM), MacDill AFB, Fla.

Brig Gen Howard E. Kreidler (U.S. Air Force), deputy director of STRICOM Operations (J–3), has been named chairman of the study group to analyze all aspects of strike capability to deploy and employ joint forces on contingency operations or to reinforce unified commands.

Designated "NEWCON 70–75" (New Concepts, 1970–75), the group will consider organizational changes pending, present and new equipment, weapons and weapons systems and other military problems.

Formation of the group, it was explained, will involve prolonged effort on the part of highly experienced Army, Navy, Air Force and Marine Corps personnel assigned to HQ STRICOM. Contributions to the study will be made by John O. Bell, diplomatic adviser to General Theodore J. Conway, STRICOM Commander-in-Chief, and Dr. F. B. Kapper, STRICOM scientific adviser.

Eventually, it is contemplated that personnel from other U.S. Armed Forces and commands may participate in the special joint study. The Joint Operations Analysis and Test Group (JOATG), a major staff agency of STRICOM, will provide the framework for the study group, augmented by personnel of other HQ STRICOM staff offices.

"Operational concepts must be continually reviewed and updated in view of lessons learned from [the war in] Southeast Asia and the modern hardware and products emerging from aerospace technology," it was said.

Results of the study will benefit primarily the Strike Command but will be applicable to the deployment and employment of U.S. Armed Forces worldwide. This is in line with one of STRICOM's functions of supporting and carrying out the missions assigned by Department of Defense.

U.S. STRIKE COMMAND Commander-in-Chief General Theodore J. Conway is briefed by Brig Gen Howard E. Kreidler, STRICOM operations director and chief of a new study group appointed to determine joint operational concepts for strategic mobility of the Armed Forces in the 1970–75 time frame. At right is John O. Bell, a former U.S. ambassador now serving as diplomatic adviser to General Conway. In 1958, Conway was Director of Army Research.

DDC Surveys DoD Interest in COSMIC Program

The Defense Documentation Center (DDC) is reviewing results of a survey to determine Department of Defense (DoD) interest in joining the National Aeronautics and Space Administration (NASA) and the University of Georgia in a program to make computer programs and program documentation available to the scientific community.

As this article was written, returns from 111 of 129 Department of Defense R&D activities indicated a high degree of interest in the Computer Software Management and Information Center (COSMIC) program.

Army R&D potential users and contributors include 61 activities of the Office of the Chief of Research and Development, Medical R&D Command, Chief of Engineers, and the Army Materiel Command.

The survey was initiated by DDC at the request of the Office of the Director of Defense Research and Engineering. Headed by Dr. Robert B. Stegmaier Jr., the DDC is the central facility of the DoD for the secondary distribution of scientific and technical reports generated by Defense-funded R&D. It also operates computer-based data banks of management and technical information and is responsible for the development storage and retrieval systems.

COSMIC was initiated in 1966 as part of the NASA Technology Utilization Program to increase the return on the public investment in aeronautical and space activities by encouraging and providing for the transfer of technical knowledge to private industry.

Since then, the Computer Center has expanded its services in disseminating computer programs and computer information emanating from NASA programs to industry, business and educational institutions.

If adopted by the Department of Defense, the COSMIC program would be explained to include collection and dissemination of program documentation and programs generated within DoD R&D Communities.

The computer programs that are acceptable to the COSMIC program are all completely documented programs. These do not include standard mathematical functions, elementary matematical and engineering problem solvers, or limited housekeeping programs that cannot be used by anyone other than the innovator for the purpose for which the program was originally designed or for any secondary application.

Users of COSMIC are periodically informed of computer programs as they are added to the inventory. They may request the program and documentation of any program announced and may also request the source program in either tape or card form. Source program decks over 2,000 cards, however, will not be disseminated in card form but are provided on magnetic tape in IBM Binary Coded Decimal Format. All requests for source programs on tape are provided on reels the Center furnishes.

COSMIC employs a professional staff of statisticians, mathematicians, biologists, numerical analysts, engineers, chemists, physicist, and information and computer scientists for reviewing all documentation.

The two major computer systems in the Center are the IBM 360 Model 65 and the IBM 7094 with two IBM 1401 systems serving as input/output peripheral units for the 7094. In additions, an IBM 1620 computer and EAI TR–20 analog computer are operated on an open-shop basis.

For additional information on DoD participation in this program, address all correspondence to the Defense Documentation Center, Directorate of Systems Development, ATTN: DDC–D, Cameron Station, Alexandria, Va. 22314.

Col Millar Succeeds Healy as Kwajalein CO

Command of Kwajalein Missile Range in the Marshall Islands, Pacific Ocean, was assumed recently by Col Donald B. Millar, who succeeds Col F. C. Healy, now product manager for Sentinel System munitions at Picatinny Arsenal, Dover, N.J., HQ Army Munitions Command.

Prior to being assigned to Kwajalein nearly two years ago, Col Millar served at Norton Air Force Base, Calif., assistant deputy for Reentry Systems to the commander of the Air Force Space and Missile Systems organization. He was also chief of the Sentinel System Command's field office at Norton and from 1964 to 1966 was assigned to the Office of the Chief of R&D.

Kwajalein is the primary testing ground for the Army's Sentinel System being deployed to protect the United States against the limited nuclear-armed ballistic missile threat being developed by the Communist Chinese. It is a National Range operated by the Army but used by all the services and the Department of Defense for RDT&E.

As commander of Kwajalein Missile Range, Col Millar is responsible for supervising all the programs being conducted there. He is also responsible for the welfare of the more than 4,000 persons who live and work at Kwajalein.

Since he reentered the service in 1948, following discharge from five years service in World War II in the Pacific, his assignments have included serving as a member of the Military Armistice Commission in Korea; as test director for Phase II of the SAGE/Missile Master Defense Systems; as deputy for Operations and Training (G–3), United States Army, Hawaii; and as commander of the 7th Battalion, 11th Artillery in Southeast Asia.

He graduated from high school in Wilmington, Del., and has attended the University of Texas, the University of Maryland and the University of Hawaii. His decorations include the Soldier's Medal for heroism, the Army Commendation Medal, and the Air Force Commendation Medal.

Col Donald B. Millar

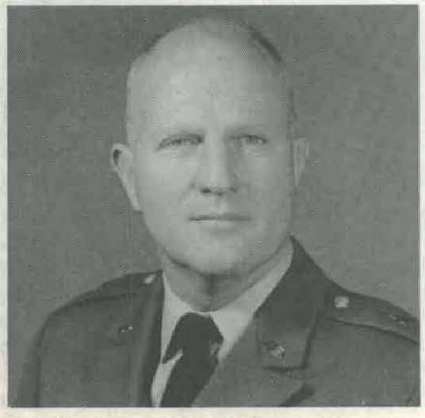
Brig Gen Harvey Retires After 30 Years Service

Brig Gen Clarence C. Harvey Jr., deputy commanding general for Air Defense Systems at HQ U.S. Army Missile Command, Redstone (Ala.) Arsenal, left the Army July 31 after 30 years of military service. He has served three years at Redstone.

The general and Mrs. Harvey will move to the Monterey Peninsula in California and this fall he will join the faculty at Robert Louis Stevenson School in Pebble Beach to teach math and physics.

Among his Army assignments, he has taught at the Artillery School, Fort Sill, Okla.; Guided Missile School, Fort Bliss, Tex., and at the U.S. Military Academy.

After graduating from West Point, he studied at Columbia University and attended the University of Southern California, where he earned a master's degree in aeronautics and guided missiles. Before joining Redstone, he was deputy chairman, Guided Missiles and Astronautics Intelligence Committee of the United States Intelligence Board.



Brig Gen Clarence C. Harvey Jr.

CDC Creative Thinking Programs Pays Off for Ideas

Interest is mounting in the Creative Thinking Awards Program announced recently by the Army Combat Developments Command. Designed to stimulate original and imaginative thinking by students in the Army Service School System, the program will provide pay and recognition for the best ideas.

Awards may be granted to any student in some 20 of the Army's career schools, such as the Command and General Staff College, Fort Leavenworth, Kans., the Armor School, Fort Knox, Ky., the Infantry School, Fort Benning, Ga., and the Artillery School, Fort Sill, Okla. In addition to the Combat Arms schools, the Creative Thinking Award may be presented to one student per class in the Combat Support and Service Support Schools.

The program is being coordinated by CDC Institute of Combined Arms and Support (ICAS), collocated with the Command and General Staff College at Fort Leavenworth, and by the commanders of other CDC arm-and-branch specializing agencies.

In most cases, CDC has such a branch agency located on the same post with its career branch school. This is the source of the detailed expertise CDC draws on in developing requirements for tactics, hardware and organization for the field Army.

Ideas submitted for consideration in the Creative Thinking Awards Program must be stated in 1,000 words or less; they may apply to the categories of materiel, technique, doctrine or organization, and meet other criteria such as identifying constraints and limitations in the idea.

CDC officials stress that the award is for a clear and practical elaboration of a new, imaginative idea, not for a good thesis. While looking for creative and imaginative ideas for tactics, systems and organization for the future Army, CDC's advance thinkers will also judge ideas on their potential for adoption.

In addition to being officially credited with the idea, a student winning the Creative Thinking Award will receive considerable cash or saving bonds and an engraved trophy.

Student ideas which may not win are not necessarily losers. Ideas which appear to merit further CDC review will be sent for staffing and evaluation to the Fort Belvoir headquarters or the Pentagon.

"This is another way of showing how firmly we believe in the primacy of ideas over 'things' in the design of a combat effective Army," said Lt Gen Harry W. O. Kinnard, CG of the CDC. "We know that a contest of arms 20 years from now must begin with a contest of minds today. Our Creative Thinking Award will reward inventive people who see this point."

Major RDT&E, Procurement Contracts Exceed 1 Billion Dollars

Fiscal Year 1968 closing-rush awards swelled the total of Army research, development, test, evaluation and procurement contracts, each exceeding $1 million, to a record $1,000,796,787 during the 2-month period of this consolidated edition. The report covers contracts to July 8.

Consolidated Diesel Electric Co. Division of CONDEC Corp. will receive $28,585,799 for the first-year increment of a $132,120,077 3-year procurement for 1¼-ton cargo trucks, M561 (Gamma Goat).

AVCO Corp. was issued seven contracts totaling $93,380,432 for special test equipment and tooling, expansion and repair of production facilities, and production of T53–L–13 and T55–L–11 turbine engines for helicopters.

Olin Mathieson Chemical Corp. gained three contract modifications totaling $58,449,022 for operation of a plant for production of propellants, bags, liners, ammunition components and for support services. Kaiser Jeep Corp. was issued a single-year contract for production of 6,633 M44 Series 2½-ton trucks valued at $51,453,949.

Day and Zimmermann, Inc., received two contract modifications totaling $45,162,265 for loading, assembling and packing of miscellaneous ammunition items and components, and for maintenance of plant facilities at Texarkana, Tex.

Mason and Hangar-Silas Mason Co., Inc., was awarded three modifications totaling $41,134,086 for operation of a bomb production plant and support services at the Cornhusker Army Ammunition Plant; for loading, assembling and packing medium- and large-caliber ammunition, ordnance items and components; and for support services and operation of the Army Ammunition Plant, Burlington, Iowa.

General Motors Corp. received five contracts totaling $36,286,698: $4,757,470 for work on the XM70 (Main Battle Tank); $2,875,194 for T63–A–5A turbo-shaft engines for OH–6A aircraft; $1,977,709 for generator sets; $1,126,233 for rebuilding/retrofit of CD–850 series transmissions for the M48 combat tank, and $5,615,003 as the first-year increment to a $25,550,092 3-year procurement for diesel engines for M561 (Gamma Goat) cargo trucks.

Southern Airways of Texas, Inc., gained a $28,270,000 modification to a contract for helicopter pilot training and maintenance of aircraft and related equipment.

Philco-Ford Corp. added a $24,100,398 for two definitizations of a previously awarded contract for Shillelagh guided missiles, and $3,172,656 for aid in operation of the Electronic and Nucleonic Instrument Calibration and Repair Facility at the White Sands Missile Range.

Martin Marietta Corp. is receiving $24,595,300 in a definitization of a letter contract and a $2,025,272 (F-P-I) contract for Pershing ground-support equipment. Bell Helicopter Co. will get $24,085,145 for five contracts: $5,561,418 for rotary-wing blades; $10,865,000 for UH–1 and TH–1 helicopters; $4,236,876 for UH–1 transmission assemblies; $1,421,851 for UH–1 flight control cylinder assemblies; and $2,000,000 for maintenance and repair parts and support equipment for OH–58A helicopters.

IT&T Corp. will be paid $23,677,395 for radio sets AN/GRC–144 and antenna alignment indicators. Norris Industries, Inc., was issued three contracts totaling $20,069,276 for 2.75-inch rocket motor tubes, 152mm projectiles, and metal parts for 81mm projectiles and 105mm cartridge cases.

Colt's Inc., is receiving $19,911,821 under three contracts for M16A1 and 16 (5.56mm) rifles and for 2-round magazine assemblies for the M16/16A rifle.

Electrospace Corp. received a $2,260,476 fixed-price contract for the first increment of a $19,261,841 4-year procurement of radio sets and components.

Six contracts totaling $18,000,569 were awarded to Chamberlain Manufacturing Corp., including a $4,828,608 modification for metal parts for 155mm projectiles; $4,761,700 for modernization of support activities for the 175mm and 155mm production program; $2,693,876 and $2,433,784 for metal parts for 81mm projectiles; $1,892,407 for 4.2-inch

ECOM Evaluates Lightweight Power Source

Evaluation tests of a new fuel cell that can produce 30 watts of electricity for eight hours on a solid fuel charge the size of a pack of cigarettes and a pint of water, are being conducted at the U.S. Army Electronics Command, Fort Monmouth, N.J.

The lightweight power source for ground combat electronic equipment was developed from a fuel cell similar to that used to generate electricity for the Gemini space capsule. The big difference is that the Gemini version used hydrogen gas directly. A solid fuel (sodium aluminide hydride) is used in the Army to produce the hydrogen.

The common feature of the original and new versions of the fuel cells is a plastic membrane that serves in the process of converting chemical fuel into electrical energy. Operation is silent, and reloading is about as easy as brewing a cup of instant coffee.

Designed to power equipment such as compact field radio and radar sets, the unit is 11 inches high, 12 inches wide and four inches thick. Loaded with solid metal hydride fuel and water, it weighs 12½ pounds.

Intended to supply direct power for a variety of equipment, the unit can be sandwiched between the AN/PRC-70 radio and a 4-pound rechargeable battery to form a self-recharging communications package weighing 35 pounds with a carrying harness. (The PRC–70 is under development.)

For operating equipment that uses more than 30 watts during peak periods, such as a radio set on transmit mode, this combination of fuel cell and rechargeable battery provides the higher output on demand and then replenishes its energy from the fuel cell during periods of low power consumption.

For a number of purposes, the fuel cell could thus do away with dry batteries, or trips to a recharging point to energize storage batteries.

The fuel cell project is being carried out in the Power Sources Division of the ECOM's Electronic Components Laboratory. The project engineer is Frank P. Malaspina. General Electric Co. is the contractor.

FUEL CELL undergoing tests by Army produces 30 watts of electricity for eight hours on a fuel charge the size of a pack of cigarettes.

projectiles; and $1,381,826 for metal parts for 2.75-inch rockets.

Harvey Aluminum, Inc., will receive $15,835,405 in two contracts for metal parts for 40mm cartridge cases and for loading, assembling and packing medium-caliber ammunition and components. Bell Aerospace Corp. is receiving $15,500,000 for AH–1J helicopters.

Boeing Co., added $13,008,267 under four contracts for transmission assemblies and spare parts for CH–47 helicopters, and for absorber assemblies, transmission shafts and rotary-wing blades. Chrysler Corp. will receive $12,797,318 under three contracts for metal parts for 175mm high-explosive projectiles and for engineering services for the M60 tank.

Lockheed Electronics Co. is receiving $12,499,950 in four contracts for radar equipment used in the fire control system of the 20mm antiaircraft gun, for AN/TPM–22 D S/GS shop sets with antennae, test panel AN/VTS–1, documentation and related spare subassemblies, for AN/VPS–2 radar sets for XM163 Weapons System (Vulcan Air Defense), and for 4.2-inch projectile canisters.

Radio Corp. of America was awarded a $12,218,705 cost-plus-award fee contract for operation and maintenance of government-owned radar and target acquisition systems at White Sands (N. Mex.) Missile Range.

Continental Motors Corp. was issued five contracts totaling $11,585,292 for remanufacture or retrofit of replacement spares for multifuel engine assemblies for 2½- and 5-ton trucks, for remanufacture of government-furnished AVDS 1790–28 engine assemblies with metal containers, and for remanufacture of engine assemblies, with containers, for replacement spares for M48 and M60 tanks.

Raytheon Co. is furnishing, under six separate contracts totaling $11,538,666, metal parts for bombs, detection devices, multiplexers, running spare part kits, refurbishing services for Hawk battery sets, M514A1E1 artillery proximity fuzes, and repair and overhaul of 148 major items of the Hawk missile system at various overseas locations.

Holston Defense Corp. was awarded $10,797,636 in a modification for operation of the Holston Army Ammunition Plant, Kingsport, Tenn., and for manufacture of various explosives and support services.

Sperry Rand's $10,722,922 in three contracts calls for AN/ASN–43 gyromagnetic compass sets, ID–998/ASN indicators and AM–3209/ASN amplifiers for aircraft flight control systems; also, operation of the Army Ammunition Plant, Shreveport, La. Ford Motor Co. was awarded two contracts totaling $10,227,364 for 1¼- and ½-ton utility trucks and ambulances.

Contracts under $10 million. United Aircraft Corp. will receive $9,697,850 on two contracts for spare T73–p–1 aircraft engines and T73–0–1 engines for CH–54A helicopters. Hercules Engines, Inc., is receiving $9,665,856 under three separate contracts for LD465–1 multifuel engines assemblies for 2½-ton trucks, for support services and operation of an ordnance production facility at the Radford Army Ammunition Plant, and for support services and operation of a propellant-producing facility at the Sunflower Army Ammunition Plant.

Atlas Chemical Industries, Inc., is receiving $9,019,867 for operation of a facility for TNT production and for support services at the Volunteer Army Ammunition Plant, Chattanooga, Tenn. Western Electric Co. was issued two contracts totaling $8,995,000 for overhaul of Nike Hercules systems and electronic shop sets for Nike Hercules.

Texas Instruments, Inc. will be paid $7,139,132 for AN/AAS–24 infrared detecting sets and $1,500,000 for classified electronic equipment. Caterpillar Tractor Co. is furnishing hydraulic-operated tractors for $8,579,040.

Curtis Wright Corp. will get a $3,152,642 as a first-year increment to a $7,801,916 fixed-price contract for 2-year procurement of tactical imagery interpretation equipment. Studebaker Corp. is receiving a $7,524,394 fixed-price contract for generator sets.

General Dynamics Corp. will get $7,282,799 in two separate contracts for Redeye trainer systems, XM49E3, and for a 3-year procurement of radio teletypewriter sets.

Honeywell, Inc., will receive $7,161,183 under five contracts for metal parts for bomb and grenade fuzes, infrared target indicators, XM224 grenade fuzes, and facilities to increase the fuze production capacity at the Twin Cities Army Ammunition Plant. Two contracts totaling $6,285,800 went to Magnavox Co. for AN/ARC–131 and AN/URC–68 radio sets.

Motorola is being awarded three contracts totaling $6,016,810 for metal parts for fuzes for artillery and mortar ammunition, AN/APS–94 Radar Surveillance Sets, and radar data receiver and transmitting sets. Sylvania Electric Products, Inc.. gained a $5,954,803 definitization of a classified contract.

White Motor Corp. is receiving $5,853,803 for 2½-ton trucks; General Electric Co., $5,768,000 for 20-mm subsystem armament and related supplies for AG–1G Hueycobra helicopters; American Machine and Foundry Co., $5,559,680 for metal parts for 750-pound bombs; and

Talley Industries, Inc., Mesa, Ariz.. $5,364,375 (two contracts) for hand grenades and colored smoke canisters; and Hughes Tool Co., $5,244,866 (three contracts) for Iroquois Night Fighter and Night Tracker (INFANT), and hub and transmission assemblies for OH–6A helicopters.

(*Continued on page 18*)

ARMY'S AIR CUSHION VEHICLE designed for use in Southeast Asia races through performance tests at speeds up to 70 mph. The hard bottom of the craft is supported on a 4-foot-thick cushion of air, enabling it to travel with ease over land, water, muck or marsh. Armament includes two machineguns mounted on twin turrets atop the cabin, two pintle-mounted machineguns amidship, one on either side, and a grenade launcher on the port bow. Three of the craft were built for the Army by Textron's Bell Aerosystems Co. and were airlifted to Vietnam following extensive testing at Aberdeen Proving Ground, Md.

RDT&E, Procurement Contracts Exceed $1 Billion

(*Continued from page 17*)

Contracts under $5 million. Rubber Fabricators, Inc., $4,762,040 for pneumatic, 12-ton capacity pontoon floats; Bowen-McLaughlin-York Co., $4,681,643 for retrofit of M48A1 tanks to M48A3 tank configuration; Uni-Royal, Inc., $4,669,577 for 12-ton capacity pontoon floats; and

LTV Electrosystems, Inc., $4,266,-634 for vehicular radio communication sets; R. G. LeTourneau, Inc., $4,242,966 (two contracts) for M131-A1 fin assemblies and metal parts for 750-pound bombs; North Electric Co., $4,115,840 for a Tactical Automatic Switching System (SATSS) for Seventh Army; Brunswick Corp., $4,058,200 for chemical-filled (CS) canisters; and

Ryan Aeronautical Co., $3,906,180 for repair parts in support of the MQM–34D Target Missile area and the MQM–34D Target Missile Flight Service program (two contracts); Food Machinery Corp., $3,827,190 for 4.2-inch projectiles; General Electric Co., $3,757,041 for AN/MPQ–4 radar sets; Federal Cartridge Corp., $3,-745,800 for operation of a government-owned ammunition producing facility at Twin Cities Army Ammunition Plants; and,

Cutler-Hammer, Inc., (two contracts) $3,68,8113 for AN/PPS–5 radar sets, ancillary items and related items; Eureka Williams Co., $3,666,300 for fuzes for 750-pound bombs; Columbus (Ohio) Milpar Manufacturing Co., $3,629,500 (two contracts) for fin assemblies for 2.75-inch rockets and for 81mm projectile fuzes; Penland Paper Converting Corp., $3,619.062 (three contracts) for projectile and ammunition containers; and

Uni-Royal, Inc., $3,476,152 for operation of a facility for production of explosives, and for loading, assembling and packing of medium- and large-caliber items; Thiokol Chemical Corp., $3,400,740 (two contracts) for technical chemical agent, for operation of a government-owned facility, and for loading, assembling and packing of ammunition and related components; and

H. R. B. Singer, Inc., $3,215,500 for AN/ART-41A transmitting sets, AN/AAS-14 detecting sets, maintenance floats for the AN/AAS-14 and TAQ-1A surveillance information centers; Franchi Construction Co., Inc., $3,177,500 for rehabilitation of six existing buildings to provide laboratory and administration facilities for the Army Materiel Research Agency; and

Fairchild Camera and Instrument Corp., $3,145,680 for M514A1E1 artillery proximity fuzes; Continental Aviation and Engineering Corp., $3,105.832 for engineering support for production of the Ld/LDS 465 family of multifuel engines and for repair parts in support of the MQM–34D Target Missile Flight Services program; and

Marquardt Corp., $3,038,945 for fin and nozzle assemblies for 2.75-inch rockets; Northrop Corp., $2,981,-733 for radio set components; Eastman Kodak Co., $2,964,926 for support services and operation of a government-owned facility for production of various explosives; and

Westinghouse Electric Corp., $2,-794,735 for redesigning and modifying AN/TPS–27 radars to AN/TPS–48 configuration; Farmers Chemical Association, Inc. (Tyner, Tenn.), $2,770,445 for production of chemicals, maintenance and support services; and

Hawthorne Aviation, $2,567,591 for aircraft maintenance services on fixed and rotary-wing aircraft and related test support; Northrop Carolina, Inc., $2,528,140 for 40mm cartridges; Federal Container Corp., $2,520,625 for 105mm ammunition containers; Bendix Corp., $2,520,000 for stabilized platforms and amplifier control power supply for the Pershing missile system; and

ITEK Corp., $2,505,141 for stabilized night sights; Consolidated Box Co., Inc., $2,445,561 for ammunition containers; Remington Arms Co. Inc., $2,397,563 for operation of a government-owned facility for production of various small arms ammunition; John Wood Co., $2,275,552 for fin assemblies (M131A1) for 750-pound bombs; and

PRD Electronics, Inc., $2,233,551 for AN/USM–234 microwave sets; American Fabricated Products, Inc., Indianapolis, Ind., $2,220,356 for fin assemblies for 81mm mortars; Kollsman Instrument Corp., $2,186,000 for night observation devices; Mohawk Rubber Co., $2,144,688 for 5-ton truck pneumatic tires; and

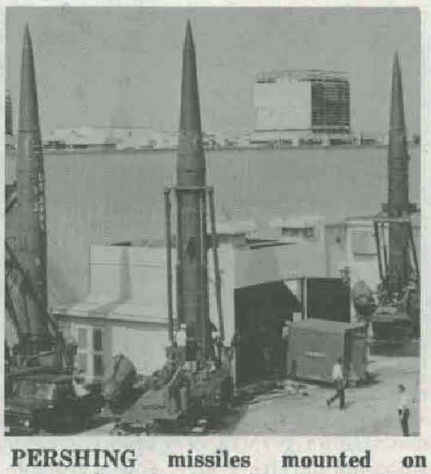
IBM Corp., $2,117,507 for one combat services support system (S3)—logistics data-processing subsystem; Litton Systems, Inc., $2,056,325 for test equipment to support AN/ASN-86 inertial navigation sets; and General Time Corp., $2,017,839 for M125-A1 metal parts for artillery shells.

Contracts under $2 million. Brad's Machine Products, Inc., $1,935,000 for

$31 Million Contract Let for Pershing Equipment

Production of Pershing missile system ground support equipment and power stations is the basis of a $31 million procurement order announced July 2 by HQ Army Missile Command, Redstone (Ala.) Arsenal.

A $29,095,300 contract is a second-year follow-on for Pershing 1–A erector-launchers and other equipment to transport the 400-mile-range, surface-to-surface missile, successfully test fired in March 1968. Production of power stations to furnish electrical energy for the 2-stage, nuclear-tipped weapon accounts for the remaining $2,025,750.



PERSHING missiles mounted on erector-launchers at Martin Marietta Corporation's Orlando (Fla.) plant.

The new Pershing 1-A system stems from the Army's continuing requirement for a faster rate of fire, increased reliability, less maintenance and lower overall costs than the system deployed in Europe since 1964 with U.S. and West Germany troop units. The biggest change is a switch from tracked to wheeled vehicles for ground support, including the erector-launcher.

An 8-wheeled prime mover carries the erector-launcher. Other improvements center on the programer/test station, which provides countdown facilities, and a completely new battery control central linked by communications to higher headquarters for use as a command post.

The system is engineered for rapid ground movement from one firing position to the next and can be transported in a C–130 aircraft.

Most of the work on the $31 million contract will be done by Martin Marietta's Orlando (Fla.) Division under a fixed-price incentive agreement although some will be done at the firm's Baltimore (Md.) operation.

metal parts for artillery shells; Muncie (Ind.) Gear Works, Inc., $1,900,250 for fin and nozzle assemblies for 2.75-inch rockets; Blount Brothers Corp., $1,875,000 for rehabilitation, conversion and new construction at the Ravenna Army Ammunition Plant; Etowah Manufacturing Co., Inc., $1,825,125 for metal parts for artillery shells; Raymark Cargo, Inc., $1,822,792 for packing container services at the Oakland (Calif) Army Base; Vatronics, Inc., $1,769,850 for time fuzes; and

Triangle Electronics Manufacturing Co., Inc., $1,774,107 for cable assemblies, electrical connector plugs and preformed wire grips; Revere Copper and Brass, Inc., $1,759,220 for cup cases and bullet jacket cups for .30- and .50-caliber ammunition; and

Donovan Construction Co. (New Brighton, Minn.), $1,740,852 for metal parts for 155mm projectiles; F. T. S. Corp. (Denver, Colo.), $1,736,870 for 275-inch rocket fin and nozzle assemblies; Phalo Corp. (Shrewsbury, Mass.), $1,733,238 for cable assemblies with electrical connector plugs and wire grips; and

Jette Power, Inc. (Peekskill, N.Y.), $1,714,060 for gasoline engine driven generator sets; Scovill Manufacturing Co., $1,669,253 for grenade fuzes; Hunter Outdoor Products, Inc., $1,638,063 for tank assemblies; and

Stevens Manufacturing Co. (Ebensburg, Pa.), $1,629,247 for 1½-ton cargo trailers and 1½-ton trailer chassis; Whittaker Corp. (Saugus, Calif.), $1,613,700 for igniters for 2.75-inch rocket motors; Pacific Car and Foundry Co., $1,600,000 for overhaul and conversion of M110 artillery guns to self-propelled full-tracked M107 guns; and

Maremont Corp. (Saco, Maine), $1,561,016 for 7.62mm machineguns with spare barrels and bipod assemblies; Poloron Products, Inc., $1,491,000 for M131A fin assemblies for 750-pound bombs; Computer Sciences Corp., $1,465,116 for internal procedures and automatic data processing programs with a training program; and

Page Communications Engineers, Inc., $1,453,000 for engineering services and equipment for integrated wide band communications system in Vietnam; International Terminal Operating Co., Inc., $1,404,338 for filling containers and related services; Lockheed Aircraft Corp., $1,397,873 for equipment and services in connection with underground nuclear testing at the Nevada site; and

Pace Corp. (Memphis, Tenn.), $1,390,194 for surface flares; Kennedy Van Saun Corp. (Danville, Pa.), $1,357,500 for metal parts for projectiles; Varo, Inc., $1,346,700 for AN/TVS-3 searchlights; Mine Safety Appliances Co., $1,342,522 for multiyear procurement for M17A-1 field protective masks; Firestone Tire and Rubber Co., $1,332,445 for loading, assembling and packing of ammunition and related components at the Ravenna Army Ammunition Plant; and

Union Carbide Corp., $1,310,031 for dry batteries; Mills Manufacturing Co. (Asheville, N.C.), $1,303,800 for cargo parachutes; Sharpe and Hamaker, Inc. (Arlington, Va.), $1,286,682 for construction of a Night Vision Simulator Laboratory at Fort Belvoir, Va.; Machlett Laboratories, Inc. (Stamford, Conn.), $1,244,000 for image intensifier assemblies for the night vision program; and

Akwa Downey Construction Co. (Milwaukee, Wis.), $1,238,628 for construction of a communication electronic shop and an addition to an existing auto maintenance shop including site preparation, excavation and all support utilities; Burroughs Corp., $1,237,489 for automatic message processing equipment; and

United Ammunition Container Corp., $1,233,881 for ammunition containers; Gunnar I. Johnson and Son, Inc., $1,228,000 for construction of 200- and 600-meter testing ranges at the Twin Cities (Minn.) Army Ammunition Plant; AiResearch Manufacturing Co. of Arizona, $1,226,700 for gas turbine engines and containers for the Army Medical Unit Self-contained Transportable (MUST); and

Bell and Howell Corp., $1,185,338 for metal parts for 81mm projectile fuzes; Irving Air Chute Co., Inc., $1,124,470 for cargo parachutes; Flinchbaugh Products, Inc. (Red Lion, Pa.), $1,112,324 for metal parts for 90mm projectiles; and

Missouri Research Laboratories, Inc., $1,101,936 for 195 patient ward containers for MUST; TRW, Inc., $1,081,452 for electrical equipment shelters; Whirlpool Corp., $1,040,918 for 90mm projectiles, XM594; and Pioneer Recovery Systems, Inc. (Manchester, Conn.), $1,000,110 for cargo parachutes.

Hueycobra Armed With XM28 Weapon System

All AG–1G Hueycobra helicopters being shipped to the Vietnam conflict are now being equipped with the XM28 weapon system, giving crews more firepower than they have ever had, the Department of the Army announced.

Flexibility in delivering the firepower is a feature of the XM28 system. Three combinations of weaponry are mounted in the AH–1G chin turret—two M134 high-rate-of-fire machineguns, two XM129 high-velocity grenade launchers, or one of each. Rapid change of these combinations is possible, a feature facilitating repair or replacement.

Each AH–1G also has two armament racks under each of its stub wings. These racks can carry 7.62mm automatic gun pods capable of firing 2,000 or 4,000 shots a minute; or either a 7- or 19-tube 2.75-inch rocket launcher.

The XM129 grenade launcher fires its 40mm rounds at rates of 425 to 450 shots a minute, using the same fragmentation projectiles that have proved highly effective in Vietnam.

Production and deployment of the of the Hueycobra are conducted under the overall management of the Commodity Management Office, HQ Army Weapons Command, Rock Island (Ill.) Arsenal.

AVIATION TEST BOARD member makes adjustment to chin turret of XM28. At left is M134 high-rate-of-fire 7.62mm machinegun. At right is XM129 high-velocity 40mm grenade launcher.

WECOM's First Research Chief Retires After 23-Year Career

Gerald Reinsmith, who served as chief of the research office when the Army Weapons Command was activated in August 1962, ended a 23-year career in Army research and engineering activities by retiring Aug. 31.

Under his leadership, the research office was responsible for recommending research programs and for reviewing and directing research performed at WECOM subordinate installations.

He and his wife will establish residence in Cape Coral, Fla.

U.S. ARMY MATHEMATICS STEERING Committee members gathered recently at the Harry Diamond Laboratories, Washington, D.C., for the 25th meeting of the AMSC since it was established in February 1956. Only 26 members were present and only 23 were available for this picture, believed the only one ever taken of the group. Dr. I. R. Hershner Jr., chief of the Physical and Engineering Sciences Division, Army Research Office, Office of the Chief of R&D, DA, has served as chairman of the AMSC for the past eight years. Seated (l. to r.) are Jerome H. N. Selman, Picatinny Arsenal, Dover, N.J.; Gerard T. Dobrindt, Aberdeen (Md.) Proving Ground; Col Stefano Vivona, Walter Reed Army Institute of Research, Washington, D.C.; Joseph Kirshner, Harry Diamond Laboratories (HDL), Dr. Walter D. Foster, Fort Detrick, Md.; 1st Lt Michael A. Moses, Office of the Assistant Vice Chief of Staff, DA; Dr. Richard Soland (standing), Research Analysis Corp.; Capt W. Stephen Piper (standing), Assistant Vice Chief of Staff, DA; Dr. John H. Giese (standing), Aberdeen Proving Ground; Sidney Sobelman, Office of the Deputy Chief of Staff for Operations, DA; Dr. Alan S. Galbraith, Army Research Office-Durham, N.C.; Dr. I. R. Hershner Jr.; Fred Frishman, AMSC Secretary, Army Research Office, Washington, D.C.; Joseph Weinstein, Electronics Command (ECOM), Fort Monmouth, N.J.; Lawrence A. Gambino, Army Engineer Topographic Laboratories, Fort Belvoir, Va.; 1st Lt G. A. Shanholt, Fort Belvoir; Dr. Siegfried H. Lehnigk, Redstone (Ala.) Arsenal; Dr. Walter Pressman, ECOM; Dr. Francis J. Murray, Duke University, Durham, N.C.; Prof. Robert M. Thrall, University of Michigan; Dr. Gilford Quarles, chief scientific adviser, Office of the Chief of Engineers, DA; Dr. Ernest P. Paxton, Fort Eustis, Va.; Dr. J. Barkley Rosser, director, Mathematics Research Center, U.S. Army, University of Wisconsin.

Edgewood Staging Design of Experiments Meet

Lt Gen William B. Bunker, deputy CG of the U.S. Army Materiel Command, and three distinguished professors have accepted invitations to speak at the 14th Army Conference on Design of Experiments, Oct. 23–25, at Edgewood Arsenal, Md.

General Bunker will give the introductory address on "Design of Experiments." Prof. Rolf E. Bargmann of the University of Georgia at Athena will follow with "Structure and Classification of Patterns."

Other speakers between clinical and technical sessions will be Prof. Acheson J. Duncan, Johns Hopkins University, "Bulk Sampling," and Prof. Emanuel Parzen, Stanford University, "Time Series."

The U.S. Army Research Office-Durham, N.C., has set Aug. 30 as the deadline for submission of synopses of papers to be presented at the technical and clinical sessions.

The Design of Experiments Conference is sponsored by the Army Mathematics Steering Committee chaired by Dr. Ivan R. Hershner Jr., chief of the Physical and Engineering Sciences Division, Office of the Chief of Research and Development, Department of the Army.

Conference Chairman Dr. Frank E. Grubbs, associate director, U.S. Army Ballistic Research Laboratories, Aberdeen (Md.) Proving Ground, has requested that nominations for the Samuel S. Wilks Award be forwarded to him or to Dr. Francis G. Dressel, Mathematics Division, ARO-D, Box CM, Duke Station, Durham.

Award of the Wilks Memorial Medal is a highlight of the annual meeting of statisticians.

Tarbert Gets APG Director's Award

Recipient of the 1968 Director's Award at Aberdeen (Md.) Proving Ground Development and Proof Services is John H. Tarbert, a senior test director.

Employed in the same test division for the past 18 years and a senior test director in the Special Equipment (Electronics) Branch since 1964, Tarbert was commended by Col Paul A. Troup, Jr., D&PS director.

The citation noted his "successful and timely completion" of the U.S. Army Test and Evaluation Command's highest priority project "which affected the Department of Defense plans on the conduct of the war in Southeast Asia." The project involved test and evaluation of the effects of detection and transmission devices, within a 4-month time frame.

AMSC Sponsors Army Mathematicians Meet at WECOM

HQ U.S. Army Weapons Command at Rock Island (Ill.) Arsenal was host to the recent 14th Conference of Army Mathematicians, sponsored by the Army Mathematics Steering Committee on behalf of the Army Chief of Research and Development.

About 100 mathematicians from Army installations throughout the United States attended the 2-day program. Featured were addresses by Col Lothrop Mittenthal, U.S. Army R&D Group, Frankfort, Germany, and Col Leonard M. Orman, acting deputy commander of WECOM.

WECOM's Dr. Alexander Hammer was master of ceremonies at the conference dinner. Col J. J. Albertson, arsenal commander, gave the welcome.

Six of the technical papers presented were authored by WECOM personnel, as follows: Stephen D. Beck, Watervliet Arsenal (WA), "Finite Fourier Transforms in Plane Polar Coordinates"; Dr. Jagdish Chandra, WA, "The Generalization of the Gronwall-Bellman Inequality in Partially Ordered Banach Spaces," coauthored with Dr. B. A. Fleischman of Rensselaer Polytechnic Institute; and

Dr. Royce Beckett, Rock Island Arsenal (RIA), "Optimization of a Dynamical Response of a Structure"; R. Steven Newell, RIA, "Optimal Design of Structures with Angular Deflection Restrictions," coauthored with Dr. (Capt) Edward Haug Jr.; Dr. Eugene Brunelle, WA, "Perturbation Solutions of the Conical Shell Vibration Problem"; and Dr. Chi-Neng Shen, WA, "Analysis of Heat Exchanger Dynamics with Stochastic Parameter Variations and Closed Loop Control," coauthored by Peter Jasinski and Manfred Wittler.

US/FRG Army Observers Report to Duty Stations For MBT Development Tests

United States and Federal Republic of Germany senior Army observers for main battle tank for the 1970s (MBT–70) developmental tests are now at their duty stations.

In making this anonuncement, HQ U.S. Army Test and Evaluation Command (TECOM), Aberdeen (Md.) Proving Ground, said the tests are beginning on the 60-foot-long heavy equipment transporter. Six U.S. and six German prototypes are being delivered for tests at U.S. and West Germany proving grounds.

Stationed at Aberdeen as chief of the German observer group is Lt Col Ralph Rodenhauser, veteran Bundeswehr tank officer from Munich, Bavaria, who has been with the MBT–70 program since 1966.

Initially, he was with the Joint Engineering Agency, a subordinate element of the U.S./FRG MBT–70 Program Management Board, where General Motors Corp. produced the U.S. MBT–70 prototypes. He is responsible for supervising German observers at Aberdeen, also those with the U.S. Army Armor and Engineer Board at Fort Knox, Ky., and elsewhere as required.

Lt Col Ralph Rodenhauser

Col Ralph C. Waara

Col Chester C. Sargent

Col Rodenhauser's experience as a tank officer began with one of the first German armored units in the 1930s. His American counterpart in Germany is Lt Col Ralph C. Waara, a 40-year-old armor officer from St. Ignace, Mich., who is stationed in Koblenz, Germany. Detachments at German proving grounds near Meppen and Trier are under his supervision. A third detachment will be at Munster-Lager when tests begin.

Col Waara has been an armor officer since 1952 and in recent years has been assigned to Germany (three years with the 4th Infantry Division), Alaska and South Vietnam. Assigned to HQ TECOM in January 1966, he was awarded the Army Commendation Medal in recognition of his accomplishments prior to departure for Germany.

The U.S. test program is directed from HQ TECOM by Col Chester C. Sargent, MBT–70 systems test manager. He exercises operational control over the U.S. observer group in Germany and has the German group attached to his office.

Col Boller Becomes Director of GETD

Responsibility for general equipment testing for the U.S. Army Test and Evaluation Command (TECOM) was assumed in July by Col Quellen D. Boller. Col James O. Daulton headed the General Equipment Testing Directorate (GETD) from November 1965 until his recent assignment to Fort Bragg, N.C.

Col Boller joined the HQ TECOM staff after nearly five years in the office of the Deputy Chief of Staff for Military Operations and Reserve Forces, U.S. Continental Army Command, Fort Monroe, Va. He heads one of the eight commodity-oriented testing directorates that coordinate the test programs conducted by TECOM's 15 proving grounds, service test boards, environmental test centers and special test activities.

The GETD is responsible for items commonly used by engineer, quartermaster and transportation units and for general use items not within the jurisdiction of other directorates. In these categories of equipment are items such as general-purpose vehicles, materials-handling equipment, marine and railway gear, individual clothing and equipment.

Col Boller graduated from the U.S. Military Academy with the Class of 1943 and received his master's degree in automotive engineering from the University of Michigan in 1949. His military education includes graduation from the Artillery School advanced course and from the Army Command and General Staff College.

Commissioned in the Coast Artillery Corps during World War II, he served initially on the Atlantic coast with the 359th AAA Searchlight Battalion. In the Philippines from 1945 to 1947, he took part in the Leyte and Luzon campaigns and served in the Manila provost marshal's office after the city was recaptured by the Sixth Army.

His first assignment with the Continental Army Command was R&D coordinator in connection with the development of combat vehicles from 1959 to 1962. He was then assigned to Korea as commander of the 5th Howitzer Battalion of the 82d Artillery until he returned to CONARC.

Col Quellen D. Boller

NIPA Selects AMC Analyst For 1968–69 Education Award

David L. Stanbrough, a management analyst for HQ Army Missile Command since 1966, has been selected by the board of trustees of the National Institute of Public Affairs to receive a career education award for the 1968–69 academic year.

Chosen in national competition because of his exceptional ability, outstanding performance, and high potential for future leadership in U.S. Government, he is among 23 federal employes selected for the 1968–69 program.

Stanbrough began his federal service with the Army Aviation Command in 1962, soon after completing work for his MA degree from the University of Chattanooga. He received his BA degree in 1960 from Tennessee Temple College.

Stanbrough will attend the University of Virginia's Woodrow Wilson Department of Government and Foreign Affairs. Instruction stresses basic understanding of governmental processes and institutions and the development of critical judgment, analysis and communicative facility.

AFIP Schedules Forensic Dentistry Course, Oct. 7-11

Members of the dental, legal and law enforcement professions will participate at the Armed Forces Institute of Pathology (AFIP), Washington, D.C., Oct. 7–11, in the only forensic dentistry course in the United States.

AFIP Director Capt Bruce H. Smith, USN (MC), said the program, one of the few of its kind in the world, is presented to develop a critically needed nucleus of dentists trained in the principles of identification and dental jurisprudence to respond to the collective requirements of the three professions.

The faculty will include dentists with experience in forensic odontology, general and oral pathologists, law enforcement officials, lawyers, anthropologists and an identification expert.

The course will provide the first opportunity for an American audience to hear Dr. Soren Keiser-Nielsen, professor of forensic odontology, Royal Dental College, Copenhagen, Denmark, who will be on the faculty.

Lecture subjects will include Recent Advances in Identification; Dental Identification in Mass Disasters; The Relationship between Forensic Dentistry and the Federal Bureau of Investigation; Study of Bite Marks; and Professional Liability.

Course Director Col William G. Sprague, USAF, Dental Corps, said the course "is essential in this country as the sole medium for continuing dialogue among the three professions."

In the science of identification, he said, the spiraling rate of air traffic has posed great challenges to officials. Fires following air crashes often destroy the bodies, leaving teeth and dental restorations as the only identifying structures.

In criminal investigation, many police officers are not aware that the dentist trained in forensic odontology is often able to judge age, sex, race and even occupation from teeth and associated structures and bite marks.

Police have been helped to solve crimes by forensic odontologists who examined food from which bites have been taken and the imprints of teeth on bodies of victims of violent death.

Features of the course include a laboratory session on identification of human remains by comparison of dental records and a mock trial depicting the role of the dentist as an expert witness or defendent.

Members of the law enforcement, legal and dental professions are invited to make application by writing to the Director, ATTN: MEDEM-PG, Armed Forces Institute of Pathology, Washington, D.C.

USACDC Establishes RILO As Army-Industry Contract

Organization of a new Research and Industrial Liaison Office (RILO) to provide coordination between Army, industry and science planners was announced in July by HQ U.S. Combat Developments Command, Fort Belvoir, Va.

Headed by Lt Col James W. Ryan, RILO is intended to help establish face-to-face contact between Combat Developments Command headquarters staff personnel and their research counterparts in industry. Seminars, briefings and informal meetings will be used for this purpose, and the office will work closely with the CDC Scientific Advisory Group.

RILO is preparing a booklet on its operations. Persons or organizations desiring to receive this document should contact RILO, HQ Army Combat Developments Command, Fort Belvoir, Va. 22060.

DCA Contract to Modernize 9 Centers

Modernization of a portion of the AUTODIN (Automatic Digital Network) has been contracted for by the Defense Communications Agency (DCA), Washington, D.C. AUTODIN is a data transmission and switching network and is an essential part of the Defense Communications System.

DCA awarded the contract through its Defense Commercial Communications Office (DECCO), Scott Air Force Base, Ill., which will service the contract. It calls for estimated monthly recurring-use charges of $595,000, including amortization and operating expenses.

The Western Union Telegraph Co. will invest approximately $20 million in this project, with RCA Corp. and Control Data Corp. as subcontractors.

The project will include replacement of some equipment at all nine of the AUTODIN centers presently provided by Western Union, located at Albany, Ga., Andrews Air Force Base, Md., Fort Detrick, Md., Gentile Air Force Station, Ohio, Hancock Air Force Station, N.Y., McClellan Air Force Base, Calif., Norton Air Force Base, Calif., Tinker Air Force Base, Okla., and Wahiawa, Hawaii.

Completion of construction will improve the operational efficiency and reliability of operations and will reduce power and air-conditioning requirements.

The first site is scheduled for completion by Sept. 30, 1969, with the last site completed by Mar. 15, 1971.

Unique Structure to House Joint Command HQ at APG

When the new Joint Command Headquarters building under renovation and construction at Aberdeen Proving Ground, Md., is completed, it is expected to be unique among contemporary structures of its type in this country.

Decorative panels will cover exterior walls of the entire second story of the 3-story edifice. Installation should be completed within the near future.

Each panel is 23 feet 4 inches high by 5 feet wide, weighs 2 tons (precast concrete, steel reinforced), and has a natural aggregate finish in a white cement frame. Strescon Industries, White Marsh, Md., is producing the panels in five types.

Approximately 216 panels will be used in the construction. Each panel will hang by clips and is attached to the steel framing by bolts. A slotting arrangement allows each panel to fit snugly and the unusual "hanging" method of attachment completely eliminates the necessity for a special support foundation.

Members of the Proving Ground's Engineering Support Services Division, who are working closely with construction engineers, stated that the panels would almost completely eliminate damage from concussion while substantially reducing tremors created by gun firing.

The new headquarters building was designed to utilize the existing framework of the former Ordnance Center and School Museum. When completed, the building will be 190 feet wide by 340 feet long and will contain 154,000 square feet of floor space.

"PANELISTS" prepare to "seat" a decorative concrete panel as a mobile crane swings it into place on framework of Joint Command Headquarters building at Aberdeen Proving Ground.

Key Officials Attend Opening of Quality Control Lab

Ceremonies for the opening of a Medical Quality Control Laboratory, a $750,000 facility at the Philadelphia (Pa.) Defense Personnel Support Center, 2800 South 20th Street, attracted many distinguished officials.

Brig Gen William M. Mantz, commander of the center, said the laboratory facilities are capable of covering the full scope of testing and evaluating medical materiel, ranging from drugs to surgical and hospital supplies. Cmdr Henry S. Rudolph, MSC, U.S. Navy, is laboratory chief.

Among responsibilities of the laboratory will be supporting medical procurement by testing and evaluating precontract award and production samples, examining depot medical stock samples to determine suitability for issue and use, and analyzing and examining manufactured drugs and chemicals for compliance with specifications.

The new laboratory traces its history back to the early days of World War II, when it was organized under the Army Medical Department for testing medical materiel purchased by the Army and Navy Procurement Agency in Brooklyn, N.Y.

In 1965, the Philadelphia Defense Personnel Support Center assumed the mission of supplying medical materiel to the military. Most operations of the former Defense Medical Supply Center were moved. Due to lack of space in Philadelphia, the Medical Quality Control Laboratory remained in Brooklyn.

The laboratory is a branch of the Division of Technical Operations, Directorate of Medical Materiel. Key scientific personnel moved from Brooklyn include Thomas Guild, laboratory chief, Ferdinand Stoll, senior chemist, and Robert Baclawski, senior engineer.

Gould, a graduate of Brooklyn Polytechnic Institute, has more than 25 years experience in chemical and drug testing. Stoll has a master's degree from Purdue University and was formerly professor of pharmacy at the University of Kentucky. Baclawski graduated from Ohio State University and has 25 years experience in medical materiel testing.

Operational Crews for Vulcan Begin Training at Fort Bliss

Operational crews for the Vulcan weapon system, the U.S. Army's newest air defense, have started training at Fort Bliss, Tex., following extensive testing of the system at Aberdeen (Md.) Proving Ground.

Based on the Gatling Gun principle, the 20-mm XM 168 Vulcan is an air-cooled, rotating, multiple-barrel type automatic gun that fires up to 3,000 rounds a minute. The gun is operated by an electric drive and fires electrically primed linkless ammunition from each of its six rotating barrels.

Development of the Vulcan gun was accomplished under contract with General Electric Co. at Burlington, Vt.

ICAF Prepares Second Text on Defense R&D

Defense Research and Development, the second of two texts prepared by the Industrial College of the Armed Forces (ICAF) to replace the 1960 edition of *Research and Development*, is edited by Ralph Sanders, ICAF professor of public administration.

Based on intensive research, this 181-page textbook serves as a complement to the first text, *Science and Technology: Vital National Assets*, published in 1966.

Covering many aspects of the operation of the scientific and technological programs of the Department of Defense, *Defense Research and Development* examines in detail the relationship between defense and science and technology.

The chapters were written individually by seven members of the 1966–67 Industrial College class and coordinated by the editor.

One of the main areas explored by the authors concerns the responsibilities of defense R&D management and the various roles played by timing, creativity, discipline and decision in this vital field.

"Largely organized around DoD's development of the R&D spectrum," the text provides both a general background and detailed analyses of defense R&D management, development, organization, research, and past and future performance.

Special attention is paid to the progression of R&D "from investigations of fundamental natural phenomena to building a piece of hardware," with detailed examination of the various phases involved.

Included within this examination are studies on R&D philosophy, structure and managerial practices; the relationship between military requirements and R&D scientific and technological programs; research, exploratory and advanced development; contract definition; the process of weapon development; fulfillment of military requirements of the United States; cooperation with allies; and the past accomplishments of defense R&D with an eye to future trends in management.

As only a limited number of copies of *Defense Research and Development* are in print, the text is not available for general sale. Copies are being distributed selectively to government agencies and on a study program basis to those individuals or agencies having a career or professional interest in the subject.

Army Appoints Romm Civil Defense Director

U.S. Army responsibility for Civil Defense is now vested in Joseph Romm, a 17-year veteran of the Department of Defense, who recently took over as director after serving since Jan. 1 as acting director.

Transferred to the Office of the Quartermaster General in the War Department in 1941, after serving about a year with the Bureau of the Census, Romm has climbed the ladder of progressively responsible assignments.

After 10 years with the Army, he transferred to the Department of Defense in 1951. He was assistant director of Civil Defense from 1961 until he became acting director, following resignation of William P. Durkee.

As staff director for Vulnerability Analysis in the Office of the Assistant Secretary of Defense for Installations and Logistics, he was responsible for a program for assessing effects of possible attack on industrial resources. He developed programs for introducing nuclear damage assumptions into military logistics planning, and was one of the founders of the Defense Department Damage Assessment Center, now the National Military Command System Support Center.

Joseph Romm

Born in New York City on Nov. 2, 1920, he is a 1940 graduate of City College of New York, where he majored in mathematics and biology. He holds a master's degree in economics from American University.

During World War II, he served two years in the European Theater of Operations with the Army Signal Intelligence Division.

$2.1 Million Building Started for Simulator at RIA

Groundbreaking ceremonies for construction of a $2.1 million building to house the first Army test device capable of simulating motions of an armored vehicle or a helicopter, while absorbing and measuring forces of the weapon being fired, were held recently at Rock Island (Ill.) Arsenal.

When installed, the simulator will enable Army Weapons Command (WECOM) researchers and engineers to develop, more quickly and economically, improved gun-type armament for self-propelled artillery, armored vehicles and helicopters. The building is scheduled for completion in July 1969.

Representing Brig Gen William J. Durrenberger, CG of WECOM, Col Leonard M. Orman, deputy CG, turned over the first shovelful of dirt at the groundbreaking ceremonies.

Because of the close relationship of the vibration effects of the weapon on the vehicle and the vibration of the vehicle on the armament, a large portion of the research will be devoted to the mount—the hardware joining the vehicle and the armament.

WECOM engineers will be able to duplicate these vibrations on the new simulator. While the simulator is in operation, the weapon mounted on it will actually be fired to duplicate the complete interaction of weapon, mount and vehicle or "platform."

The simulator will be located in the center of the building. A 20-ton-capacity crane will make it possible to move large tank guns, helicopter frames, and other bulky weaponry items into position on the simulator for remote-controlled firing down a 1,000-inch range.

A control room for the range will give the researchers an unobstructed view of the simulator in action. Data acquisition devices will give WECOM engineers information about the test being conducted. A computer system will be used to store and evaluate acquired data.

A second 1,000-inch range will have environmental controls that will give a temperature variation from 90° below zero to 200° above.

Two other ranges, each 100 meters long, with remote firing control rooms and adjustable lighting that will give almost perfect simulation of natural light conditions 24 hours a day, will also be included in the new building.

The 545-foot long, 113-foot-wide building will be constructed by the Priester Construction Co. of Davenport, Iowa. Contracts for production and installation of the simulator test devices have not been awarded.

Redstone Arsenal to Test S/D-500 Information System

"Push-button" access to more than 3.6 million pages of technical reports will be provided by a new high-speed information retrieval system at the Redstone Scientific Information Center, Redstone Arsenal, Ala.

The center provides library services to both the Missile Command and the Marshall Space Flight Center as an administrative element of the Army Missile Command's Research and Development Directorate.

The S/D–500 System, which has intermixed format storage and retrieval capability, was shown publicly for the first time by Sanders Associates, Inc., at the recent National Microfilm Association Show in Chicago. It consists of a microimage repository that can hold and display intermixed microimages of all sizes and formats and a remote television-type display terminal and keyboard.

Arrangements call for the initial system, including one display terminal, a power file and a special hard-copy printer, to be delivered at the center within seven months for acceptance tests.

The data storage and retrieval system will locate a specific page of information, display it on a TV-like screen for viewing and printout a permanent copy—all automatically and in a matter of seconds.

The Redstone center will use the system to house a sample collection of reports and to begin investigation of automatic image-handling techniques as part of its participation in the ATLIS (Army Technical Library Improvement Study) efforts sponsored by the Army Research Office.

Reports will be stored in the system's 8 x 10-foot repository after they have been reduced photographically onto "microfiche."

When a viewer wishes to see a specific report or page, he will enter a request for it through the keyboard. The item will be selected automatically and pictured on the display terminal at the viewer's desk by a built-in closed-circuit television system. A special hard-copy printer will permit the user to obtain paper copies of the information being displayed.

The system to be delivered to Redstone will be standardized on "Cosati" microfiche cards. The repository can store up to 50,000 of these cards, with 72 pages imaged on each card. The remote display terminal will be located about 500 feet from the data-storage unit.

Gudaitis Takes MICOM Hawk Project Office Post

Designation of William Gudaitis as acting deputy project manager of the Hawk Project Office was announced recently by HQ Army Missile Command.

Employed by MICOM since 1960, he has served as technical director of the Army Inertial Guidance and Control Laboratory where he was instrumental in setting up the Army Inertial Guidance Management and Technology Center for Army-wide coordination of inertial system and component R&D.

Gudaitis received the Army Meritorious Civilian Service Award in 1964 and in 1965 became the first Army employe to receive an Alfred P. Sloan Fellowship Award for a year of study at Massachusetts Institute of Technology, leading to an MS degree in management.

William Gudaitis

Following his return from MIT, Gudaitis was transferred to the Research and Development Directorate's Advanced Sensors Laboratory as deputy director, later serving as acting director.

Before joining the government, he worked for the Chrysler Corp. Missile Division in missile guidance and control, and with the Bendix Corp. Research Laboratories in radar system and computer design.

Gudaitis earned a BS degree in physics from the University of Detroit and has done graduate work at both Harvard and at MIT. He is a senior member of both the Institute of Electrical and Electronic Engineers and the American Institute of Aeronautics and Astronautics.

MacArthur Papers Available

The late General Douglas MacArthur's personal papers are now available for examination. Inquiries about the nature of these papers and requests for access to them should be forwarded to Philip P. Brower, director, Bureau of Archives, MacArthur Memorial, 198 Bank Street, Norfolk, Va. 23510.

DoD Announces Plans for DSCS Program

Announcement of a decision to proceed with the next phase of the Defense Satellite Communications System (DSCS), involving development and acquisition of new satellites and terrestrial terminals, was made in July by the Department of Defense.

Dr. Gardiner L. Tucker, Deputy Director of Defense Research and Engineering (Electronics and Information Systems), informed the House of Representatives Military Operations Subcommittee of the Government Operations Committee of the decision in recent testimony.

Procurement of the new satellites and development of the new terminal types, he said, will be initiated in FY 1969. Some of the new satellites are expected to be placed in synchronous, equatorial orbit by late 1970 or early 1971.

Both "earth coverage" and "narrow beam" antennas will be built into the new satellites. The first will direct most of the satellite radiated power toward the earth, providing relatively uniform coverage of that portion of the earth visible to the satellite. The narrow-beam antennas will focus their radiated energy to illuminate an area of one to two thousand miles in diameter on the earth's surface.

The narrow-beam antennas will be steerable, so that the beams may be directed toward any selected area of the earth visible to the satellite. The satellites are to be positioned above the equator so that most of the earth's surface will be visible to at least one of the satellites at all times.

This next phase of the Defense Satellite Communications System will provide many more channels for unique and vital military needs than are provided by the initial system. The concentration of radiated power provided by the narrow beams will enable establishment of channels to highly transportable terminals having smaller antennas.

Commercial satellite and other common carrier communications systems will continue to be used for transmission of a substantial load of routine traffic between the United States and overseas locations.

The program to establish the advanced system will be under the management of the Defense Communications Agency. DCA also will exercise operational control over the system when it is established.

The Department of the Army will be responsible for development and acquisition of land terminals. The Navy will be responsible for the development and acquisition of shipboard terminals. The Air Force will be responsible for the development, acquisition, launch and on-orbit control of the satellites and for development of airborne terminals that might be used with the system.

Requests for proposals on the new satellites will be issued to industry later this summer.

USAEPG Completes Tests on AN/PPS-5 Radar Set

Final engineering and reliability testing of the U.S. Army AN/PPS–5 Surveillance Radar Set, currently in use in the Vietnam conflict, was completed recently at the US. Army Electronic Proving Ground, Fort Huachuca, Ariz. The unit is the most modern of its type.

Weighing about 120 pounds, the unit normally is carried and operated by three men. Two silver-zinc batteries provide power and it is equipped with a 50-foot cable for remote operation. A distinguishing feature is its wing-like, disc-shaped antenna.

Ruggedly constructed, the set is designed for all-weather use by tactical units. Moving targets, such as foot troops, vehicles and other units, are indicated to the operator through a headset by an audio tone superimposed on background noise, or visually on radar display scopes.

Final testing in the USAEPG Environmental Division of the Applied Mechanics Directorate included operation, performance and reliability of the unit under simulated climatic and physical stresses.

Instrumentation provided a precise recording of results of exposure to extremes of wind, altitude, sand and dust, temperature and humidity, vibration, shock, immersion, salt fog, jungle fungus and corrosion.

Assisting in the tests was a representative of the Airborne Instruments Co., Deer Park, N.Y., prime contractor for the AN/PPS–5. The USAEPG was represented by D. R. Pittman, chief of the Surveillance Test Division. Frank J. Leyva ran the engineering tests and CWO George A. Van Horn supervised reliability.

AN/PPS–5 Surveillance Radar Set is shown at White Sands (N. Mex.) Missile Range Environmental Pretest Shop. At left is the control indicator and on the tripod is the receiver-transmitter with antenna mounted in place. Test equipment is on the bench. Hidden behind the antenna is the silver-zinc battery power supply unit.

ARPA Awards $6.5 Million For Upstage Missile Program

Award of the first increment of $6.5 million of a planned $25.8 million contract for an experimental missile configuration known as Project Upstage, a part of the continuing research on ballistic missile systems, was announced June 28.

Advanced Research Projects Agency (ARPA) awarded the contract to the Douglas Missile and Space Systems Division, McDonnell-Douglas Corp., as a follow-on to Project Defender programs.

Flight tests will be conducted later in the program at White Sands Missile Range, N. Mex.

Work on the Upstage program will be directed by the Nike-X Development Office (NXDO) at Redstone Arsenal. The NXDO manages the program for the U.S. Army Advanced Ballistic Missile Defense Agency of OCRD.

STRATCOM Liaison Office Established at Fort Monroe

Establishment of a Strategic Communications Command (STRATCOM) liaison office at HQ Continental Army Command, Fort Monroe, Va., became effective Aug. 1.

The office will be an element of STRATCOM to assure coordination of various engineering, installation and construction programs in which both commanders are interested. It will also serve as a coordinated planning point in support of component command activities of the commanding general. CONARC, in support of the commander-in-chief, U.S. Strike Command (CINSTRIKE) and commander-in-chief, Atlantic (CINCLANT).

As an added project, the new office will provide coordinated communications support proportionate to the planned force deployment in event of civil disturbances.

FIRST GAS REGIMENT VETERANS shown reminiscing during Edgewood Arsenal's June 22 Celebration of the 50th anniversary of U.S. Army Chemical Corps are (l. to r.) Henry C. Molter, Conneaut, Ohio; John Temple, Folsom, Pa.; R. V. Jordan, North Chatham, N.Y.; and Carl E. V. Berger, Tacoma Park, Md.

Chemical Corps Veterans Celebrate 50th Anniversary

Half a century passed in review, highlighted by recollections of 18 survivors of the "Hell Fire Boys" of the 1st Gas Regiment who pioneered chemical warfare, when the U.S. Army Chemical Corps recently celebrated its 50th anniversary at Edgewood Arsenal, Md.

Retired General Anthony McAuliffe, a former Army Chief Chemical officer, headed an illustrious gathering of past and present leaders of the Chemical Corps in making the most of the occasion. As was befitting, with the Hell Fire Boys assembled once again from all parts of the United States, sentiment flowed freely.

General McAuliffe, better known to the world for his "Nuts" reply to the German demand for surrender of U.S. Forces at Bastogne in the World War II Battle of the Bulge, joined with Arsenal Commander Col Paul R. Cerar in welcoming the celebrants.

Following by little more than a month the 50th anniversary of the founding of Edgewood Arsenal, the Army Chemical Corps celebration on June 22 featured awards ceremonies, a parade, a huge picnic, sports, games, dancing and the general good fellowship sparked by old friendships. It turned people "on."

Among veterans who gathered from many parts of the nation was Andrew A. Benson, Holdredge, Nebr., a former medic with the Hell Fire Boys who fought in more than 130 actions in the "war to end all wars."

Patriarchal-looking Dr. Ralph F. Beard of Kennebunkport, Maine, was on hand to join in the reminiscing, as was Henry C. Molter of Conneaut, Ohio, who was awarded the Distinguished Service Cross for extraordinary heroism while serving as a sergeant with Company B of the Hell Fire Boys in France.

Members of the 1st Gas Regiment and former chiefs of the Chemical Corps joined with past Edgewood Arsenal commanders in taking the salute during the formal review and parade. More than 2,000 observed the ceremonies.

After the parade, a memorial service was held at a monument erected in June 1925 to honor 75 members of the 1st Gas Regiment who were killed during World War I. Col Cerar and A. A. Hawthorne of Pittsburgh, Pa., who served 50 years ago with Company B, placed a wreath on the memorial.

"LEFTOVER CLUB" shown discussing early days at Edgewood Arsenal with Col Paul R. Cerar, present commander, are (l. to r.) Rosella Nagall, Gertrude Kutzleb, Agnes Duggan, Alice Amos and Julia Morgan. That's right—all Misses!

Separate Career Fields Formed To Tailor Artillery Assignments

Formation of two separate career fields for all artillery officers was announced recently by the Department of the Army. Artillery officers below the grade of colonel will be managed as either air defense artillery or field artillery officers by their respective career branches.

Field artillery officers will remain in the present artillery branch. A separate office for the career management of air defense artillery officers will be established.

Artillery colonels will continue to be managed by the Colonels Division, Office of Personnel Operations, because of the more generalized career requirement for officers at this grade and length of service.

The doctrines, missions, equipment and techniques of air defense artillery and field artillery have created two widely separate fields, causing a need for separate concentration of skills and efforts. Two career branches will provide a tailored response to the dual missions assigned and to the anticipated professional requirements of future weapons systems.

Active Army artillery officers whose previous branch experience has been solely air defense or field artillery will remain in that particular career field. Those who have had assignments in both fields will be tentatively assigned to the career field for which they appear to be best qualified. They will be encouraged to submit a preference. Such preferences will be reviewed and considered in light of career branch requirements.

Newly commissioned officers will continue to be given a choice within limits established by worldwide military requirements. The assignment policies for enlisted men are not affected by this program.

Insignia for the new branch of air defense artillery and the current artillery branch insignia remains the authorized insignia for wear.

Battelle Reviews Metallic Device Implant Efforts

Successful implantation of metallic devices in the human body is requiring increasingly the combined skills of orthopedic surgeons, metallurgists, chemists, engineers and anatomists.

Dr. Horace J. Grover of the Columbus (Ohio) Laboratories of Battelle Memorial Institute, reported recently on this modern-day interdisciplinary effort in a *Battelle Technical Review* article.

In the past decades, he states, surgeons have become particularly concerned with metals and engineering in relation to bone and joint surgery. Developments in materials, design and application techniques have raised orthopedics to a level of sophistication requiring coordinated technology of numerous specialists.

Harmful effects of incompatible materials point up the need for collaboration between metallurgists and surgeons. Incompatibility "may not only contribute to pain and delay of healing but also to stress corrosion or to corrosion fatigue in the device itself," emphasizes Dr. Grover.

Other material characteristics the orthopedic team must contend with are fatigue strength, elastic modulus, density, surface hardness and coefficient of surface friction. Design problems have to be worked out to ensure that the part will fulfill its purpose under various conditions or twisting, bending and compression forces.

Implantation is the province of the surgeon, but engineering and scientific knowledge is also important at this point. Dr. Grover says a small nick, scratch or dent might produce a stress concentration, resulting in fatigue. Bending a bone plate several times, to conform to an irregular bone surface "might cause local work hardening, loss of ductility, and local residual stresses, all of which might weaken the plate for its intended use."

Research and development of implants along engineering-scientific lines has been limited to date to the efforts of a few surgeons and to studies by a few device manufacturers and even fewer universities.

"Many existing questions could be answered by larger-scale employment of modern methods of science and engineering in cooperation with physicians," Dr. Grover contends.

CDC Speakers Review Land Combat System Progress

Progress in designing the total Land Combat System (Army) for future years was reported by speakers from the U.S. Army Combat Developments Command (CDC) at the recent International-Standardization Program "TEAL-12" conference at Fort Benning, Ga.

TEAL is short for Tactics, Equipment and Logistics and is the annual meeting of the vice chiefs of staff of the "ABCA Armies" of America, Britain, Canada and Australia. New Zealand is an associate ABCA member. The TEAL group reviews the ABCA Armies' programs to assure the highest degree of international standardization in the development of weapons, equipment and development procedures.

The Combat Developments Command group was headed by Lt Gen Harry W. O. Kinnard, commanding general. Col Norman Farrell, commander of CDC's Institute of Land Combat at Fort Belvoir, Va., headed the briefing team. Attending were Col Russell W. Bertholf Jr., chief, International Division, CDC Directorate of Plans, and Col Claude S. Hamilton, chief of the Conceptual Design Directorate, Institute of Land Combat.

AFRRI Adds British Scientist to Staff

British scientist Dr. George M. Meaburn, noted for his work in pulse radiolysis, recently became a member of the research staff at the Armed Forces Radiobiology Research Institute (AFRRI), Bethesda, Md.

Assigned to the Chemistry Division, Physical Sciences Department, Dr. Meaburn will continue his studies of the effects of a short burst, or pulse, of ionizing radiation administered to a volume of gas or liquid.

The radiation creates free radicals, or unattached electrically charged molecules, from the components of the gas or liquid. He will be concerned with formation of free radicals and combination with other atoms or molecules.

What happens when free radicals are formed by ionizing radiation is extremely pertinent to AFRRI's research program. Institute scientists investigate the effects of ionizing radiation on biological systems, in an attempt to determine what damage occurs, how it occurs, and how it may be treated.

Research has shown that a large portion of the damage caused by ionizing radiation may be due to the creation of free radicals in water and aqueous solutions in the body. These free radicals and their combinations interfere with the proper functioning of the body's liquid systems and can therefore affect the entire body.

Dr. George M. Meaburn

Dr. Meaburn will use the AFRRI electron linear accelerator (LINAC), currently being installed, in his experiments. The LINAC is capable of producing the short bursts of radiation which create free radicals in water or an aqueous solution.

Until recently, he was a research chemist for six years with the Comissariat a l'Energie Atomique in Saclay, France, following two years as a research associate in the Chemistry Division at Argonne (Ill.) National Laboratory. From 1954 to 1956, he was assistant experimental officer, United Kingdom Atomic Energy Authority, Harwell, England.

Dr. Meaburn has a BS degree in chemistry (1954) and a PhD degree in radiation chemistry (1960) from the University of Leeds.

Hornig Announces Promotion Of Col Aines to Head COSATI

Presidential Science Adviser Dr. Donald F. Hornig, whose four titles include that of chairman of the Federal Council for Science and Technology, recently announced appointment of Col Andrew A. Aines (USA, Ret.) as chairman of the FCST Committee on Scientific and Technical Information.

Col Aines, former chief, Scientific and Technical Information Office, ARO, and the first director of Army Technical Information (1962–64), had served in a dual capacity as acting chairman and executive secretary of COSATI since the departure of William T. Knox as chairman Nov. 1, 1966. In June 1964, Col Aines was assigned to the Office of the Director of Defense Technical Information.

Some of the views of the new COSATI chairman on the rapid developments in communications technology were introduced into the May 23, 1968, *Congressional Record* (pages E4551 to 54) by Senator Hugh Scott of Pennsylvania as a "thought-provoking address."

CDC Completes QMDO for Soil Stabilization

Efforts to provide better ground mobility by rapid soil stabilization and dust control are being studied by the U.S. Army Combat Developments Command, Fort Belvoir, Va.

Realizing that present and future concepts of land and air operation are predicted on rapid reaction and high mobility for military forces, the CDC planners have completed a Qualitative Materiel Development Objective (QMDO) for soil stabilization.

A QMDO is a Department of the Army approved statement of a military need for development of new materiel. Maj Theodore L. Doherty Jr., Mobility Division, CDC Materiel Directorate, the action officer on the project, said "to achieve this objective, the employment of new and different materiels, techniques and equipment other than the conventional means will be stressed."

If and when it becomes a reality, the rapid soil stabilization system will be used primarily by engineer combat and construction units for stabilizing road, beach, air landing, weapon firing, logistical storage, medical treatment facility and other areas which require improved soil surfaces.

The system is intended to increase the stability of soil to support foot troops, animals, vehicles, weapons and aircraft in most land areas and under varied environmental conditions; also, to treat the surface sufficiently to retain its stability when wet and, when dry, to suppress and control dust.

Dust control itself is considered vital. Studies have shown that dust creates tremendous logistical problems. For example, under severe dust conditions rotor blades of helicopters have to be replaced in about 200 to 300 hours rather than an estimated 1,100 hours, and helicopter engines have to be replaced in about one-third to one-half the usage under normal environmental conditions.

MICOM Engineer Designs Infared Data Link

What do you use to monitor a missile during "a hazard test?" Leon H. Riley, an engineer in the Army Missile Command Test and Reliability Evaluation Laboratory, designed a unique new infrared data link to do the job.

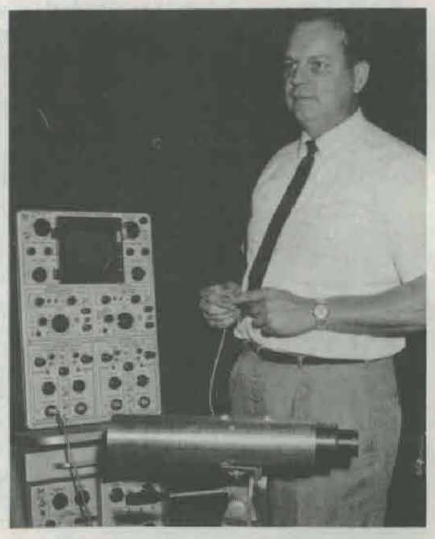
Missiles in combat are constantly exposed to a variety of radio and radar signals. The purpose of the hazard test is to determine if a missile might accidentally fire when so exposed. During the Test, a disarmed missile is bombarded with signals while a small on-board monitor sends data on the missile's behavior to the test team some distance away.

The problem in hazard testing has been that the monitor sent the data in the form of another radio signal, thus interfering with the test. In Riley's system, the monitor on-board turns the data into a pencil-thin beam of infrared light and shoots it out the nose of the missile. The receiver picks up this light, turns it back into electrical impulses and feeds it into an oscilloscope, where engineers can view it.

Riley experimented with 15 models before achieving the 5-channel transmitter-receiver combination he has today. His plans call for a 10- and possibly 20-channel model in the near future.

The infrared data link has been used in hazard tests on the TOW missile, and is also used for radio frequency effects tests on TOW, Sergeant and Lance.

Riley has worked on his data link throughout most of his four years in the Research and Development Directorate. Born in Headland, Ala., he attended Auburn University and graduated in 1954 with a BS degree in chemical engineering. After serving in the U.S. Air Force for three years, he returned to Auburn for a bachelors degree in electrical engineering. He was with Thiokol Chemical Corp. until he joined the MICOM research staff.



ENGINEER Leon H. Riley points to small light-emitting diode which is the heart of his infrared data link developed at Redstone Arsenal, Ala.

ECOM Advisory Group Selects New Chairman

Edward Goldstein, an executive with American Telephone and Telegraph Co., has been named chairman of the 8-member Electronics Advisory Group of the U.S. Army Electronics Command (ECOM) at Fort Monmouth, N.J.

Goldstein succeeds Donald G. Fink, general manager of the Institute of Electrical and Electronics Engineers (IEEE), after serving as vice chairman of the group for the past three years.

Maj Gen William B. Latta, CG of ECOM, also announced appointment of Dr. Ernst Weber as vice chairman. Dr. Weber is president of the Polytechnic Institute of Brooklyn, N.Y.

Composed of leaders from industry, universities and professional organizations, the group advises the ECOM commanding general on scientific, technological and other matters of broad scope relating to the command's mission.

Prior to his association with AT&T in New York, Goldstein was director of the Military Communications Systems Engineering Center for Bell Telephone Laboratories. He holds a bachelor's degree in electrical engineering from the University of Minnesota and has done graduate work at Stevens Institute of Technology.

Edward Goldstein

Other members of the Electronics Advisory Group are Dr. Andrew Longacre, professor of engineering at Syracuse University; Dr. C. Stark Draper, director of the Instrumentation Laboratory at MIT and Institute professor emeritus; and

Dr. James B. Angell, professor of electrical engineering and director of the Solid-State Laboratory at Stanford University; Prof. Enoch J. Durbin of the Department of Aerospace and Mechanical Sciences at Princeton University, and Dr. Jerome B. Wiesner, who is provost of MIT, and was scientific adviser to the late President Kennedy.

USACDC Completes Phase I of UTTAS Study

Phase I of a critical study to establish aircraft performance requirements for tactical movement of Army troops in the 1975–1985 time frame has been completed by the U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va.

Called UTTAS for Utility Tactical Transport Aircraft Systems, the study was started in August 1967 by HQ CDC's Doctrine Directorate, with active input from CDC Combat Arms Group, Fort Leavenworth, Kans., and Army Aviation Agency at Fort Rucker, Ala.

Phase I defines the mission and performance "design envelope" (region) for the sought-for aircraft to move troops, units and their supplies and equipment in the 1975–85 tactical zone.

Aircraft resulting from the final UTTAS studies may replace the UH–1 (Huey) series helicopters of today and start a transition toward an ultimate "family" of future aircraft. The UTTAS should be capable of all-weather day/night operations, troop lift, medical evacuation, command-control and communications, administrative and special missions.

Characteristics such as speed, hover criteria, concealability, payload and many others emerging from the CDC study milestone will now undergo technical approach and trade off studies in Phase II. During this phase, the Army will, for the first time, request suggested technical approaches to its air-mobility needs from industry.

CDC, commanded by Lt Gen Harry W. O. Kinnard, is responsible for the UTTAS concept formulation studies. The main proponent of the UTTAS study is CDC Doctrine Directorate's Joint Operations Division, with Lt Col Gerald W. Kirklighter (Air Support Branch) as action officer.

Combat Arms Group, a CDC subordinate headquarters commanded by Col Richard G. Murdock, is composed of six combat arms "expertise" agencies. The Aviation Agency, also deeply involved in the UTTAS study, is commanded by Col Howard I. Lukens.

MERDC Awards Contract To Reduce AVLB Weight

Weight reduction exceeding 50 percent in the U.S. Army's Armed Vehicle Launched Bridge (AVLB) is the objective of a contract awarded by the U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va.

AVLB officials said the new version will retain the 60-foot length and 60-ton load capacity, but it is expected to weigh about 13,000 pounds as compared to 29,800 pounds for the model currently in service.

The $38,408 contract with the Washington Aluminum Co., Inc., Baltimore, Md., calls for fabrication and delivery of one experimental design for the bridge this fall. It is to be made from 7005 and 7039 aluminum alloy extrusions and will have extruded magnesium curbs.

Weight reduction will be accomplished by employing some of the same principals and materials developed for the armored personnel carrier recently designed by the Mobility Equipment R&D Center for use in Vietnam.

Kaiser Aluminum Co. is producing the extruded orthotropic plate decking which will provide the roadway surface and act also as the primary load-carrying member. Two treadways are joined by bolted cross braces to form the roadway.

The bridge will have a geared non-eccentric hinge at the folding point of the two leaves to provide a completely flush bottom flange when it is in the open position. The folding mechanism will include a hydraulic cylinder of lightweight materials.

ECOM Single-Diode Design Replaces 18 Formerly Used

Army Electronics Command development of a single diode instead of 18 formerly used in a device to protect combat radios against breakdowns is expected to save an estimated $1.25 million through FY 1970.

As reported by the command's Value Engineering Agency, an electrical transient suppressor was developed internally on a crash basis by the Electronic Components Laboratory. It protects radio sets, including the AN/VRC–12 and the AN/GRC–106, from transistor burn-outs caused by the effects of voltage transients in tracked vehicles, such as armored personnel carriers and tanks.

Following initial design of the suppressor using an 18-diode array, ECOM engineers bought a small quantity of large single diodes in May 1967. A value engineering study at a cost of $5,000 then showed that one of the large diodes was equal to 18 of the others.

The Value Engineering Agency points out that, as with many materiel items, the procurement projections could be changed but that in any event savings will be "very substantial."

WRAIR Awards Hoff Medal to Lt Col Sheetz

Recipient of the Hoff Medal for outstanding scholarship in the annual Military Medicine and Allied Sciences course at Walter Reed Army Institute of Research is Lt Col Walter L. Scheetz. The medal was established in 1897, four years after the Army Medical School was founded and first directed by Capt Walter Reed.

Designed to keep doctors aware of the late developments in their profession, the Military Medicine and Allied Sciences course is a continuation of the original Army Medical School course. Participants are chosen on the basis of the clinical ability and professional ability they have demonstrated.

The 9-month course is spent reviewing current opinion of medically important aspects of the physical and life sciences and studying the means for retrieving, storing and communicating information. Studies include applied medicine, infectious disease and the behavioral sciences.

Each participant develops a research project which constitutes a significant contribution to the expanding body of medical knowledge. Lt Col Scheetz reported on "Cyanoacrylate Tissue Adhesive: Thrombogenic Effect," a study of the effect of n-butyl 2-cyanoacrylate in the femoral vessels of dogs. His research indicates that better techniques and/or other adhesives must be found before using such agents in small vessel injury.

Lt Col Walter L. Sheetz

Brig Gen Frederic J. Hughes Jr., commander of Walter Reed General Hospital, brought congratulations to graduates from Col William D. Tigertt, director of Walter Reed Army Institute of Research. Col Donald L. Howie, chief of the Life Sciences Division, Army Research Office, Office of the Chief of R&D, also extended congratulations.

Ladies' Day Ceremonies Honor 3 AMC Researchers

LADIES' DAY AWARDS ceremonies at the Pentagon featured Meritorious Civilian Service Award to Mrs. Virginia W. Perry (left), and Exceptional Civilian Service Awards to Mrs. Mary V. Klicka and Mrs. Sarah W. Clements. Secretary of the Army Stanley R. Resor presented the awards.

Distinctive accomplishments in project management, design of food rations and in operations research analysis were commended by Secretary of the Army Stanley R. Resor at the Department of the Army Second Annual Ladies' Day Awards Ceremony.

Decorations for Exceptional Civilian Service, the Army's highest award for a civilian employe, were presented to Mrs. Sarah W. Clements and Mrs. Mary V. Klicka. Mrs. Virginia W. Perry received the Meritorious Civilian Service Award, the Army's second highest civilian employe honor. All are U.S. Army Materiel Command employes.

Ceremonies at the Pentagon, Washington, D.C., attracted a substantial gathering of fellow employes and well-wishers of the recipients. The awards were made through the Army Incentive Awards Program.

In her capacity as acting special assistant for AMC Project Management, Mrs. Clements was recognized for her outstanding leadership and administrative skills. She was cited for a "substantive" contribution to the success of about 60 weapon and equipment systems acquisition programs funded annually in excess of $4 billion, on which she used "vertical" management techniques.

Backed by 22 years of U.S. Government service, Mrs. Clements is a native of Chickasha, Okla., and was a Phi Beta Kappa at the University of Oklahoma, where she received bachelor and master's degrees. She was a research associate at the university and later was state director of Oklahoma archaeological projects.

After serving 10 years with the Federal Aviation Administration, she transferred in 1956 to the Office of the Chief of Ordnance, Department of the Army, as a weapons system staff officer. She was a program analyst in the AMC Comptroller and Director of Programs Office when she was promoted to the Office of Special Assistant for Project Management in 1964.

MRS. KLICKA is employed as a ration design specialist at the U.S. Army Natick (Mass.) Laboratories and has been concerned with nutritional problems since she entered U.S. Government service in 1951.

The Exceptional Civilian Service Award, however, recognized her work for the U.S. Armed Forces since 1947 in providing "significant creative ability and leadership" in the planning and design of operational, survival and special rations; also, for her guidance of researchers and technologists in development of new or improved food for space flights.

Author of numerous publications in journals and proceedings of scientific meetings, Mrs. Klicka also is widely known as a lecturer on nutrition before professional and lay groups. She has a bachelor's degree from the University of Washington and a master's from the University of Chicago.

MRS. PERRY, an operations research analyst with the Army Logistics Management Center, Fort Lee, Va., was cited for many "significant contributions" to the improvement of Army logistics management. She was credited with setting up efficient management methods in determining Army replacement needs for major equipment.

Graduated from Smith College in 1940 with a BA degree in mathematics, Mrs. Perry was a Phi Beta Kappa student. She continued graduate work at the Virginia Polytechnic Institute and at the College of William and Mary.

Dr. Ley Succeeds Goddard as FDA Commissioner

Commissioner of the U.S. Food and Drug Administration became the new title of Dr. Herbert L. Ley Jr., a 1961–63 member of the U.S. Army Research staff, when he succeeded Dr. James L. Goddard, who resigned effective July 1.

While assigned to the Army Research Office, Office of the Chief of Research and Development, Dr. Ley was chief of the Medical and Biological Branch and acting chief of the Scientific Analysis Branch.

Prior to his selection by Dr. Goddard to head the Bureau of Medicine, Dr. Ley served three years in the Harvard University School of Public Health, first as associate professor and then as chairman, Department of Microbiology. He was professor of bacteriology, microbiology and community health and department chairman at George Washington University, Washington, D.C., from 1958 to 1961.

Dr. Ley served his internship at Peter Bent Brigham Hospital in Boston, following graduation (cum laude) from Harvard Medical School in 1946. Then he entered the Army Medical Corps and while in service in 1951 earned a master's degree (cum laude) from Harvard School of Public Health.

Dr. Herbert L. Ley Jr.

During 1955–58 duty as chief, Preventive Medicine Research Branch, R&D Division, Office of The Surgeon General, he made field studies in Malaya, Korea and Vietnam. Much of his research has involved use of biotics in treating typhus and typhoid and he is the author of more than 30 publications in scientific journals and medical textbooks.

When appointed to the Food and Drug Administration in 1966, he was serving as a member of the U.S. Army Scientific Advisory Panel and is presently a consultant to ASAP.

Mobility Expert Bekker's Books Acclaimed

Acclaim of a high order for *Introduction to Terrain Vehicle* Systems, such as "a monumental work," is rewarding Dr. M. G. (Greg) Bekker for a volume produced in two parts under contract with the U.S. Army Research Office-Durham (ARO-D), Durham, N.C.

Eminently qualified evaluators have been unanimous to date in hailing the book, scheduled for publication, tentatively this fall, by the University of Michigan Press.

Formerly chief of land locomotion research at the U.S. Army Tank-Automotive Command, Warren, Mich., Dr. Bekker has continued in this field since 1960 with AC Electronics Defense Research Laboratories, General Motors Corp., Santa Barbara, Calif.

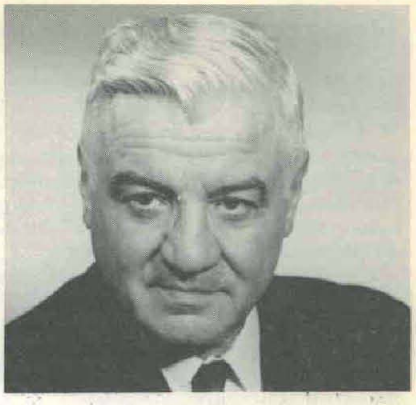
Associates have recognized his work by calling him the "father of our off-road and articulated vehicle concepts for travel on rough terrain of the earth and moon." Comments in reviews of his new books include: "No one else could have produced such a complete and all-encompassing work. The chapters which discuss adaptation of systems cost-effectiveness techniques to off-road vehicle evaluation problems are novel and badly needed.

"This is a work to stand beside the six volumes of Durand's *Aerodynamics Theory* and the Massachusetts Institute of Technology laboratory series of the forties."

Dr. Bekker recently became the second non-Swedish person to receive Sweden's Royal Military Technical Association medal for professional achievement.

Sven Berge of the Royal Swedish Army Ordnance Administration in Stockholm presented the award for Dr. Bekker's contributions to the development of theory and practice for off-road locomotion and for fostering the concept of articulated vehicles, one of which now is standard equipment for the Swedish Army.

Dr. Bekker was recognized with the Army Meritorious Civilian Service Award for his work in organizing the



Dr. M. G. Bekker

Land Locomotion Research Laboratory, now a part of the Army Tank-Automotive Command. He has received numerous other awards and citations.

In 1961 he was the coorganizer and U.S. national secretary of the First International Conference on Soil-Vehicle Systems, held in Italy, and he is cofounder of the International Society for Terrain-Vehicle Systems.

Distinction has come to him in a series of progressively responsible research and teaching assignments. He was a staff member of the Johns Hopkins University Operations Research Office, a research professor in the Stevens Institute of Technology Graduate School and head of its Motor Vehicle Laboratory, and a special lecturer at the University of Michigan School of Engineering.

A retired lieutenant colonel of the Canadian Army, he served as head of research in vehicle mobility with the Canadian Department of National Defence. In the United States, he served with the Ground Warfare Panel of the President's Science Advisory Committee.

Dr. Bekker is a graduate of the Warsaw (Poland) Institute of Technology. The Technical University of Munich (Germany) awarded him the degree of doctor of engineering, *honoris causa*, in recognition of his contributions toward a synthesis of various disciplines in the mechanics of ground locomotion and terrain-vehicle systems.

Holder of several patents for vehicular mobility inventions, he is the author of numerous articles and technical papers published in U.S. and international professional magazines. The University of Michigan Press has published two of his books: *Theory of Land Locomotion—The Mechanics of Vehicle Mobility* and *Off-the-Road Locomotion—Research and Development in Terramechanics.*

'Pulse Energy Discriminator' Inventors Get Patent

Two scientists of the U.S. Army Missile Command's Research and Development Directorate have received a patent for invention of a test system which reaches into the very heart of a missile.

James B. Wright and J. Darryl Holder, both electrical engineers with the Army Inertial Guidance and Control Laboratory and Center, call their invention a pulse energy discriminator. Complete testing of a firing system previously required actual firing of the missile. With the Wright-Holder pulse energy discriminator, a firing system can be tested before firing, preventing failures.

Wright, a veteran of 14 years with the Missile Command, has two patents pending, and the pair is awaiting another patent.

Born in Water Valley, Miss., Wright began training as a civilian in Army Signal Corps Radio School in Paducah and Lexington, Ky. In May 1943, he was inducted into the Army. After his discharge in 1946, he attended the University of Southern Mississippi, graduating in 1950 with a BS degree in mathematics.

From 1950 to 1954, Wright was associated with the U.S. Air Force at Keesler Air Force Base. In 1954 he came to Redstone Arsenal to begin 14 years with the Army Inertial Guidance and Control Laboratory and Center.

Holder is a native of Roanoke, Ala. He received his BS degree in electrical engineering from Auburn University in 1961. After graduation, he held a position with the Boeing Co. in Seattle, Wash., for a short time before coming to the Missile Command in 1962.

Although the Wright-Holder team has a patent on the pulse energy discriminator, the U.S. Government is permitted to utilize the invention without payment of royalties, since the device was developed in an Army research laboratory.

INVENTORS James B. Wright (left) and J. Darryl Holder demonstrate "pulse energy discriminator" for which they recently received a patent.

Reservist Compiles Snail Fever Monograph

Much of the known information on clinical and pathological aspects of bilharziasis, known also as schistosomiasis or snail fever, a dreaded debilitating disease in most tropical climates, is compiled in a 357-page monograph edited late in 1967 by an Army Reserve R&D unit officer.

Col Fathollah K. Mostofi, Medical Corps, is a physician on the staff of the Armed Forces Institute of Pathology (AFIP), Washington, D.C., and a member of the 1622d R&D Training Unit (Research).

Dr. Mostofi received the Army Exceptional Civilian Service Award in 1967 for his AFIP work, but he considers his interest and research in bilharziasis as "simply one of my hobbies."

Published by Springer-Verlag of New York City, the book reports on the experiences and findings of men of medicine and scientists invited to contribute to a symposium organized by Dr. Mostofi. The 31 chapters, two authored by Dr. Mostofi, are written in most cases by more than one investigator on various aspects of the disease.

Dr. Mostofi states that the disease has been a major problem in every military campaign in Africa. The French troops in the Napoleonic invasion of Egypt, the British and Australian troops in South Africa during the Boer War and the Australian troops in Egypt during World War I ceased to be effective fighting units when infected.

Snail fever is widespread not only in Africa and the Far East, but the Middle and Near East and Latin America are feeling its scourge. More than 200 million people suffer from it, acerding to world health estimates, and it is spreading. Every new irrigation project may bring with it the debilitating disease.

The oncomelania snail, common in fresh water, carries "schisto." The life cycle begins as eggs are shed by infected animals, or man, usually by the fecal or urinary route. They hatch and the larvae infect the bodies of the snails. When the larvae mature to a free-swimming stage (*cercariae*), they leave the snail for the surrounding pond or stream as microscopic hazards to health.

"All that a soldier has to do," said Dr. Mostofi, "is to get his hands or feet wet in any fresh water in any contaminated area. Infection, even when very mild, causes a severe incapacitating reaction in the newcomer."

In World War II, Dr. Mostofi states, "A large number of British and African troops in Nigeria suffered heavy casualties; more than 2,500 Americans acquired the disease during the liberation of the Philippine Islands.

"The U.S. Army Medical Research and Development Command has been especially interested in this research. Largely through the efforts of the U.S. Army Medical Corps, the disease has almost completely disappeared from parts of the Far East."

Indiana University Publishes Science, Technology Listing

Science, Technology, and Public Policy, Vol. 1, a selected and annotated bibliography, has been published and distributed by the Department of Government, Indiana University.

Prepared for the National Science Foundation, the bibliography was compiled by Prof. Lynton K. Caldwell, asisisted by William B. DeVille and Hedvah L. Shuchman. Divided into 12 sections. Vol. I lists about 5,000 books, monographs and government documents classified into 12 major sections and 46 subsections.

The bibliography is restricted to material published in English (including translations) from 1945 through 1967, the period of advances in science and technology symbolized by the controlled release of nuclear energy, the penetration of outer space, and the discovery of the structure of heredity.

The 12 major sections include Bibliographies and Research Tools; Philosophy of Science; History of Science and Technology; Nature and Impact of Science and Technology; Science, Politics and Government; Science, Technology, and the Law; Science, Education and the Universities; and

Scientific and Technical Personnel; Scientific Organizations and Institutions; Organization and Management of Research; Science, the Humanities, and Religion; and Science and Society.

The editors invite the opinions and suggestions of users, including comments regarding material that should have been listed and proposals for improvement in the plan of classification.

Individual requests for copies of the bibliography should be directed to the Office of Planning and Policy Studies, National Science Foundation, Washington, D.C. 20550.

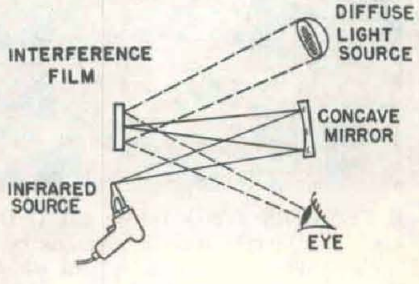
NBS Develops Image Converter for DoD

Viewing and photographing normally invisible infrared light now is possible with a simple, inexpensive image converter developed for the Department of Defense by the National Bureau of Standards.

The converter was described recently at a meeting of the Optical Society of America in Washington, D.C., as possibly an "economical" member of a "generally expensive and complicated" family with widespread applications.

Applications of devices that change infrared into visible images are used, for example, in military night-vision instruments and in the medical diagnosis of certain types of cancer.

In the new device, which has been successfully used in the laboratory, a concave mirror focuses an infrared image on a special plate. This energy alters the color of the plate by changing humidity conditions, thus making the image visible.



INFRARED IMAGE CONVERTER

The special plate (the converter) is produced by putting fine-grain photographic emulsion in contact with mercury. The emulsion then is exposed to light from a helium-neon laser through the back of the glass on which it is deposited.

The reflected light from the mercury combines with light from the laser to produce standing waves of light in the emulsion. When the plate is developed, the standing waves become closely spaced layers of silver grains. The layers give the plate a color changing from red to blue and then to white as the humidity is increased.

Change in color is caused by absorption of moisture from the air which expands the gelatin of the emulsion, thus increasing the distance between the layers of silver which produce the color.

An infrared image focused on the plate changes the humidity enough to visibly change the plate's color. A diffuse light shining on the plate reveals the infrared image which can be seen and photographed.

President's YOC Program Gets Results at WSMR

If you want the job done right, results of at least one project indicate, use YOCs—personnel employed by White Sands Missile Range under the President's Youth Opportunity Campaign.

Based on a recent experimental assignment completed by a YOC group, their employment is a good investment. Ten high school students reduced a large amount of meteorological data in about a third of the time and at less than half the cost previously required by an adult group for a comparable amount, supervisors report.

The project began in October 1967. The prime objective was to reduce, code, keypunch and process by computer a large amount of climatological wind and temperature data for the Tropospheric Branch, Atmospheric Sciences Office. The procedure was for the YOC personnel to reduce strip-charts in terms of hourly averages, and code the data on standard coding forms.

The coded data were then keypunched and processed by computer.

Card listings of the punched data were checked by YOC personnel, and after computer-processing, the resultant data summaries were partially analyzed by the YOCs. This consisted of graphing the results and assembling the graphs in a logical order for further analysis by meteorological personnel.

The students also reduced and coded wind and temperature profile data, did some fairly complicated statistical computations by desk calculators, and graphed wind and temperature profiles.

Costs of data reduction ran as high as $5 a manhour and processing was rather slow, a WSMR official said, when this work was done on contract.

A comparison of the efficiency of the closely supervised YOCs with the previous operation revealed that, for the same amount of data points, the YOCs did in four months what the other group required one year to do. Where the YOCs required three-and-a-third man-years, the other group required 10; where the YOCs costs, including overhead in manhours, was $2.12, it was $5 for the other.

"It is felt that YOC personnel utilized in this operation gained as much from the experiment as did the U.S. Government," stated James M. Patton, chief of Training and Development Branch, Civilian Personnel Office, WSMR. "They learned a considerable amount about the approach to solving scientific problems and gained an insight into the procedure of preparing information for processing on a computer."

Picatinny School Provides Skilled Tool, Die-Makers

Essentiality of highly skilled tool and die-makers in Army in-house laboratories to fabricate models of materiel concepts of scientists and design engineers often may be overlooked, but not at Picatinny Arsenal, Dover, N.J.

Picatinny's Toolmaker Apprentice School recently graduated 15 men who completed a 4-year course of on-the-job training on various machines and instruction in mathematics and mechanical drawing. Picatinny CO Col Roger Ray presented certificates of course completion.

Operated under the direction of Otto V. Freund, chairman of the apprenticeship board, the school is supervised by Donald F. Buchanan. Other members of the board are Charles G. Schomp, Gerald L. Goldsworthy, Ronald Seals and Harold Werthein. John R. Simkins, James Donaldson and Joseph E. Donini are instructors.

VALIDATED SAVINGS of $23,200 to the U.S. Government resulted at Picatinny Arsenal when a production controller and a tool, die and gauge-maker foreman combined their ideas to improve the method of producing a friction, fiberglass plate. James J. Mahtook, controller, and Harry Simon (left) increased production seven times by their innovation of the process.

MICOM Employs 350 Students Under YOC Program

The Youth Opportunity Campaign at Redstone (Ala.) Arsenal, HQ U.S. Army Missile Command (MICOM), is burgeoning for the fourth straight year, with a record 350 students employed during the summer.

Under the YOC Program, most federal agencies are encouraged to hire at least one youth for every 100 regular employes. MICOM is doubling that voluntary quota and is the largest summer employer in northern Alabama.

This year's total of 350 represents an increase of 80 more than in 1965 and is double the "pioneer" group in 1965. Employment is not all that is expanding. Counseling was initiated in 1967 and is being broadened this year. Mrs. Viola Adams, the counselor, has a bachelor's degree from Alabama A&M College and 21 years teaching experience.

Assisting her is a newcomer, Mrs. Rachel D. Sykes, to meet requirements of the expanded program. Mrs. Sykes has a master's degree in counseling and guidance from Mississippi State University and has been a teacher for six years.

John Nelson, project coordinator for the MICOM Civilian Personnel Office, believes that both students and supervisors have profited by improvement of the YOC activities at Redstone. Supervisors who have worked at Redstone for the past three years are now more aware of the problems involved and more proficient in helping students adapt themselves to a work environment.

SCIENTIFIC CALENDAR

Symposium on Physiological Basis for Human Work Performance, sponsored by OTSG, Boston University and American College of Sports Medicine, Boston, Mass., Aug. 24.

24th International Congress Physiological Sciences, sponsored by OAR, Washington, D.C., Aug. 25–30.

1st Nuclear Conference of the International Atomic Energy Agency, N.Y.C., Aug. 26–30.

National Conference and Exhibition of the Association for Computing Machinery, Las Vegas, Nev., Aug. 27–29.

Inter-American Symposium on Health Aspects of the International Movement of Animals, sponsored by OSG, Pan American Health Organization and AFOSR, San Antonio, Tex., Aug. 28–30.

2d International Conference on Liquid Crystal, sponsored by OSR and Kent State University, Kent, Ohio, August (date undetermined).

International Conference on Light Scattering Spectra in Solids, sponsored by ARO–D and the International Union of Pure and Applied Physics, N.Y.C., Sept. 3–6.

156th National Meeting of the American Chemical Society, Atlantic City, N.J., Sept. 8–13.

Symposium on Solid Mechanics, sponsored by AMC–AMRA, Baltimore, Md., Sept. 10–11.

15th International Meeting of the Institute of Management Sciences, Cleveland, Ohio, Sept. 11–13.

17th Defense Conference on Nondestructive Testing, sponsored by the Air Training Command, San Antonio, Tex., Sept. 18–20.

6th International Power Sources Symposium, Brighton, England, Sept. 42–26.

Fall Meeting and Materials Testing Exhibit, sponsored by ASTM, Atlanta, Ga., Sept 29–Oct. 4.

Kudos

DISTINGUISHED SERVICE MEDAL. *Maj Gen Leland G. Cagwin* received the DSM in recognition of his accomplishments during the past two years as commander of the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, Md. General Cagwin

General Frank S. Besson, CG of the Army Materiel Command, presents DSM to Maj Gen Leland G. Cagwin for services as CG of the Army Test and Evaluation Command (TECOM).

recently took command of the 2d Infantry Division in Korea.

Maj Gen James T. McGibony was awarded the DSM for his service as Deputy Surgeon General in the Office of The Surgeon General (OTSG), DA, Washington, D.C., during the period April 1965 to July 1968. General McGibony is now Chief Surgeon, U.S. Army, Europe.

PHILIPPINE LEGION OF HONOR. *Col Walter A. Kostecki,* a survivor of the Bataan death march, now serving as CO of Fort Myer's Andrew Rader Army Clinic, was recognized with this award for his continued dedicated service to the people of the Philippines during World War II as a prisoner of the Japanese, and since. Col Kostecki also is serving as the U.S. Army's chief medical liaison to the Philippine Embassy.

MERITORIOUS CIVILIAN SERVICE (MCSA). *Manfred Gale,* chief of the Mobility Equipment R&D Center's (MERDC) Intrusion Detection and Sensor Laboratory, Fort Belvoir, Va., received the Army's second highest civilian employe award for his major contributions to the Army's detection and sensor program.

Otto H. Von Lossnitzer, formerly the Army Materiel Command's (AMC) special assistant for armament and special assistant to the project manager for Cheyenne, was presented the MCSA for his "immeasurable contribution to the U.S. Army's armament and fire control mission." He is now serving as director of research and engineering, Amron Corp., Waukesha, Wis.

John L. Carter and *Sam DiVita,* employed in the Army Electronics Command's (ECOM) Electronic Components Laboratory, were honored with the MCSA for work on microwave duplexing switching and beam plasma devices, and for development of electronic ceramics for the Army and the Department of Defense.

Marvin Diamond received the MCSA for his outstanding performance of duty during May 1960 through May 1968 as technical manager and senior scientist with the Atmospheric Science Office at White Sands (N. Mex.) Missile Range (WSMR). *John L. Traub* earned the MCSA for establishing the chemical process laboratory of the Edgewood (Md.) Arsenal Research Laboratories.

Robert A. Miller, Edgewood (Md.) Arsenal, became an MCSA recipient for bravery in administering first aid and evacuating four comrades when a helicopter carrying the group crashed in a test-site landing area in the Everglades National Park, Fla.

SILVER STAR. *Col Stewart C. Meyer,* assigned as executive, Office of the Chief of Research and Development (OCRD), when Col Frank R. Bates Jr. departed July 15 for a new assignment, was awarded the Silver Star for "gallantry in action involving close combat with an armed hostile force in Vietnam on Nov. 19, 1967." From Apr. 1968 until he assumed his new duties, he was deputy director, Missile and Space Directorate, OCRD.

LEGION OF MERIT. *Col Frank A. Bates Jr.* received the LOM for outstanding performance of duties as OCRD executive and (earlier) chief of the Nuclear, Chemical and Biological Division and then deputy director, Missiles and Space Division, OCRD. The award recognized his "significant contribution to the R&D Program" from July 1965 to July 1968. He is now assigned to Rhode Island University with the U.S. Army Instructor Group.

Col Donald L. Howie, chief of the Life Sciences Division, Army Research Office, OCRD, was awarded the LOM for "outstanding and meritorious service" from May 1962 to November 1967 as chief, Medical Research Branch, then as chief of the Plans, Programs and Funds Division, and finally as deputy commander, U.S. Army Medical R&D Command, Office of The Surgeon General. The citation recognized his "inspiring leadership" which "resulted in the establishment in Vietnam of a medical research effort which has met the challenge of a potentially dangerous medical situation."

Col John D. Hickey, now retired, was awarded the first OLC to the Legion of Merit for service as chief, Grant Aid Division, Army Materiel Command. *Col Charles H. Curtis* was similarly honored for outstanding service as deputy director of management in the Office of the Comptroller of the Army. He is presently assigned to the 1st Cavalry Division (Airmobile) in Vietnam.

Col W. A. Van Sandt was presented the LOM and first Oak Leaf Cluster (OLC) for service from August 1965 to November 1967 as chief, Signal Branch, Officer Personnel Directorate, Office of Personnel Operations, HQ, Department of the Army (DA), and as CO, U.S. Army Strategic Communications Command (STRATCOM-CONUS). He is now chief, Defense Communications Agency, Pacific.

Col Spencer Baen, Shillelagh weapon system project manager, and *Col James N. Lothrop,* TOW missile project manager, U.S. Army Missile Command (MICOM), Redstone (Ala.) Arsenal, also received the LOM upon completion of duty tours. Col Baen has been assigned to duty in Germany and Col Lothrop has retired from active duty.

Col Jack P. Libby, upon his recent retirement, was awarded the LOM for service as MBT-70 Systems test manager, TECOM. *Lt Col Albert B. Suttle Jr.* was similarly honored for outstanding service as chief of the Air Movement Branch, Air Mobility Division, OCRD. He was cited for notable R&D accomplishments on the CH-54A and the XV-9A heavy-lift helicopters and on the demonstration engine and aircraft engine programs.

Receiving the LOM from the U.S. Army Combat Developments Command (CDC) were *Lt Col Peter N. Wolkonsky,* Environments and Threats Directorate, Institute of Land Combat, for his service as CO, 219th Military Intelligence Detachment, II Field Force, Vietnam; *Lt Col Robert L. Mendenhall,* Environments and Threats Directorate; *Lt Col Fred D. Tucker,* Evaluation

Lt Col Fred D. Tucker, Evaluation Directorate; *Lt Col John C. Kirsch*, Evaluation Directorate; *Lt Col Arthur Cummings* (now retired), Conceptual Design Directorate; and *Lt Col Gordon M. Einhaus*, Doctrine Directorate.

JOINT SERVICE COMMENDATION MEDAL. *Lt Col James R. W. Inskeep*, now with Plans Division, OCRD, received the JSCM for meritorious service as staff officer and executive officer, Military Assistance Directorate, HQ U.S. European Command, from July 1964 to July 1967. He was cited for helping to coordinate delivery of U.S. Army "multimillion-dollar missile system components" to NATO countries.

ARMY COMMENDATION MEDAL. *Col Robert E. Van Gilder* received the 2d OLC to the ACM for meritorious service as special project officer, Medical Intelligence Coordination Office, Office of The Surgeon General, from November 1964 to December 1965, and subsequently as special assistant to the Surgeon General for Intelligence, with concurrent duty as chief, Medical Intelligence Office, OTSG, from December 1965 to July 1968.

Lt Col Henry E. Maes, now with the Life Sciences Division, Army Research Office, OCRD, was awarded the 1st OLC to the ACM for outstanding service as supply staff officer and as chief, Materiel Division, Combat Developments Command Medical Service Agency, Fort Sam Houston, Tex., from January 1965 to December 1967.

Lt Col John H. Cain earned the 1st OLC to the ACM for distinguishing himself by exceptionally meritorious service as deputy commander of MERDC from September 1966 to June 1968. He is now attending George Washington University to complete work on a master's degree.

Maj Larry T. Walker was honored with the 2d OLC to the ACM for service with STRATCOM-CONUS from 1965 to 1967. He is now Automatic Data Processing Systems plans officer. *Maj Hazel W. Johnson*, ANC, chief of the Field Equipment Branch, U.S. Army Medical R&D Command, received the ACM for meritorious service at Valley Forge General Hospital, Phoenixville, Pa., as supervisor of the Centralized Materiel Section.

Capt Ronald Von Freymann, now assigned to U.S. Army Behavioral Science Research Laboratory, Washington, D.C., was recognized by award of the ACM for service in 1966–67 as a member of HQ and HQ and Service Battery, 2d Battalion, 9th Artillery, 3d Brigade Task Force, 25th Infantry Division, in the Republic of Vietnam.

1st Lt James W. Blackburn Jr., chief of Logistics Division, STRATCOM Pentagon Telecommunications Center, received the ACM for "outstanding service in the resupply of tactical signal operations in the Republic of Vietnam. *1st Lt John C. Runski*, operations officer, STRATCOM-CONUS, was similarly honored for performance of exceptionally meritorious service in support of U.S. objectives in the counterinsurgency effort in Vietnam.

Sgt Maj Bernard P. Yurchik, MERDC, and *SFC Leo B. Higginbotham*, MH-1A Detachment, Nuclear Power Field Office (NPFO), Fort Belvoir, Va., *SFC Howard L. Russell*, NPFO, were presented the ACM. Russell's award was for service in his previous assignment as an instructor at Brooke Army Medical Center, Fort Sam Houston, Tex.

30-YEAR AWARDS. The U.S. Army Satellite Communications Agency, Fort Monmouth, N.J., presented 30-year Length of Service Awards to *George F. Senn*, director of Engineering, and *Homer P. Hendrickson*, Programs Directorate.

The Office of the Chief of Engineers, Washington, D.C., presented 30-year awards to *John M. Alley*, Personnel Administration; *Reginald A. Barron, Peter T. Egan Jr., Donald M. Elliot, Harry A. Ernst, Charles W. Fletcher, Brice L. Hobbs, Guy C. Sandefur, August J. Smet* and *Walter G. Sutton*, all assigned to Civil Works.

Also, to *Woodrow L. Berge* and *Charles S. Deem*, Real Estate; *Bela J. Bodner, Bert W. Farrington, Joseph M. Patania* and *Mary L. Rylander*, Topography and Military Engineering; *John T. Bruton, Chester L. Eva, Frank R. Hann, Frank R. Maguire, John W. May Jr., M. Robert Millard, Perry F. Wendell* and *George F. Wigger*, Military Construction; *Manning E. Seltzer*, General Counsel; *James R. Malley* and *Minna Werner*, Office of the Engineer Comptroller.

Moglia Becomes 2nd 50-Year Employe at Picatinny

In this age of specialization, versatility is perhaps the outstanding trait of Peter Moglia who recently became the second 50-year employe at Picatinny Arsenal, Dover, N.J.

Like his friend Wilfred Hosking, who recently became the first to serve 50 years at Picatinny, "Pete" joined the arsenal as a laborer at $2 a day and stayed to earn the high esteem of his fellow employes as "an all-around man."

Assigned primarily as deputy chief of the Administration Division, Moglia is also printing control officer, post restaurant officer, fund coordinator, and adviser to the commanding officer on many matters.

One noteworthy advance he introduced was the use of motion picture film for munitions ballistic studies. That won him an achievement award from the Army Chief of Ordnance.

When the Munitions Command (MUCOM) was formed, with Picatinny Arsenal designated as headquarters, Pete was responsible for establishment of a nationwide command printing and publications control program. He still controls it.

His part in the now highly endorsed once-a-year campaign to replace the numerous charity fund drives held at government agencies earned him a commendation by the Secretary of the Army and the Civil Service Commission.

He is also known as one of the organizers of the first baseball and bowling teams at Picatinny and, as a skilled tennis player, raised money for construction of three courts.

Pete also organized the Twenty-Year Club and a Technical Division Social Club; published for many years the *Picatinny Barrage*, an employe newspaper; and has served as president of the Civilian Welfare Council.

Peter Moglia

MICOM Engineers File for Patent On 'Stress Corrosion Monitor'

Engineers Bernie J. Cobb and John H. Honeycutt have filed for a patent on a "stress corrosion monitor" which they developed in their work at the Structures and Mechanics Laboratory of the U.S. Army Missile Command, Redstone Arsenal, Ala.

Designed to observe day-to-day effects of corrosion on materials under stress, the invention consists of a cylindrical chamber and sensing units that give continuous information on the condition of the sample. The monitor is helpful in problems such as the design of missile fuel tanks.

Harold B. Croskery

Daniel J. Shearin

Victor C. Young

3 AMC Personnel Selected for ICAF Course

Department of the Army civilian employe representation in the Industrial College of the Armed Forces (ICAF) 1968–69 resident course, starting in August to train personnel for important command, staff and policy-making positions, is 75 percent from the Army Materiel Command.

The percentage sounds impressive, but actually only four Army civilians are allocated by the Joint Chiefs of Staff each year for the ICAF course. Selected for the honor are Harold B. Croskery and Daniel J. Shearin, HQ Army Materiel Command; Victor S. Young, Army Electronics Command (ECOM), Fort Monmouth, N.J.; and Theodore J. Hamilton, Office of the Deputy Chief of Staff for Personnel.

Under the apportionment selection system for the course, 33 civilians are selected each year. Since 1964, of the Army representatives, 16 have been employes of the Materiel Command.

The course runs from August through June and covers the economic and industrial aspects of national security. Management of defense programs and resources is treated in a broad political, social and military context, as concerned with national security.

ICAF has a cooperative arrangement with George Washington University (GWU), Washington, D.C., that enables students who have a bachelor's degree to earn a master of science degree in business administration.

CROSKERY is backed by 22 years of U.S. Government service and is deputy project manager of the Chaparral-Vulcan missile air defense system involving more than $1 billion. His responsibilities include all phases of research, development, procurement, production, distribution, and logistic support required to field this highly complex system.

A graduate of American University, he previously served as AMC's project manager staff officer for the Sheridan/Shillelagh and TOW weapons systems. Prior to that time he was a section chief in the research and development division in the Army's Chief of Ordnance office.

SHEARIN, chief of the Project/Commodity Management Branch, Office of the Comptroller and Director of Programs, AMC, was graduated from Pennsylvania State College in 1949 and is now a master's degree candidate at GWU. He is responsible for technical and management analysis of plans covering all major Army weapons and equipment systems. These systems consume approximately 50 percent of the annual AMC budget of $15 billion.

Shearin served as a branch chief with the Office of the Chief Chemical Officer until he joined the AMC staff in January 1963. During World War II he served in the Army as an enlisted man and commissioned officer. Recalled during the Korean Conflict, he was assigned in Korea as a transportation officer.

YOUNG is chief of the Cost Research and Methodology Branch, Cost Analysis Division, Electronics Command, and has been assigned to Fort Monmouth since 1963. A Certified Public Accountant since 1958, he was graduated from St. Mary's University, San Antonio, Tex., in 1955 and received an MBA degree from Syracuse University in 1962.

HAMILTON has been assigned to the Civilian Personnel Field Office in Chicago, Ill., since 1961 and is currently field representative. He has an AB degree from Western Reserve University, Cleveland, Ohio.

Trident Scholar Selected for AFRRI Research

The Armed Forces Radiobiology Research Institute (AFRRI), Bethesda, Md., will participate for the first time in the U.S. Naval Academy's Trident Scholar Program established in 1963.

Midshipman Simon A. Hershon has been named by Superintendent (Rear Adm) Draper L. Kauffman of the Naval Academy to conduct an independent research project at the institute for the 1968–69 academic year. He is one of 16 students chosen this year as Trident Scholars.

The Trident Scholar Program enables outstanding midshipmen to conduct individual research as the major part of their senior academic program. Each scholar carries a reduced load of courses and works closely with advisers from the Academy's faculty.

Hershon, whose major is applied science and mathematics, will work toward developing a method for detecting minute amounts of fluoride. This research is of particular interest to the Navy because of the existence of fluorine in the ocean which affects the hardness and corrosion-resistance of solids—especially ship hulls.

Fluoride elements present in extremely small amounts normally are detected through activation analysis; they are made radioactive and the pattern of the radiation emitted reveals the elements present. However, fluorine is not readily activated by usual means. Hershon's project will be devoted principally to developing and characterizing a satisfactory activation procedure, using AFRRI's electron linear accelerator (LINAC) as a source of radiation.

The LINAC is one of several radiation-producing sources used at the institute in its own research program. For other AFRRI nuclear reactor research capabilities, see December 1966 (page 16), February 1968 (page 19), and May 1968 (page 13) *Army R&D Newsmagazine*.

MIDSHIPMAN Simon A. Hershon (right) and Lt Anton Vierling, adviser.

CSC Changes Disability Retirement Procedures

Disability retirement procedural changes were effected July 1 by the U.S. Civil Service Commission after lengthy consultation with agencies, personnel directors, employe union officials and medical practitioners.

Primarily, the changes relate to the handling of cases initiated by agency managers. Basic requirements for eligibility to retire on disability remain unchanged. Employes initiating their own applications have the same appeal rights allowed by the Bureau of Retirement and Insurance when applications are rejected.

Objectives of the revised procedures are to provide federal employes with maximum assurance of fair treatment and a just decision in all cases where disability retirement is initiated by management officials.

Specific steps will have to be followed in referring employes for physical or mental examination. Avenues of appeal are clearly prescribed for both employe and agency.

At least two of three members of a panel of agency officials must agree that such action is warranted before a psychiatric examination may be ordered. The CSC recommends that the panel consist of the immediate supervisor or manager, a personnel official, and the agency medical officer if one is available.

After being notified in writing as to why he is being sent for a fitness-for-duty examination, the employe, if he objects, may submit the names of board-certified psychiatrists or other appropriate medical specialists to whom he would willingly report.

In the event he calls for examination by a private practitioner, the employe will not be charged for the examination, including further examination should it be required by the Civil Service Commission.

An unqualified right to representation is guaranteed to the employe and he may name his own representative if psychiatric examination is indicated. If he does not, the agency must offer him assistance and, if he still declines, must appoint a representative, who will receive copies of all pertinent documents.

USAEPG Tests Antenna Kits For Improved Range in Jungle

Improved radio range in dense tropical jungle areas of Southeast Asia is the goal set for two new reduced weight antenna kits tested recently at the U.S. Army Electronics Proving Ground (USAEPG), Fort Huachuca, Ariz.

The 20-pound "Tactical Extended-Range Antenna Systems for Manpack Radio Sets" contain parts for two 15-foot antennas or one 30-foot antenna. Each is equipped with all the wire, stakes, fiberglass mast sections, antenna turners and accessories necessary for quick assembly.

The AN/GRA-93 kit for HF (2 to 30 megaHertz) and the AN/PRA-6 for VHF (30 to 76 megaHertz) radios are designed for use with FM and singlesideband radios. They are expected to quadruple the radio range of soldiers on patrol.

Gain, increased range and environmental safety characteristics tests have been completed. Tested also were the increase in power-handling capability of the antennas, and the ability to operate in temperatures from −40°F. to +120°F.

Col Stanley Heads TECOM Infantry Materiel Testing

Col LeRoy S. Stanley, new director of the Infantry Materiel Testing Directorate at the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, Md., succeeded Col Robert B. Tully when he departed service in Vietnam.

A master parachutist and Special Forces officer, Col Stanley served with the U.S. Military Assistance Command, Vietnam, from February 1967 to March 1968 as senior adviser to the Vietnamese airborne division.

He is a 1942 graduate of Oklahoma State College, has an MA degree in international relations from George Washington University, and has completed one-year residence courses at the Command and General Staff College (1955) and the Army War College (1964).

Col LeRoy S. Stanley

Commissioned in the Infantry in 1942, he served in Europe during World War II with the 175th Infantry Regiment, 29th Infantry Division. He took part in the Northern France, Rhineland and Central Europe Campaigns.

Postwar assignments have included duty with the staff and faculty of the Infantry School at Fort Benning, Ga.; the European Command in Germany; 2d Infantry's 9th Infantry Regiment in Korea; Office of the Deputy Chief of Staff for Military Operations in Washington, D.C.; and the Military Assistance Advisory Group in Spain.

Upon returning from Spain in 1963, Col Stanley served a 3½-year tour of duty at Fort Bragg, N.C. There he directed the Special Warfare School's Unconventional Warfare Department and, in September 1965, assumed command of the 3d Special Forces Group (Airborne), until assigned to Vietnam.

Among his decorations are the Legion of Merit, Bronze Star Medal (two OLC), Vietnamese National Order (5th Class), Vietnamese Gallantry Cross with Palm and Gold Star, Vietnamese Honor Medal (1st Class), and the Royal Order of the White Elephant (Thailand).

MERDC Orders Jet System to Breach Concrete Barriers

Feasibility of using a water cannon for breaching rock and concrete barriers and emplacing demolition munitions is being investigated by the Army.

The Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va., has awarded a $74,873 contract to Exotech Inc., Rockville, Md., for an advanced design experimental pneumatic model of the cannon.

Scheduled for delivery in February 1969, the model will be designed to fire five shots a second at a pressure of 100,000 pounds per square inch. The pulsed water-jet velocity will be approximately 3,800 feet per second.

MERDC scientists believe that this will be the first pulsed water-jet system at this high pressure level developed in the United States. The water cannon will be mounted on earthmoving or construction equipment, and will operate from compressed air supplied by a diesel engine.

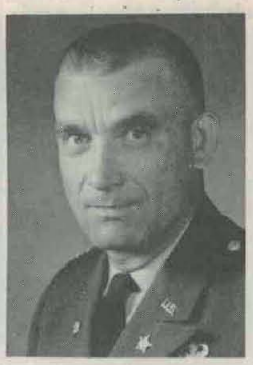
Contracts also have been awarded by the R&D Center to Engelhard Industries, Inc., Newark, N.J., to produce a 200-watt, phosphoric acid-based, fuel cell stack for $47,502 and to General Motors' Allison Division, Indianapolis, Ind., to conduct a producibility study of the steering unit on the Universal Engineer Tractor (UET) for $25,255. The UET is an all-purpose tractor developed by the MERDC over a period of several years.

Col T. W. Mellen

Col A. E. Joy

Col G. C. Muir Jr.

Col C. D. Daniel Jr.



Col J. A. Davis

OCRD Announces 35 Personnel Assignments

Assignment of Col Thomas W. Mellen as Deputy Chief of Research and Development for Southeast Asia (DCRD for SEA), in addition to his duties as Director of Developments, headed a long list of recent personnel actions in the Office of the Chief of Research and Development (OCRD).

Designated for promotion to general rank, Col Mellen was chief of staff, 25th Infantry Division, Hawaii and in Vietnam from June 1965 to February 1967, and was commander of the 3d Brigade, 25th Infantry Division, in Hawaii in 1964–65.

Col Albert E. Joy became chief of the Programs and Budget Division, OCRD, effective July 15, after serving in the Army Research Office since June 1966 as chief of the Research Programs Office and doubling as the assistant executive officer. Graduated from the U.S. Military Academy in 1946, he has a master's degree (1966) from the Wharton School of Commerce and Finance, University of Pennsylvania.

Lt Col Daniel J. Walsh, a member of the Army Research Office staff since June 1966, most of the time as executive secretary of The Army Research Council (TARC), and in the Research Plans Branch, succeeded to the jobs vacated by Col Joy. Col Walsh has a BS degree from the University of New Hampshire and an MS from Arizona State University, both in electrical engineering.

Col George C. Muir Jr., promoted to that rank shortly after assuming his new duties as chief of the Systems Analysis Division, OCRD, returned recently from a tour of duty in Korea as CO of 7th Battalion (Hawk), 5th Artillery. From March 1966 to February 1967, he was a research associate with the Strategic Studies Center, Stanford Research Institute.

Col Muir is a 1946 graduate of the U.S. Military Academy and is working toward a master's degree in international relations at American University in Washington, D.C. He is a graduate of the Spanish Army Command and General Staff College, Madrid.

Other major assignments have included tours with the International Policy Division, Office of the Deputy Chief of Staff for Operations, Washington, D.C. (1964–66); and the Army Section, Military Assistance Advisory Group, Spain (1960–63).

Col Charles D. Daniel Jr., recently promoted to that rank, is the new chief of the Nuclear, Chemical and Biological Division, OCRD, and is newly graduated from the Industrial College of the Armed Forces, Washington, D.C.

Col Daniel served as commander of the 2nd Battalion, 33rd Artillery, 1st Infantry Division in Vietnam in 1966–67, following a 3-year tour as chief of the Nuclear Branch, Defense Atomic Support Agency, Washington, D.C.

Graduated from the U.S. Military Academy in 1946, he earned an MS degree in physics at Tulane University and was awarded his doctoral degree from the same institution in 1968 (course work completed in 1963).

Col Daniel's list of military honors is impressive, including the Silver Star, Legion of Merit, Distinguished Flying Cross, Bronze Star with 4 OLCs, Air Medal with 16 OLCs, Joint Service Commendation Medal, Army Commendation Medal and Republic of Vietnam Cross of Gallantry with two Silver Stars.

Dr. F. W. Morthland and Harold T. Weiler, among the "pioneers" of the Army Research Office, switched jobs for the second time in less than four years. Dr. Morthland went to Rio de Janeiro, Brazil, in October 1964 to succeed Weiler as science adviser, U.S. Army Element, Defense Research Office. Weiler took his place in the Life Sciences Division. Now they are in their old jobs.

Col Joseph A. Davis took over from *Lt Col Charles E. Ramsburg*, who is retiring from the Army late in August, as chief of the Behavioral Sciences Division, Army Research Office. Col Davis served formerly in the Human Factors and Operations Research Division and since April 1967 has been chief of the Low-Altitude Systems Branch, OCRD.

Lt Col Clarence L. Williams was assigned recently as chief of the High-Altitude Systems Branch, Air Defense and Missiles Division. For the past year he has served as staff operations officer, Joint Task Force 2, Joint Chiefs of Staff, Washington, D.C.

For three years previous, he was air defense materiel test officer, U.S. Army Test and Evaluation Command. He has a BS degree in chemistry from Morehouse College and has done graduate work at American University and George Washington University.

Lt Col Harry A. Griffith was assigned recently as assistant director and commanding officer of the relatively new U.S. Army Advanced Ballistic Missile Defense Agency, OCRD, after serving nearly two years as program manager of Project PRESS in Washington, D.C.

Col Griffith is a 1949 graduate of the U.S. Military Academy and has an MS degree in civil engineering from California Institute of Technology. He has completed the Command and General Staff College and National War College.

Lt Col Oscar G. Price Jr. is the new chief of the Army Research Unit, Korea, which is monitored by the Army Research Office, OCRD, an assignment that followed graduation from the Army Command and General Staff College.

Col Price has a BS degree in sociology from Southern Louisiana College and MD degree in personnel

administration from George Washington University. From 1964 to 1967, he was a staff officer in the Office of the Deputy Chief of Staff for Operations, HQ U.S. Continental Army Command, Fort Monroe, Va.

Lt Col Grayson D. Tate Jr., chief, Nike-X and Space Division, OCRD, from April 1967 until August 1967, when he departed to attend the Industrial College of the Armed Forces, Washington, D.C., is back in the division as chief of the Nike-X Branch.

Col Tate is a 1950 graduate of the U.S. Military Academy, has BS and MS degrees in aeronautical engineering from Georgia Institute of Technology, and is a graduate of the Armed Forces Staff College (1965) and Army Command and General Staff College (1962).

From August 1965 to February 1967, he was commander of the 3d Battalion, 38th Artillery (Sergeant) at Fort Sill, Okla., where he also served as deputy commander for Operations, 9th Field Artillery, Missile Group.

Lt Col Harold F. Lombard reported for duty recently as chief of the Space Branch, Nike-X Space Division, following completion of the Army War College Course. He is also a graduate of the Command and General Staff College.

Col Lombard was assigned to HQ U.S. Army Combat Developments Command Experimentation Command, Fort Ord, Calif., from 1965 to 1967, first as a battalion commander and then as assistant chief of staff, G-1.

In 1964–65 he served as an adviser in the Republic of Vietnam Command and General Staff College, following three years as a research assistant at the Lawrence Radiation Laboratory, University of California. He is a 1949 graduate of the U.S. Military Academy and has an MSE degree in aeronautical engineering from the University of Michigan.

Lt Col Robert E. Lazzell assumed his new duties as chief of the Mid-Range Plans Branch, Plans Division, OCRD, after graduating from the Armed Forces Staff College.

He served in Vietnam in 1966–67 as chief, Research and Evaluation Division and deputy G–3, HQ II Field Force, following duty as 1st Brigade, 9th Infantry Division, executive officer. He was AMC deputy project manager for Airborne Surveillance System MQM58A (1962–66).

Col Lazzell has a BS degree in electrical engineering from the University of West Virginia.

Lt Col Robert J. Lunn was assigned as chief of the Fire Support Missiles Branch, Air Defense and Missiles Division, OCRD, soon after graduating from the U.S. Army War College. He is also a graduate of the Armed Forces Staff College (1967) and the Army Command and General Staff College (1965), with an MS degree in aerospace engineering from the University of Arizona.

From June 1965 to June 1966, he was commander of the 4th Battalion (HERC), 44th Artillery in Korea, following three years at Fort Sill, Okla., as a project Officer on the Honest John and Lance missiles with the U.S. Army Artillery Board.

Lt Col Russell Wayne Parker is assigned as a staff officer in the Nike-X and Space Division, OCRD, and is newly graduated from the Army Command and General Staff College. He has an MS degree in electrical engineering from Georgia Institute of Technology.

Col Parker served in Vietnam as executive officer, 4th Battalion, 42d Artillery, 4th Infantry Division, in 1966–67, following duty as assistant S-3 with the 4th Division Artillery at Fort Lewis, Wash., and in Vietnam. He was an Air Defense Board representative in testing operations at Kwajalein in the Marshall Islands from 1964 to 1966.

Maj James R. Fuller is the new assistant executive secretary of the Army Scientific Advisory Panel, following graduation June 29 from the Armed Forces Staff College at Norfolk, Va.

In 1966–67 he was a subsector and sector adviser with III Corps in Vietnam, following six months with a Basic Training Brigade at Fort Dix, N.J. He was assistant S-3, HQ Commandant, Seventh Army in Stuttgart, Germany, from 1964 to 1966.

Maj Lewis E. Beasley is a new staff officer in the Combat Support Aircraft Branch, Air Mobility Division, OCRD, and is a 1968 graduate from the Armed Forces Staff College. He served in Vietnam in 1967 as assistant S-3, 1st Squadron, 9th Cavalry, and then as commander of Troop B, 1st Squadron, 9th Cavalry.

Assigned to the U.S. Army Aviation Laboratories, Fort Eustis, Va., in 1965–66, as an aerospace engineer, he served the preceding year as S-2, 1st Squadron, 9th Cavalry in Korea. He is a 1952 graduate of the U.S. Military Academy and has an MS degree in aerospace engineering from Georgia Institute of Technology.

Lt Col Joseph J. Yeats reported recently for duty as a staff officer in the Combat Arms Branch, Combat Materiel Division. Until reassigned he was on duty in Germany as commander of the 3d Squadron, 12th Cavalry, 3d Armored Division, and (earlier) as a G-1 Plans Officer, HQ Central Army Group (NATO). Col Yeats graduated from the U.S. Military Academy with a BS degree in engineering and earned his master's in the same field at Georgia Institute of Technology. He is a graduate of the Army Command and General Satff College course at the Naval War College.

(Continued on page 72)

Dolezal Assigned Dual Role at ECOM Lab

Commanding officer and director of the Army Electronics Command's Electronic Warfare Laboratory became the dual responsibility of Col Thomas R. Dolezal in mid-July.

Prior to his assumption of duties at HQ U.S. Army Electronics Command, Fort Monmouth, N.J., he was on the staff and faculty of the Army War College, Carlisle Barracks, Pa.

Col Dolezal studied at Beloit (Wis.) College and Northwestern University, receiving BS and MS degrees in physics. He entered the Army as a second lieutenant in the Army Signal Corps in June 1942 and served until 1945 in the 322d Bombardment Group (Medium) of the U.S. Army Air Force in the European Theater of Operations.

Since returning to active duty in 1950 after five years as a civilian, he has served with the Signal Training Center at Camp Gordon, Ga.; the Signal Section of Army Forces, Far East; with the Army Deputy Chief of Staff for Operations; with the Joint Staff, Military Mission to Turkey; and as commander of the 51st Signal Battalion (Corps), formed in World War I and the Army's oldest Signal battalion of its type.

Col Thomas R. Dolezal

$1,000 Award Technical Paper

TITLE: Mechanism of Thermal Decomposition of HMX (1,3,5,7-Tetranitro-1,3,5,7-Tetrazacyclooctane)

AUTHORS: SURYANARAYANA, AUTERA and GRAYBUSH
Explosives Laboratory, Picatinny Arsenal

ABSTRACT: The thermal decomposition of δ-HMX has been investigated by determination of the gaseous products at various temperatures using mass spectrometric analysis. The major products of decomposition were formaldehyde and nitrous oxide. In addition, smaller amounts ($< 10\%$) of N_2, NO, CO, CO_2 and HCN were obtained. The origin of nitrogen among these products has also been traced using nitro-N^{15}-labeled HMX. The isotopic species of the decomposition products, determined by mass spectrometry, showed that N_2O, N_2, NO and HCN consisted mainly of $NN^{15}O$, NN^{15}, $N^{15}O$ and HCN, respectively. These and other results are interpreted to mean that thermal degradation of HMX proceeds by a predominant breakage of C-N bonds but not by a breakage of N-N bonds and elimination of NO_2 groups. This appears general to secondary nitramines since a test run with nitro-N^{15} labeled RDX gave an identical N^{15} distribution in its products.

Some mechanisms are considered to account for the observed chemical and isotopic species in the decomposition products. Further experiments with carbon-13 and oxygen-18 labeled HMX are being designed to understand the course of reaction better and to determine the relative importance of intra- versus intermolecular processes.

$500 Award Technical Papers

TITLE: Flash Blindness: The Effects of High Intensity Photic Stimuli Upon the Cat Electroretinogram

AUTHOR: RANDOLPH
Natick Laboratories

ABSTRACT: With the advent of various wavelength-specific lasers which generate high energies and coherent beams, the problem of the effects of specific wavelengths in generating decrements in visual functions has become more acute.

Four cats were anaesthetized and their corneas positioned at the focal point of a beam of light from a microscope illuminator. Each cat was dark adapted for 5 minutes, after which time ERGs were obtained by presenting a 5080 mL, 1 Hz stimuli of .03 second duration for 2 minutes at one of six energy equated wavelengths (λ_{max} = 456, 485, 515, 575 and 620 Nm and "white"). The light from a Xenon flash system was then focused on the same corneal area. The Xenon lamp yielded a pulse of 0.15 j/cm^2 at the cornea for all wavelengths. ERG recovery times were taken from the second following the flash until the post-flash ERG was equal to the pre-flash ERG.

The results indicated: (1) For equal adapting flash energies, the recovery times were significantly longer for blue and blue-green flashes than for red flashes, while "white" flashes were less efficient in producing flash blindness than the blue or blue-green adapting stimuli. (2) No differences in the recovery times were found resulting from wavelength differences in the ERG stimulus. (3) Some theoretical and military implications are discussed.

TITLE: Interaction of Hot Electrons With Optical Modes of Lattice Vibrations

AUTHORS: BENNETT, WILKINSON and HARTMAN
Redstone Arsenal

ABSTRACT: Maser and laser technology has caused a resurgence of interest in the subject of the interaction of a hot electron with its crystalline host. An electron can revert to a lower energy level by transferring energy to the cry-

(Continued on page 41)

Army Science Confe
For Excellence of M

REPRESENTING WINNERS of the top Arm Suryanarayana (second from left) poses with the Army (R&D), Lt Gen A. W. Betts, Chie Scientist, Office of the Chief of R&D.

(Continued from page 1)

survivability and evacuation and the other on the pacification program.

Most of the more than 400 participants undoubtedly will long remember the rollicking, robust, inimitable humor contributed by Dr. Ralph G. H. Siu, Army Materiel Command Deputy Director of Developments, known as the "perennial" banquet

Capt David I. Randolph

Jefferson S. Bennett

ence Gains Acclaim ajor Presentations

Science Conference Award of $1,000, Dr. B. Dr. Russell D. O'Neal, Assistant Secretary of of R&D, and Dr. Marvin E. Lasser, Chief

toastmaster. General Johnson commented, "If I had known I would have to follow a man of his talents, I might not have accepted."

General Johnson spoke for almost an hour after being introduced by Dr. Lasser as "one of the most sincerely compassionate men I have ever known." Enrapt attention prevailed

(*Continued on page 44*)

Capt S. J. Normann

Joseph Nemarich

$500 Award Technical Papers

(*Continued from page 40*)

stal lattice. The most important transfer mechanism involves the interaction of the electron with the lattice vibrations. Certainly the character of the lattice vibrational spectrum will be reflected by its influence on the relaxation of a paramagnetic spin system to the lattice.

The theory of relaxation processes is well established, but recent measurements of the spin relaxation of Cr(3+) in MgO show a large discrepancy from the conventional theory which treats only the acoustical mode: of lattice vibration. The optical modes are ignored in the theory even though they occur in all real crystals. Consideration of these optical modes was able to resolve the discrepancy. Thus our experiment has furnished conclusive proof that optical modes are effective and should be considered in the interpretation spin-lattice elaxation phenomena.

$250 Award Technical Papers

TITLE: The In Vivo Localization of Staphylococcal Enterotoxin B
AUTHORS: NORMANN and JAEGER
Fort Detrick

ABSTRACT: Isolation and purification of bacterial toxins have progressed rapidly but their biology has remained largely unknown. One such toxin, staphylococcal enterotoxin B (SEB), is highly purified and affords opportunity to investigate the biology of food poisoning as well as the mode of action of bacterial toxins in general. Experimental enterotoxemia in rats and monkeys was induced by intravenous SEB challenge. In both species SEB was rapidly removed from blood principally by renal clearance as indicated by distribution studies and by the dramatic drop in clearance rate after nephrectomy. Distribution was studied relative to toxin concentration by radioactive tagging and to cellular localization by fluorescence microscopy. Highest concentration of radioactivity was found in the kidney although lesser amounts were present in liver, lung and gastrointestinal tract. Renal toxin was confined to proximal convoluted tubules having gained access to the tubules by glomerular filtration and tubular reabsorption. It remained there for up to 8 hours in monkey and 24 hours in rat. It was concluded that the proximal tubules are the major site of enterotoxin localization (about 75% of injected dose) while the liver and to a lesser extent the lung may also be important sites. Identification of the sites of toxin localization represents a major step towards understanding the pathogenesis of enterotoxemia. Such understanding should eventuate in better treatment of man suffering from staphylococcal intoxication.

TITLE: Associated Ytterbium and Niobate Impurities In Calcium Tungstate
AUTHOR: NEMARICH
Harry Diamond Laboratories

ABSTRACT: The paramagnetic resonance spectrum of trivalent ytterbium has been investigated in single crystals of calcium tungstate containing niobium for charge compensation. In addition to the spectrum of Yb^{3+} in sites having the tetragonal point symmetry of the calcium site, spectra of ytterbium in three other types of sites were observed. On the basis of the symmetry of these spectra in principal crystallographic planes, it was concluded that they are due to three types of associated Yb^{3+} ions and niobate complexes. The associates are identified as a Yb^{3+} ion in a calcium site and $(NbO_4)^{3-}$ in either the first, second, or in certain of the fourth nearest-neighbor $(WO_4)^{2-}$ sites. The use of this identification for explaining the behavior of optically pumped laser materials is discussed.

(*Continued on page 42*)

$250 Award Technical Papers

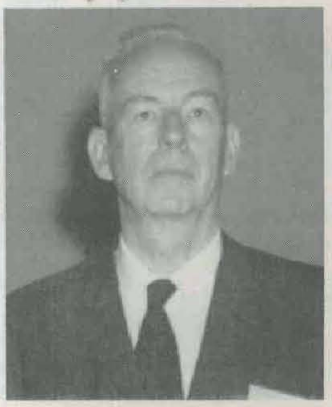
(*Continued from page 41*)

TITLE: Boundary-Layer Studies on Helicopter Rotors in Forward Flight
AUTHOR: McCROSKEY
Aeronautical Research Laboratory, Ames Research Center, Moffett Field

ABSTRACT: Future improvements in the performance of helicopters, and advanced aircraft that rely on rotary-wing technology, will depend upon an improved understanding of the aerodynamics of the rotor. One of the problem areas that is least understood is the airflow in the thin viscous layer adjacent to the surface of the rotor blade. This boundary layer flow, which significantly affects the maximum lift capability and forward flight speed, has been studied theoretically and experimentally. Based on the simplifying assumption of small crossflow, analytical solutions were obtained that demonstrate the essential features of the problem. Experiments were performed to check the assumptions of the theory and to determine the primary differences in laminar and turbulent crossflow.

The results of the analysis reveal that the effects of rotation can be large in regions of incipient separation, but the crossflow due to forward flight generally predominates elsewhere. The crossflow and unsteady effects are beneficial in delaying retreating blade stall, but they increase the power required to drive the rotor. In practice, the benefits could be exploited further by using airfoils that stall at the trailing edge first. Experimental streamlines showed that the crossflow is small, as predicted, and the streamline patterns were virtually identical in laminar and turbulent flows.

Capt W. J. McCroskey



Dr. H. W. Kohler

TITLE: An Inductive Proximity Sensor
AUTHOR: KOHLER
Harry Diamond Laboratories

ABSTRACT: An inductive proximity sensor with a novel arrangement of primary and sensing coils is described. The electrostatically shielded primary coil is energized at about 100 kHz. The secondary, decoupled from the primary, senses the field of the eddy currents induced in a nearby metallic object. Decoupling is obtained by positioning the secondary on the surface of a constant rms magnetic flux. This flux surface is generated by rotating a field line of the primary, in free space, around the coil axis.

Models of the sensor have given useful signals from objects 2 to 8 coil diameters away. For a particular sensor, range law and directivity curves are shown. Advantages of the device are: desirable directional properties; insensitivity to non-metallic objects, rain and foliage; simplicity and low cost.

S. J. Doherty

TITLE: A New Concept in Lightweight Armor Penetrators - Dual-Hardness Projectiles
AUTHOR: DOHERTY
Army Materials and Mechanics Research Center, Watertown Arsenal

ABSTRACT: This paper deals with an original concept leading to the development of a new metallurgically bonded dual-hardness composite projectile for penetrating lightweight armor materials at low energy levels.

Included in the study are variations in existing penetrator ogive geometry, hardness, and strength levels required for optimum penetration of ceramic and dual-hardness steel armor materials.

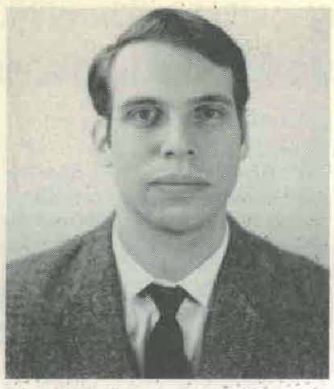
Parallel studies were carried out with the new dual-hardness and high density material experimental penetrators against the composite targets.

Optimum kinetic energy, small-arms penetrators are recommended for penetration of both composites and homogeneous armor materials.

(*Continued on page 43*)

Dr. Helmut Helwig

Outstanding Achievement Papers



H. I. Bassen

TITLE: Pulsed Transistor Oscillators With Fractional RF Cycle Risetimes at VHF-UHF Frequencies

AUTHOR: BASSEN
Harry Diamond Laboratories

ABSTRACT: A method for the generation of pulsed VHF-UHF oscillations with immediate starting at full amplitude has been developed using a single UHF transistor. Short RF bursts with controlled, rapid rise and short fall times may be generated with peak powers of over one watt. This permits development of high performance, high resolution radar systems with a minimum number of components at a very low cost. Application of this technique to ranging systems is discussed.

C. S. Choi

TITLE: Neutron Diffraction Study of α-$Pb(N_3)_2$

AUTHOR: CHOI
Explosives Laboratory, Picatinny Arsenal

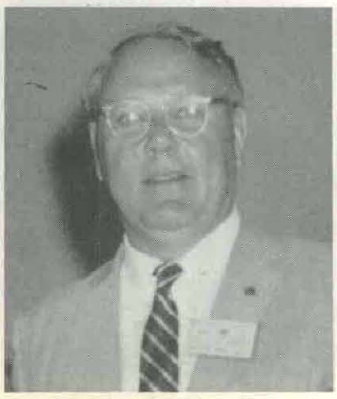
ABSTRACT: The structure of the common alpha form of lead azide was investigated using 3-dimensional neutron diffraction techniques. The atomic positions were refined in the centrosymmetric space group, Pcmn, using anisotropic temperature factors. It was found that there are 4 different types of azide structures in a unit cell. The azide groups are collinear but differ in degree of symmetry and also in bonding to the neighboring atoms. The symmetric and the asymmetric azides are arranged in different layers and separated by a layer of lead atoms. Each lead atom is bonded to 8 azides in a distorted tetragonal antiprismatic bond arrangement.

Capt J. N. Eikenberry

TITLE: Liquid Metal Chelates as Ballistic Modifiers for Composite Solid Rocket Propellants

AUTHOR: EIKENBERRY
Redstone Arsenal

ABSTRACT: A class of metal chelate compounds containing iron, cobalt, nickel, and copper were evaluated as ballistic modifiers for a composite propellant containing ammonium perchlorate. Certain iron and copper compounds proved superior to the conventional metal oxide modifier and approached the most effective ferrocene derivative in activity; the cobalt and nickel compounds performed poorly in comparison with all other modifiers. The effect of the physical state and the solubility of the metal chelate compounds on their behavior as ballistic modifiers was investigated. The liquid and more soluble compounds were more effective in reducing the pressure exponent, but the solid and less soluble compounds were more effective in increasing the burning rate.



Dr. F. E. Hahn

TITLE: Mechanisms of Action of Antimalarial Drugs

AUTHOR: HAHN
Walter Reed Army Institute of Research

ABSTRACT: The occurrence in Vietnam of falciparum malaria which is resistant to prevention and treatment with chloroquine has stimulated experimental laboratory investigations with the view to elucidating the mechanisms of action of chloroquine (I), quinacrine (II) and quinine (III). The drugs form molecular complexes with desoxyribonucleic acid, DNA, in such a manner that their heterocyclic chromophoric moieties are inserted between the levels of base pairs in native (double-helical) DNA. The aliphatic 1,4-diaminopentane side chain of (I) and (II) protrudes beyond the contours of the DNA cylinder and bridges the minor groove of the double helix by electrostatic attraction to phosphoric acid groups in the sugar-phosphate backbones of DNA. The resulting

(Continued on page 44)

Outstanding Achievement Papers

(*Continued from page 43*)

stabilization and perturbation of double-helical DNA results in an incapacitation of this polymer to serve as a primer and template for its own identical replication as well as for the transcription of RNA.

Enzume experiments in vitro have verified that the drugs do inhibit the DNA-polymerase reaction strongly and the RNA polymerase reaction significantly. (I) and (II) also inhibit DNA biosynthesis in vivo with predictable cytocidal effects. (I) additionally causes autolysis of ribosomes in vivo. RNA biosynthesis in vivo is completely blocked by (I) and subject to dose-dependent inhibition by (II). The drugs belong in the category of antimicrobial agents that are lethal to microorganisms because they complex with DNA and block DNA biosynthesis.

TITLE: Chikungunya Vaccine Project
AUTHORS: HARRISON, ECKELS, HAMPTON and BOYER
Walter Reed Army Institute of Research

ABSTRACT: Experimental formalin-killed chikungunya (CHIK) vaccines were prepared in chick embryo (CE), suckling mouse brain (SMB) and Green monkey kidney (GMK) tissue culture infected with the high passage adult mouse-adapted CHIK 168 virus. Protection tests in mice showed CE vaccine to be markedly inferior to either SMB or GMK vaccine. Since GMK vaccine was highly effective in protecting mice against an intracerebral challenge, further evaluation of SMB vaccine was not made at this time because the potentially encephalitogenic properties of this type vaccine seriously limit their use in practice. The administration of GMK vaccine to mice elicited significant levels of neutralizing antibody (N) against the mayaro virus and heterologous African and Asian strains of the CHIK virus. To correlate these findings with protection against a live challenge, a vaccine trial was performed in rhesus monkeys. The broad protective capability of GMK vaccine was demonstrated by the complete absence of viremia in the vaccinated monkeys, with one exception, while all of the control monkeys developed viremias after inoculation with the mayaro virus and heterologous strains of the CHIK virus. The widespread geographic distribution of viruses belonging to the CHIK complex throughout Africa, Asia and South America creates a potentially explosive epidemiological situation which might well be controlled, or at least ameliorated, by a vaccine of the type described in this report.

TITLE: Energy Flux Density Vector Sensor - A New Dimension in Nuclear Radiation Survey
AUTHORS: KRONENBERG and LUX
Fort Monmouth

ABSTRACT: The energy flux vector in a nuclear radiation field is the sum of vectors each defined by the product of energy times velocity of the individual particles of a given point in space and time. To measure it one needs 3 sensors each having a cosine response to nuclear radiation placed along the axis of a cartesian coordinate system. Devices of this type for X-rays and gamma rays have been developed in our laboratory. The accuracy of the cosine response of such sensors is within 1^{o} of arc. Their angular sensitivity is independent of the spectral distribition of the gamma rays.

The energy flux sensing can be applied in the correlation of the EMP produced by exploding nuclear weapons with the radiation environment, for nuclear surveillance, and in a pulsed X-ray zero visibility landing system.

TITLE: Explosive Reactions of N-F compounds with Hydrogen
AUTHORS: KUHN and WELLMAN
Ballistic Research Laboratories, Aberdeen Proving Ground

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Army Science Conference Draws Acclaim for Papers

(*Continued from page 41*)

as he explained his views of the situation in Vietnam and the problems of humanely and intelligently controlling civil disorders in American cities. (The address is featured on page 2.)

Three researchers on the basic mechanisms of high explosives at Picatinny Arsenal, Dover, N.J., combined their talents to win the $1,000 cash honorarium for the best technical paper. Dr. Bulusu Suryanarayana, Joseph R. Autera and Richard

V. R. Harrison

Dr. S. Kronenberg

Dr. L. P. Kuhn

J. Graybush shared the award as coauthors.

In selecting this paper, "Mechanism of Thermal Decomposition of HMX (1,3,5,7,-Tetranitro-1,3,5,7,-Tetrazacyclooctane)," a panel of Army judges, headed by Dr. Lasser and representative of the major scientific disciplines, considered the basic nature of the research in a field about which comparatively little is known, despite long practical experience.

Although detonations caused by high-powered explosives can be used effectively, the reactions are relatively inefficient in that only a small portion of the available energy is utilized. Results of the Picatinny research team clearly show that the common military explosive HMX reacts by the breaking of carbon to nitrogen bonds.

This discovery is viewed as a first step in formulating and understanding the mechanism of detonation. Fuller understanding of the detonation process could lead to a more complete and effective exploitation of energy available in metastable materials.

Two papers shared awards of $500 each for runner-up laurels. David I. Randolph, U.S. Army Natick (Mass.) Laboratories, authored and presented "Flash Blindness: The Effects

(*Continued on page 46*)

A. S. Lessem

C. J. Litz Jr.

Outstanding Achievement Papers

(*Continued from page 44*)

ABSTRACT: Hydrogen and N_2F_4 have been found to undergo an explosive reaction at or near room temperature. The stoichiometry and products depend upon the initial ratio of reactants in the following manner:

when $H_2/N_2F_4 > 2, 2H_2 + N_2F_4 = N_2 + 4HF$ (1)

when $H_2/N_2F_4 = 1, H_2 + N_2F_4 = N_2 + 2HF + F_2$ (2)

when $H_2/N_2F_4 < 0.5, H_2 + 2N_2F_4 = N_2 + 2HF + 2NF_3$ (3)

Reaction (1) is unaffected by inert gases such as helium or xenon whereas reactions (2) and (3) are strongly affected, the ratio, NF_3/N_2, in the products first increases and then decreases with increasing amounts of inert gas. Helium is more effective than xenon. No reaction occurs under our conditions between H_2 and NF_3 or H_2 and HNF_2, however in the presence of very small amounts of N_2F_4 these mixtures explode. N_2F_2 has been shown to be an intermediate in reactions (1) and (3) and gives rise to an intermediate formed in (2). All of the explosive reactions are strongly inhibited by small amounts of olefins. The relationship between structure and inhibiting power has been examined.

Mechanisms for reactions 1, 2, and 3 are proposed which are compatible with our observations. They are all chain reactions initiated by $NF_2 \cdot$ radical and in which $H\cdot$, $N_2F_3\cdot$, and $N_2F\cdot$ are chain carriers.

TITLE: A Mathematical Model for Traversal of Rigid Obstacles by a Pneumatic Tire

AUTHORS: LESSEM and GREEN
Engineer Waterways Experiment Station

ABSTRACT: The mathematical model for a pneumatic tire described in this paper is used to compute the horizontal and vertical forces transmitted through the tire to the vehicle axle to provide realistic force inputs for model studies of vehicle dynamics. The present model is valid for the case of a pneumatic tire traversing nondeforming obstacles with zero slip.

Static load-deformation characteristics and dynamic obstacle-traversal characteristics were obtained in laboratory tests with 9.00-14 tires under several conditions of ply rating and inflation pressure. These data were used to calculate model parameters and to produce time histories of dynamic responses.

Computer implementation of the mathematical model produced force and displacement time histories similar to those obtained during the obstacle-traversal laboratory tests. The model produced the essential features of the waveforms seen in the laboratory and is a valid representation of a pneumatic tire for dynamic analysis of vehicles on nonyielding terrain.

TITLE: Studies Relating to the Use of Propellant Gas

AUTHOR: LITZ
Frankford Arsenal

ABSTRACT: Studies were performed using propellant gas in a rather unique and heretofore untried manner. One such study concerned the propellant actuated device (PAD) antistall recovery system for fixed wing aircraft. This system provides for a safe landing after partial or total power failure of a thrusting engine or permits recovery from stall when the aircraft is close to the ground, particularly during take-off or landing. Solid propellant gas generators are used as the source of energy for leading or trailing edge blowing from airfoils to reestablish air circulation about the stalled airfoil. Two-dimensional smoke and wind tunnel tests successfully demonstrated that the PAD anti-stall system can completely unstall airfoil profiles at angles of

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attack up to 18° by gas discharge circulation-control means.

Work on a feasibility study relating to improvement of STOL (short take-off and landing) by using PAD energized blowing flaps was also conducted. Another study, concerning drag reduction characteristics of projectiles, indicated the amount of skin friction drag can be reduced in the order of 70 to 95 percent in the range of Reynolds numbers of 10^6 to 10^8, with a minimum amount of propellant.

Continued tests and studies are underway.

TITLE: Micro-Assay for Staphylococcal Enterotoxin B
AUTHORS: SALOMON and TEW
Dugway Proving Ground

ABSTRACT: A novel method for the assay of staphylococcal enterotoxin B (SEB) was developed that has the advantages of simplicity, rapidity, reliability and economy, and is more sensitive than conventional procedures by several orders of magnitude. Latex spheres 0.2 μ in diameter, coated with carefully controlled quantities of specific antiserum, were found to be exquisitely sensitive indicators of SEB. Under appropriate conditions of pH and ionic strength, and with added stabilizing colloid, such latex spheres permitted quantitation of as little as 2×10^{-4} μg of SEB per ml of original solution. Thus, an assay method is now available that is consistent with the biological effectiveness of the toxin. In conjunction with parallel development of improved procedures for collection and stabilization of samples of SEB from aerosols, practical applicability of the new techniques was demonstrated under various conditions. Large numbers of specimens can be processed with minimal requirement for skilled personnel. Further enhancement of sensitivity by lyophilization and instrumented readout was shown to be possible.

TITLE: Blast Phenomena from Explosions at the Water Surface
AUTHORS: SAKURAI, PINKSTON and STRANGE
Engineer Waterways Experiment Station

ABSTRACT: The principal objective of this study was to evaluate the blast and shock phenomena (in air and underwater) resulting from a pure surface explosion (i.e. the situation where the charge is half in and half out of the water). The general results can also be utilized, through the use of appropriate mathematical models, for the case of an air-solid interface, since a solid under a sufficiently strong impulse load is known to behave in many respects as a fluid. The approach included both theoretical and experimental investigations. For the theoretical investigation, a detailed analysis of the similarity solution was performed by assuming that a finite amount of energy (mechanical) is released instantaneously at a point on the water surface. This assumption, although not quite valid for the case of ordinary chemical explosives, is believed to be a good approximation for the initial stages of a nuclear explosion; it was used also to determine the initial ratio of shock energies that appear in the form of airblast and water shock and to establish input parameters for the later stages of the explosion phenomena. The later stages were formulated using the acoustic theory for the water half-space and a modified free-airblast-wave for the air environment. The experimental study, conducted simultaneously with the theoretical investigation, involved the detonation of forty 10-pound spherical TNT charges, with the center of gravity of each charge at the water surface. Airblast and water shock pressure-time measurements were obtained above and below the air-water interface at horizontal ranges varying from 0 to 20 $W^{1/3}$. Results of the experimental tests have been compared with theoretical predictions, and a cursory examination shows good agreement with the theoretical values, except for a small region on each side of the interface, wherein both measurements and formulas appear less reliable.

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of High-Intensity Photic Stimuli Upon the Cat Electroretinogram."

Three researchers on maser and laser technology at HQ U.S. Army Missile Command, Redstone (Ala.) Arsenal, shared $500 as coauthors, namely Jefferson S. Bennett, Edward L. Wilkinson and Richard L. Hartman. Their paper was titled "Interaction of Hot Electrons with Optical Modes of Lattice."

Randolph's findings are considered of prime military importance in that there are varied situations in which personnel will be accidentally or otherwise exposed to short-time, high-intensity bursts of light, i.e., laser and nuclear weapons.

Results of such exposure can lead to temporary or longer-term blindness—the so-called "flash blindness." The result is operational ineffectiveness of the weapons operators or a casualty requiring evacuation. Thus the military problem becomes that of preventing exposure to blinding light by the use of protective devices.

Adequate eye-shielding depends upon basic knowledge of the characteristics of the light causing flash

Dr. L. L. Salomon

Dr. A. Sakurai

CHIEF OF R&D Lt Gen A. W. Betts (right confers with Brig Gen W. W. Stone Jr. (left), deputy to Dr. Jay Tol Thomas, AMC Deputy and Director of Laboratories; Maj Gen William B. Latta, CG, U.S. Army Electronics Command; and Col Robert B. Bennett, CO, U.S. Army R&D Group, Europe.

blindness and the nature of the disturbance (lesion) caused in the eye. Randolph's research is believed to provide much of the required data, which was acquired by patient, sophisticated investigative work involving physics and neurophysiology.

The studies of Bennett, Wilkinson and Hartman of the structure of solids and transport phenomena in solids were adjudged as contributing significantly to fundamental knowledge, pointing to the eventual possibility of tailor-making materials to have desirable characteristics for a variety of military purposes.

Suitable materials, for example, could result in use for masers and lasers and the control of their beams. Among other potential applications would be to new and improved electronic equipments and to communications, surveillance and fire-control systems; also, to design of materials for structures for armor, missiles, tanks, trucks and a variety of Army materiel requirements.

Six papers each won prizes of $250. For the first time, one of the papers was selected from the supplemental list of 15 prepared as possible alternate presentations at the conference. This honor went to Dr. Helmut Helwig, U.S. Army Electronic Command, for "The Barium Oxide Molecular Beam Tube: A New Type of High-Precision Frequency Source."

Capt William J. McCroskey of the Aeronautical Research Laboratory, Ames Research Center, Moffett Field, Calif., won $250 for "Boundary-Layer Studies on Helicopter Rotors in Forward Flight." Joseph Nemarich of the Harry Diamond Laboratories, Washington, D.C., earned a like award for "Associated Ytterbium and Niobate Impurities in Calcium Tungstate."

Stephen J. Doherty's paper, "A New Concept in Lightweight Armor Penetrators—Dual-Hardness Projectiles," earned a $250 award. He reported on his development of a new process of metallurgical bonding at

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TITLE: Synthesis of Stereoisomeric Incapacitating Agents
AUTHORS: AARON, DUDLEY, LENNOX and MILLER
Edgewood Arsenal

ABSTRACT: All of the possible stereoisomers of a series of five racemic incapacitating agents have been synthesized from resolved, optically active intermediates. Biological screening of these isomers has shown that, in every case, the isomer which was synthesized from levorotatory intermediates was the most potent form. The results constitute a biological correlation of the relative configurations of these materials. The possible application of these results to the large scale manufacture of stereoisomeric agents is indicated.

TITLE: MBT-70 Mission Profile
AUTHOR: AMMENTORP
Joint Engineering Agency, US/FRG Tank Development Program, Warren, Michigan

ABSTRACT: One of the significant problems attendant to development activities is achieving adequate communications between Users and developers as well as among agencies participating in a program. This paper describes the MBT-70 Mission Profile which portrays the role envisioned for employment of this tank in a manner considered useful as a uniform guide for all disciplines involved in the design, test and fielding of that new weapon system. The paper reviews why the mission profile was needed, how it was formulated, some ways it was used and other activities for which such a document may be helpful in order that others may judge the merit of adopting the approach in different programs.

TITLE: Narrowband Infrared Detection of Important LASER Wavelengths
AUTHORS: GUALTIERI, de LHERY, AuCOIN and PASTORE
Fort Monmouth

ABSTRACT: The tripositive rare earths, holmium and erbium, embedded in tungstate, sodium rare earth tungstate, fluoride, and garnet crystals are infrared quantum detectors of important LASER wavelengths in the 1-2 μm spectral region. Their calculated detectivities using experimental values of signal bandwidth and internal fluorescent quantum efficiency, range from 1.7×10^{10} at 2.12 μm to 1.3×10^{14} cm $Hz^{1/2}/W$ at 1.16 μ m, with estimated response times on the order of 160 μ s. Especially encouraging is the good detectivity of the Er^{3+}: glass LASER wavelength at 1.54 μ m. This wavelength is important since potential eye damage in this region would be minimal.

TITLE: Experimental Scurvy in Man
AUTHORS: BAKER, SAUBERLICH, MARCH and HODGES
Fitzsimons General Hospital

ABSTRACT: Vitamin C (or ascorbic acid) deficiency was studied in volunteer human subjects employing the use of L-ascorbic-1-^{14}C acid. Metabolism, body pool size and rate of turnover of vitamin C were determined during both depletion and repletion of the subjects. Symptoms of mild scurvy occurred in the subjects when the body ascorbate pool had been reduced to approximately 300 mg. Symptoms included swollen bleeding gums, conjunctival hemorrhages and follicular hyperkeratosis. During the depletion phase, no ascorbic acid was excreted in the urine; however, unidentified carbon-14 metabolites derived from administered ^{14}C-labeled ascorbic acid appeared in the urine. The rate of depletion occurred as a first order process, while the rate of repletion occurred as a zero order process and was proportional to the level of daily ascorbic acid intake. This study would indicate that a daily intake of less than 6.5 mg per day of ascorbic acid is sufficient to alleviate and prevent scurvy in man. However, the ascorbic acid requirement was increased by emotional stress but was not influenced by other forms of stress investigated.

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TITLE: The Use of Arthropods as Personnel Detectors
AUTHOR: BARNHART
Limited War Laboratory, OCRD

ABSTRACT: Arthropods which actively seek and attack man were examined with the idea of exploiting their man-finding capabilities in ambush-detection and intrusion-detection roles. Devices employing whole insects and ticks were designed, fabricated and tested in out-of-door wooded environments.

Arthropods used in these studies included the conenose bug Triatoma infestans, the bedbug Cimex lectularius, the Oriental rat flea Xenopsilla cheopsis, the mosquitoes Anopheles quadrimaculatus, Aedes aegypti and Culex quinquefasciatus and the tick Amblyoma americanum.

These studies include the development of breadboard and prototype instrumentation and hardware for monitoring changes in insect activity presumably caused by a sudden change from a lower to a higher concentration of human airborne effluent.

Readouts from these devices are virtually in real time.

Technical feasibility of the use of arthropods as personnel detectors was established. Detections of one person up to 25 yards was recorded in tests. Reliability of devices is complicated by circadian rhythm inherent in each arthropod species.

TITLE: Chromosome Transfer Between Escherichia coli HFR Strains and Proteus mirabilis
AUTHORS: GEMSKI, WOHLHIETER and BARON
Walter Reed Army Institute of Research

ABSTRACT: Escherichia coli male Hfr strains were employed to hybridize Proteus mirabilis female recipients with chromosomal markers by the sexual process of genetic exchange termed conjugation. P. mirabilis lac+ hybrids, which behave as unstable partial diploids, were isolated at low frequency from such crosses whereas all efforts to recover ara+ and gal+ hybrids from similar matings were unsuccessful. In contrast, when a P. mirabilis lac+ diploid was used as a recipient in backcrosses with E. coli Hfr donors, the transfer of ara+ and gal+ genes was observed. Physical examination of DNA of such hybrids by CsCl density gradient centrifugation showed the presence of satellite bands of native E. coli DNA (50% GC) in addition to the P. mirabilis DNA component (39% GC). The amount of DNA in satellite bands of various diploids was as follows: lac+ diploid, 6% of the total DNA; lac+ ara+ diploid, 20% of the total DNA; lac+ gal+ diploid, 16% of the total DNA; and lac+ gal+ ara+ diploid, 26% of the total DNA. The amount of satellite DNA, therefore, appears to be sum of the chromosomal segments added by conjugation.

TITLE: Ground State Wave Functions for the Azide Ion (N_3^-)
AUTHORS: KEMMEY, MATTERN and BARTRAM
Explosives Laboratory, Picatinny Arsenal

ABSTRACT: Self-consistent-field, molecular orbitals for the azide (N_3^-) ion in the ground state have been calculated using an extended basis set of Gaussian functions. The results are compared to previous calculations. In addition the positions of the nitrogen nuclei have been varied in order to determine the equilibrium positions and to calculate vibrational force constants for the ion. It was found that the equilibrium configuration is linear symmetrical and that the ion is stable against bending. The calculated force constants are in reasonable agreement with values obtained from infrared measurements on alkali metal azides. Also, the equilibrium nuclear separations are consistent with x-ray data.

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PROJECT OFFICERS of the Army Science Conference were commended highly for their successful efforts. Left to right are Lt Col Samuel J. Hubbard, Scientific and Technical Information Division, Army Research Office, OCRD; Lt Col Robert A. Carter, U.S. Military Academy; Dr. John C. Hayes, executive secretary, Army Science Conference Advisory Committee and chief, Program and Concepts Branch, S&TI Div.

the U.S. Army Materials and Mechanics Research Center, Watertown, Mass. Shortly after presenting the paper, he journeyed to Fort Dix, N.J., for the graduation of his son, Stephen E., from Advanced Infantry Training.

Reputation of the Harry Diamond Laboratories, Washington, D.C., for pioneering development of proximity fuzes, often termed one of the most important R&D contributions to victory in World War II, was further enhanced by another $250 paper. Hans W. Kohler reported on "An Inductive Proximity Sensor" which has advantages of desirable directional properties, insensitivity to nonmetallic objects, rain and foliage, and simplified, low-cost production.

Studies related to food poisoning, as reported in "The *In Vivo* Localization Staphylococcal Enterotoxin B," enabled Sigurd J. Normann and Robert F. Jaeger of the Fort Detrick (Md.) Laboratories to share a $250 award. By inducing experimental enterotoxemia in rats and monkeys through intravenous SEB challenge, they produced new knowledge of the biology of bacterial toxins which eventually may yield improved treatment of human patients.

Assistant Secretary of the Army (R&D) Dr. Russell D. O'Neal, in pre-

senting the awards and Certificates of Achievement carrying his signature and that of Chief of Research and Development Lt Gen Austin W. Betts, commented on the "scholarly" quality of the 96 papers. Thirty-one certificates went to military authors, an unusually high percentage.

That term of scholarly applied in a higher degree than ever before to the composition of the more than 400 participants. Approximately 130 of them had doctoral degrees and the percentage of those with master's degrees also was exceptionally high.

Director of Army Research Brig Gen Charles D. Y. Ostrom Jr. gave the introductory message following the call to order by Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research, who served as general chairman of arrangements through the Army Science Conference Advisory Committee. Brig Gen John R. Jannarone, dean of the Military Academy Board, extended greetings on behalf of the academy superintendent.

Keynote speaker Dr. William G. McMillan, science adviser to the U.S. Military Assistance Command, Vietnam (MACV), since the fall of 1966, was introducted by General Betts, who said: "I do not know of anyone in the country, at any rank and in any community, who could have been more appropriate for this gathering."

Dr. McMillan explained the establishment of his office as an outgrowth of the November 1966 phaseout of the Joint Research and Test Activity (JRATA). He serves also as adviser to the Army Concept Team in Vietnam (ACTIV) and in both capacities aims to expedite development and procurement of urgently needed materiel items.

This is accomplished basically by providing better communication be-

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Conference receptionists were Anne G. Thomas, U.S. Army Research Office, and Glenna B. Hester, Office of the Chief of Research and Development.

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TITLE: Modulatable IR Emission of Alkali Vapors
AUTHORS: CREEDON and BAYHA
Fort Monmouth

ABSTRACT: Several alkali metals have been experimentally studied to determine their characteristics as infrared sources. Pulse discharges were established in the metal vapors, and the resulting spectra, radiation efficiency, and percent modulation were observed. The radiation efficiency was measured in selected infrared regions as a function of pressure and power at three pulse durations. Results of these measurements are presented and comparison between various gases is made. The experimentally observed dependence of efficiency on pressure and current is compared with theoretical predictions.

TITLE: Liquid Lasers: Preparation and Characteristics
AUTHORS: GORDON and BEATTIE
Fort Monmouth

ABSTRACT: Although a natural extension of laser material research, liquid-laser investigations have remained an academic curiosity due primarily to the lack of initial successes and unrealized potential in contrast to the spectacular advances in gaseous and solid-state laser research. The recent findings by Heller and Lempicki concerning the unique liquid laser system neodymium - selenium oxychloride, however, have prompted a closer scrutiny of liquid lasers for military applications. Liquid laser solutions of neodymium - selenium oxychloride have been prepared; their physical characteristics such as lifetime, threshold and efficiency have been measured. The preparation of these solutions requires scrupulous care both from a safety standpoint and from the standpoint of producing an efficient laser. Thresholds of 13 joules and output to 5 KW have been recorded for a 2 inch cell having a fluorescent lifetime of 70 μs. A convenient method of determining values of pulsed threshold for new solutions is suggested by a comparison of observed lifetime with a precalibrated curve. The possibility of CW operation of a non-circulated liquid laser has been discussed. Temperature induced refractive gradients result in optical degrading sufficient to prevent CW operation.

TITLE: The Mechanism and Application of Periodic Electrode Processes
AUTHORS: HUNGER and WYNN
Fort Monmouth

ABSTRACT: Periodic electrode phenomena were observed during the anodic oxidation of formaldehyde, dissolved in sulfuric acid, at platinum electrodes and room temperature.

The current-voltage relationship with its region of transient behavior was determined galvanostatically. Coulometric analysis of galvanostatic potential transients was found to be an effective diagnostic tool to study the reaction mechanism, especially when in combination with adsorption and desorption experiments.

The process frequencies of the oscillations, observed at microelectrodes, were up to 3 Hz. Adsorption experiments with variation of the anodic stripping current permitted to estimate the participation of the anodically oxidized platinum surface in the oxidation mechanism. This in turn permitted to explain the relationship between the process frequency and the current density at the electrode. The reasons for the limitations to the process frequency are discussed.

Oscillatory behavior permits us to think about electrodes and galvanic cells in different functional terms than before. We have succeeded in transferring the oscillatory behavior from a galvanic half element to a complete galvanic cell producing current, voltage and electrical power pulsations.

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TITLE: A Numerical Method for Evaluating Stresses in Gun Tubes
AUTHOR: BECKETT
Rock Island Arsenal

ABSTRACT: Gun tubes which sustain a high rate of fire are subjected to severe temperature stresses as well as stresses from high internal pressure and, in many cases, from shrink fit and autofrettage. The total stress in the tube from these factors may be very high and will influence in large measure the tube design. Current practice for evaluating the stresses is based on analytical methods that are applicable to axisymmetric cylindrical shells.

In this paper, a numerical method is developed for determining the stresses and displacements in a tube with axial symmetry but having an arbitrary contour and arbitrary conditions of pressure and displacements imposed at the boundary. Provision is made in the solution for dependence of material properties on temperature which, in turn, can be any axisymmetric function of position.

TITLE: The Enzymology of Ballistic Wounding
AUTHORS: TISDALE and BERDJIS
Edgewood Arsenal

ABSTRACT: Evaluation of the relative detrimental effects of temporary and permanent wound tracts has been under study in this Laboratory. The present study is an attempt to extend these observations to include the serial changes in serum enzyme levels after ballistic wounding, thus reflecting tissue necrosis in a manner not dependent solely upon measurement of the permanent wound tract.

Muscle wounds and enzymes found predominantly in that tissue are being evaluated. Early results indicate that changes in serum GOT enzyme activity reflect the amount of kinetic energy imparted to the tissues better than permanent tract dimensions alone.

TITLE: Hurricane Surge Determinations on the Texas Coast and in Galveston Bay
AUTHOR: WOODWARD
Engineer District, Galveston

ABSTRACT: Prediction of storm surges for hurricanes of various degrees of severity is required for both the design and economic analyses of protective structures proposed for the prevention of hurricane flood damage.

The method used to estimate the hurricane surge on the open coast utilizes the onshore and alongshore wind stress components with a moving wind field over the continental shelf. Through the numerical integration of the hydrodynamic equations of motion and continuity, the one-dimensional, non-linear storm surge is computed at selected locations along the Texas coast.

Application of the basic equations, during calibration, required solving for two unknowns, namely: (1) the wind stress coefficient and (2) the relative bottom friction factor.

After calibration, the equations are applied to synthetic isovel patterns and characteristics for the determination of the Standard Project Hurricane surge at the selected points.

Once the open coast surge hydrographs are obtained for the Galveston area, a numerical scheme for computation of two-dimensional, non-linear storm surges and tides is applied to Galveston Bay. Allowance is made for the overflow of low-lying land barrier islands and for the flooding of and recession from low-lying land areas adjacent to the bay. Preliminary results of a parametric study for the effects of the Standard Project Hurricane over the bay are also presented.

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tween field representatives and Army laboratories in the U.S.—by "cradle to the grave" follow-up action.

In a general tribute to the accelerated response of Army in-house laboratories to the most urgent Vietnam requirements, Dr. McMillan cited particularly the success of the U.S. Army Limited War Laboratory, Aberdeen Proving Ground, Md., and the Electronics Command Night Vision Laboratory, Fort Belvoir, Va. He also discussed the close relationship of his office with that of Leonard Sullivan, Deputy Director (Southeast Asia Matters) of Defense Research and Engineering, Washington, D.C.

Military technology was advanced significantly, he said, by requirements of World War II (described as an "all-out R&D effort"), the Korean Conflict (essentially a "police action") and Vietnam (which he termed a "no war" in that war has not been declared).

World War II R&D, in which university science played a major role, produced such major innovations as radar, the proximity fuze, atomic bomb, homing torpedo, the technique of operations analysis, and a great many other results of creative thinking, Dr. McMillan stated.

The Korean Conflict was marked by important advances in jet aircraft and helicopter design and components. Vietnam has yielded important advances in night-vision devices (notably the starlight scope), helicopter weapons and armament, selected munitions, herbicides and many items for jungle warfare.

Detailing some of the problem areas in Vietnam, Dr. McMillan stressed detection of the enemy "in the jungle and in the cities" as requiring more R&D effort, along with means of locating mortar and rocket sites promptly and accurately; also, further improvements in night-vision and a capability for quiet operations.

In linking the urban warfare in Vietnam to the problem of riot control in U.S. cities, he asked: "How do we control those few persons in a city bent on evil or on shooting people, or holing up and taking over territory, without at the same time destroying large sections of the city?"

Dr. McMillian emphasized strongly the need of integrating engineering and development of equipment and materiel with tactics and doctrine for military forces, saying: "I think this is something that needs to be tightened up. We need to have mate-

riel and equipment developed in conjunction with tactics and doctrine."

In launching into a rather lengthy discussion of "non-scientific observations which I have labeled perspectives," Dr. McMillan stated:

"Until recently, we have seen the most powerful nation, the most technically advanced, fought to a virtual standstill by a primitive, 20th-rate nation having a GNP (Gross National Product) of perhaps little over one-tenth of one percent of that of the U.S. We might ask ourselves, 'What's wrong? How come?'

"The plain point of fact is that the military was ill-prepared for this kind of war, an ill-preparedness that we can understand because of our concentration (I say our advisedly, meaning to include both the military and the scientists), our preoccupation, with strategic and nuclear matters.

"It was felt, and I think quite properly, that in the strategic area we could really lose our shirt, whereas Vietnam seemed to be a rather peripheral type of conflict. There was a lack of organization of science and technology. We have not seen the kind of organization that was developed in World War II, the involvement of the universities, the feeding in of new ideas—even the military laboratories were somewhat detached. . . ."

Dr. McMillan had rather strong criticism of scientists reluctant to give up jobs in the U.S. to go Vietnam, study conditions as field representatives of his office, and make a worthwhile contribution to military success because the time lost might slow their career progress.

"Now this," he said, "is just damned foolishness. I think we had better get reoriented on that kind of a point. If being in a war theater, when a man is a career military technologist, does not count toward advancement, then I don't know what should in that line of work."

Despite differences of opinion among prominent Americans which he said have seriously weakened the cause of U.S. and allied forces in Vietnam, Dr. McMillan voiced strong confidence in the future, saying:

"We have made great strides in recent months. I think that the new family of sensors, homing bombs, target locators, counter-mortar radars, the new receptiveness to operations analysis in the theater . . . I think all of these things are indicators of great progress and will pay off handsomely in the months ahead. . . .

"But in this country, because of the protracted character of the conflict, there has been considerable disaffection which leads to a mood of com-

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TITLE: Atmospheric Propagation of Injection Laser Radiation for High Data Rate Transmission

AUTHORS: SCHIEL, GAMMARINO and ARAS
Fort Monmouth

ABSTRACT: This paper describes the development of an injection laser communication link for high data rate transmission through the atmosphere. The prototype system provides a very high signal-to-noise ration for distances up to 10 km and can, therefore, tolerate large insertion losses due to unfavorable weather conditions. The system has a maximum capacity of 10 megabits/sec and either pulse frequency modulation (PFM), pulse position modulation (PPM), or pulse code modulation (PCM) can be used to transmit information. With available equipment, 196 audio channels of pulse coded modulation can be simultaneously transmitted. Error rate measurements have been conducted to determine the availability of this link under various weather conditions.

TITLE: Ionic Sensors

AUTHOR: MRGUDICH
Fort Monmouth

ABSTRACT: This paper, by presenting a few examples of systems using only three basic materials (silver, silver iodide and platinum) demonstrates the versatility, sensitivity and responsiveness of solid electrochemical systems. Thus, a thin disc of compressed silver iodide powder sandwiched between thin silver electrodes generates a substantially constant voltage when bent or twisted and this effect can be used as the basis of a large family of transducers and monitoring devices. Warming one electrode of this same sandwich also generates a substantially constant voltage whose magnitude and response speed well exceed those of the best conventional thermocouples. The same disc of silver iodide sandwiched between silver and platinum electrodes constitutes a rechargeable solid-electrolyte battery whose discharge characteristics can be used for timing purposes. A four-terminal device employing two silver electrodes, three silver iodide discs and two platinum electrodes can be used to convert nanoampere-second charge input into a many millivolt readout.

The general, and heretofore substantially neglected, field of devices based on ionic conduction through solids has been found replete with many new and novel effects of unusual sensitivity and versatility.

TITLE: Thyroidal Dysfunction During Simulated Altitude Conditions

AUTHOR: MULVEY
Research Institute of Environmental Medicine, Natick Laboratory

ABSTRACT: The present study was undertaken to determine whether acute exposure to hypoxic conditions, simulated 15,000 ft; 429 mm Hg, might have an effect on the uptake and/or the incorporation of ^{131}Iodine in the biosynthesis of thyroxine and on hormonal release from the thyroid gland of the rat. Results indicated that exposure to hypoxic conditions for various periods of time did not affect the uptake of ^{131}I. None the less, chromatographic analyses of the thyroid digest indicated that the gland from rats exposed to altitude for 23.5 to 28 hours showed a significant increase in the formation of radiomonoiodotyrosine (MIT), and a significant decrease in radiothyroxine (T_4). This resulted in an elevated MIT/DIT and T_3/T_4 ratios, and suggested that there was an effect of hypoxia on the conversion of MIT to DIT and on the coupling of diiodotyrosines to form thyroxine. Hypoxic animals indicated also a significant decrease in plasma radioactivity and in protein bound radioiodine, following 17 hours of exposure. The latter decrease might be due to either a change in the rate of hormonal synthesis, rate of release or rate of peripheral deiodination of protein bound ^{131}I.

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TITLE: Advances In Photo-Electrolytic Imaging Systems
AUTHORS: ZERNER, SOBIESKI and HODES
Fort Monmouth

ABSTRACT: A unique photo-electrolytic imaging system is described. A sandwich structure is used consisting of a photoconductive layer in contact with an image recording film. Upon the application of an electric potential across these layers, an amount of current flows which is proportional to the light striking the photoconductor. The image-wise flow of current causes initiation of polymerization and creates the image in the film.

Photoconductor systems suitable for use in photoelectrolytic imaging systems that are described include spray deposited, resin bound, and sintered. Quantum gains as high at 10^4 have been obtained with sintered cadmium sulfo-selenide photoconductors. Polymer initiating mechanisms disclosed are based on acid-peroxide compounds, metal ion oxidation-reduction reactions and oxygen complexes of zinc salts. An indication of the sensitivity of these systems is the fact that polymer can be formed over a 1cm.^{2} area upon the passage of 2×10^{-4} coulombs.

Photo-electrolytic imaging systems have been designed which show considerable light sensitivity but which, as yet, lack image quality.

TITLE: Effects of Spectrum Sampling on Speech Intelligibility
AUTHOR: CASTELNOVO
Behavioral Science Research Laboratory, OCRD

ABSTRACT: The effect of reducing the bandwidth of speech on intelligibility by eliminating several narrow bands was studied. The intelligibility of speech with a spectrum composed of several discrete pass bands was compared to (1) that with a continuous spectrum, (2) speech with one large segment of the spectrum removed and, (3) the intelligibility computed using the Articulation Index. The stimulus material was PB words presented at three speech to noise ratios. This was presented to 36 subjects through a filter system with selectable pass bands. The results indicate that at the higher speech to noise ratios, eliminating several narrow bands from the spectrum does not result in a corresponding reduction in intelligibility. When the speech is 35 dB above the noise a reduction of 20% or more can be made in bandwidth without noticeable reduction in intelligibility. As the speech to noise ratio is decreased the decrease in intelligibility becomes more nearly proportional to the decrease in bandwidth. Differences in size and number of segments excised, if the size of the excisions is not large, do not appear to differentially affect intelligibility. However, if the size of the excision becomes a relatively large contiguous portion of the total spectrum, excising several smaller segments results in a significantly higher level of intelligibility than excising a single segment of equal total bandwidth.

TITLE: Combined Stress Test Methods and Results for Ceramic Materials
AUTHOR: ELY
Redstone Arsenal

ABSTRACT: Test methods are described for subjecting tubular-shaped, ceramic specimens to biaxial stresses. Fracture strength data for over 170 tests are given for graphite, magnesium silicate and boron nitride. Some of the graphite data are for a temperature of approximately 2000°F. The strength results are compared with strength predictions of several failure theories. For two materials, the strength predictions of the modified maximum strain energy theory agreed reasonably well with the strength results.

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promise. My only hope is that this has not forced our hand in preventing a confrontation of the type of aggression which the North Vietnamese are practicing . . . I think we must be very careful not to compromise our ability to oppose that kind of aggression.

"In Paris, we see the specter of negotiations which are dragged out, supported by this attempt to display power by the enemy in Saigon and its environs. I think there are two responses to these two ploys. One is to outwait them. Don't give in just because the negotiations drag out. Don't make compromises just for the sake of 'progress.' And, on the other hand, to understand precisely what they are up to in and around Saigon and other major cities, and to interpret properly what they are doing. . . .

"Now what's the outlook? I would say it is very good, both for science and technology and contributions to the military operations in Vietnam. I think there is every evidence that the North Vietnamese are literally on the ropes. They are desperate. I think Tet was an act on desperation. They had completely fooled themselves as to what the response was going to be.

"The people [in South Vietnam] did not rise up. In fact, if anything they [the Viet Cong] alienated far more people than they ever had before. Yet our misunderstanding of the consequences of Tet at all levels virtually gave the North Vietnamese a psychological victory, and that's a mistake. . . .

"When I first arrived in Vietnam, almost every week one of the revolutionary force or popular front outposts was being overrun by the Viet Cong. Today that simply does not happen. The 'Rough Pups' are giving a very good account of themselves, and of course they are among the least well-trained, the least paid, of the RVN forces. The South Vietnamese government will soon have 900,000 men under arms as a consequence of the recent draft.

"I think a good example of what is to come is the achievements of the ROKs. In Korea it was rather analogous to what it has been in Vietnam in comparison with the caliber of the native forces. And yet today in Vietnam, the ROK divisions are among the best there are, the most ferocious fighters, the most feared. There have been in the the last month, and just this morning in the [newspaper] headlines numerous mass surrenders.

There have been high-level defections never before observed.

"It seems to me that no matter what Hanoi says, or tells itself, or wants to believe, the soldiers—the North Vietnamese and the Viet Cong soldiers in the field—know what the real situation is, and that it is bad for them. So, seriously, I think the most important thing for us to do, whether scientists, civilians, military, or what, is to hang on tight in Vietnam and not be deflected.

"Well, I'll just conclude by saying we are open for volunteers. There are still a good many useful scientific and technological problems that we can help with."

PANEL DISCUSSIONS. Problems and procedures being developed to cope with them in South Vietnam were discussed at the 1968 Army Science Conference by two panels, consisting substantially of leaders backed by recent experience in the area.

Maj Gen Joe Blumberg, CG of the U.S. Army Medical R&D Command, was unable to keep a scheduled commitment to serve as chairman of the medical panel on care and treatment of casualties and the prevention and treatment of diseases in Southeast Asia.

Pinchhitting for him was Col Donald L. Howie, chief, Life Sciences Division, Army Research Office, OCRD. Illness also prevented Col William D. Tigertt, commander and director of Walter Reed Army Institute of Research, from serving on the panel. Dr. David Jacobus represented WRAIR.

Brig Gen James A. Weir, MC, the CG of William Beaumont General Hospital in Texas and formerly surgeon of the U.S. Army in Vietnam, discussed the marked advances in concepts of combat medical operations which have evolved in Vietnam. One of the most significant is the "Dust-off" medical evacuation helicopter.

Except under the most severe climatic conditions or heavy hostile fire, many critically wounded are often under intensive hospital care within 30 minutes. Depending on the condition of the casualty and distances involved, evacuation may bypass intermediate echelons in favor of a direct flight to a Surgical or Evacuation Hospital. The chances of surviving the Vietnam war without serious complications have exceeded those of any war to date.

Col Robert M. Hardaway III, MC, commander of the 97th General Hospital, Frankfurt, Germany, and an international leader in surgical research, described major scientific and technical advances in care of the

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TITLE: A System for Measuring Dynamic Flow Properties in Airfoil Boundary Layers

AUTHOR: DURBIN
Aeronautical Research Laboratory, Ames Research Center, Moffett Field

ABSTRACT: A method for determining the magnitude and direction of the air flow near a surface by the use of direction-sensitive electrically heated surface film sensors is described. An essential part of the measurement utilizes a feedback double bridge constant temperature system. A theoretical analysis of the errors associated with such a system is described.

TITLE: Radiometric Measurements at 300 GHz

AUTHORS: CHANG and LESTER
Frankford Arsenal

ABSTRACT: A 300 GHz Dicke-type superheterodyne radiometer receiver was used to measure the atmospheric absorption and effective zenith sky temperature as a function of water vapor density in the atmosphere and to determine receiver noise figure and mixer conversion loss. It was found that the average measured values of horizontal atmospheric absorption were approximately 3.35 dB/Km/g/m^3 and 5.55 dB/Km/g/m^3 for 304 GHz and 316 GHz respectively. Variation of absorption with water vapor density at 304 GHz was also indicated in the measured results. The average calculated values of receiver noise figure and mixer conversion loss at 304 GHz were 31.4 dB and 22.9 dB respectively. A 5.0 m x 3.6 m metallic plane reflecter inclined at 45° was employed as a target to reflect zenith sky temperature into the radiometer. Calibration of the receiver was accomplished by using a noncoherent thermal radiation source.

The same radiometer operating at 316 GHz was also used to study the effect of thickness of different types of painted coatings upon the effective reflectance of highly emissive metallic surface. Samples of target were made of 30.4 cm x 30.4 cm steel plates uniformly coated with various kinds of paints and thicknesses with accuracy of 0.000127 cm. The experimental results showed that the effective reflectance was a function of the paint type for the coating and its thickness in a manner as predicted by classical thin-film interface effect and loss tangent effect.

TITLE: The Development of a Method for Utilization of Soy Protein as a Raw Material Nutrient

AUTHORS: SHOOK, McCLURE and BERKY
Pine Bluff Arsenal

ABSTRACT: Of eighty-seven proteins studied, several were identified as potentially new nutrients for a limited number of bacteria. However, these proteins failed in all cases with two of the bacteria under consideration. During the study, results with soybean hydrolysates suggested that failure to produce suitable fermentations was possibly due to the presence of a growth inhibitor. Since soybean production in the United States is about 840 million bushels per year, and soy is known to contain nearly all the essential amino acids necessary for biological metabolism, it was decided that soy hydrolysates should receive further study. The presence of a growth inhibitor in soybean hydrolysates was demonstrated which was responsible for the failure to produce some of the bacteria in the various nutrient media. A simple commercial procedure for the removal of the inhibitory material by charcoal extraction was developed, thus allowing several soy proteins to be used as alternate media for the production of four microorganisms.

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TITLE: Electroless Deposition of Nickel and Cobalt Based Alloys
AUTHORS: PEARLSTEIN and WEIGHTMAN
Frankford Arsenal

ABSTRACT: It was found that autocatalytic chemical reduction (electroless deposition) of nickel or cobalt may be made to induce simultaneous reduction of other metal ions which are themselves incapable of independent electroless deposition.

Electroless nickel-tungsten alloys containing up to 20 per cent tungsten and nickel-rhenium alloys containing up to 46 per cent rhenium were produced. These alloys are considerably higher melting than the conventional electroless nickel deposits and suggests their use for certain elevated temperature applications. Electroless nickel alloy deposits containing about 15 per cent zinc or two per cent tin were also produced.

An electroless palladium-nickel deposit containing six per cent nickel was also produced. However, this is not an example of induced reduction since palladium is capable of independent electroless deposition.

Cobalt-tungsten and cobalt-rhenium alloys were also produced by electroless deposition. The magnetic properties were characterized for these alloy deposits as well as for electroless cobalt-nickel alloys. The addition of trace quantities of phenylthiourea to an electroless cobalt solution also affected the magnetic properties of deposits.

TITLE: Conversion of Millimeter-Wave Images Into Visible Displays
AUTHORS: JACOBS, HOFER, MORRIS and HORN
Fort Monmouth

ABSTRACT: A new method is suggested, in which millimeter or submillimeter-wave images are converted to visible displays. This technique can be applied to either coherent or incoherent radiation, giving the same power response per unit area for either case.

The proposed device depends upon conductivity modulating a germanium panel by means of light or an electron beam in selected areas, and thereby controlling the transmission of millimeter wave energy through the semiconductor medium. Laboratory tests are reported in which displays have been obtained from several configurations of point sources of millimeter wave radiation.

TITLE: The Effects of Antibiotics, Corticosteroids, and Peritoneal Lavage on Experimental Peritonitis
AUTHORS: SLEEMAN, DIGGS and HAMIT
Walter Reed Army Institute of Research

ABSTRACT: The treatment of experimental peritonitis with antibiotics (IP), corticosteroids (IM), and peritoneal lavage was studied in respect to time after infection and the effectiveness of the therapeutic agent. Peritonitis was established in rats by the intraperitoneal injection of an E. coli-hemoglobin preparation, and therapy was begun immediately or at 4, 8, 12, and 16 hours following the inoculation. Compared with untreated controls, antibiotics were effective in decreasing mortality when administered up to 8 to 12 hours following inoculation but lost their effectiveness after that time. A saline peritoneal lavage was very beneficial at 4 and 8 hours, but totally ineffective at 12 hours. However, when kanamycin was given after lavage at 12 hours, survival increased significantly. Dexamethasone provided protection against death even at 16 hours. Combined treatments with dexamethasone and antibiotics were no more beneficial than dexamethasone alone. The apparent ineffectiveness of antibiotics late in peritonitis may result from the sudden death and lysis of bacteria and the release of large amounts of toxins. The beneficial effects of dexamethasone was related to increased clearance of bacteria from the peritoneal cavity.

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severely wounded. Coupled with rapid evacuation of casualties, these advances have greatly increased chances of survival, he said.

When major escalation of the war in Vietnam presented new medical problems, Col Hardaway established a combat surgical research team which provided capabilities one would expect only in major Continental U.S. hospitals and medical research laboratories.

Wounded are bought to hospitals from action so rapidly that large numbers who in the past would have been "killed in action" are being saved for the first time. Consequently, much new information is being gained from research results, and is expected to have an impact on surgical textbooks. Lessons learned in Vietnam may profoundly affect emergency medical care practices in the United States and other nations.

Dr. Jacobus, chief, Medicinal Chemistry, WRAIR, discussed "Medical Research and Infectious Diseases," with emphasis on diseases in Southeast Asia and other tropical and subtropical areas. Particularly significant is that falciparium malaria is resistant to one, many or all prophylactic and treatment drugs known today.

This fact was predicted to present a serious problem in U.S. personnel in Vietnam if escalation took place. Almost two years before the problem actually became serious, the U.S. Army launched the largest malaria research program ever conducted. Results have greatly alleviated the problem by drastically reducing the morbidity and mortality rate.

Barring a major breakthrough, however, the end of malarial research is not in sight, since tropical strains demonstrate a remarkable capability to develop resistance to new drugs, varying only in the matter of time.

The panel discussion also brought out that infectious skin diseases, especially in the Mekong Delta of South Vietnam, have been and are serious problems. Strains of pathogenic fungi not common in the U.S. have been isolated by research teams in Vietnam and the research effort has been substantially increased. Many other infectious diseases pose serious threats in Vietnam and all are subjects of research. "In some respects," it was stated, "this is a preventive medicine war."

CLASSIFIED PRESENTATION. The panel discussion on the U.S.

Army Pacification Program in South Vietnam was classified. Speakers presented accounts of many of their experiences in promoting this program, the various methodologies that have been developed, and some of the more significant results that have been achieved.

Dr. Kenneth Edwin Clark, dean of the College of Arts and Sciences at the University of Rochester (N.Y.), presided as moderator. Civilian members were Dr. Michael C. Conley, Center for Research in the Social Sciences, American University, Washington, D.C.; Dr. Gerald C. Hickey, a special researcher for RAND Corp. who has been working on pacification activities in Vietnam; and Dr. Ithiel de Sola Pool, Center for International Studies, Massachusetts Institute of Technology.

Brig Gen William R. Desobry, deputy director, Plans, Office of the Deputy Chief of Staff for Operations, HQ Department of the Army, Lt Col Thomas M. Huddleston and Lt Col James R. Bukoski of the same office served as the military members.

Picatinny Psychologist Plans Postgraduate Courses in Fall

Postgraduate psychology for "highly motivated engineers, scientists and managers" in the Dover, N.J., area will be taught this fall by Dr. Paul Strauss, Picatinny Arsenal psychologist and Human Factors Section chief.

Dr. Strauss, also adjunct professor of Fairleigh Dickinson University, Madison, N.J., contends that "understanding how people behave in response to the demands of today's large and technologically oriented organizations is surely a vital part of sound management practice."

Establishment of the industrial psychology course was begun several years ago by Dr. Strauss, who emphasizes that admittance to the program is not limited to those who previously majored in psychology.

Each applicant, he said, will be required to prove graduate student ability by doing well in a group of "core courses" in general psychology. Those who pass will be allowed to specialize in personnel and industrial psychology, organizational behavior, human factors engineering and the psychology of managing research and development personnel.

Dr. Strauss said the course will lead to a master's degree in industrial psychology for those who believe that people "with all their individual differences in attitudes, skills, personality and work habits—are the key factor in developing and using the products of modern technology."

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TITLE: Strategic and Tactical Implications of a Botanical Barrier System
AUTHORS: HENSHEL and ROBERTS
Combat Developments Command MP Agency, Fort Gordon

ABSTRACT: This paper represents an alternative approach to the design of frontier barrier systems through enfoliation or vegetation stimulation. By deliberately enhancing the natural botanical environment along frontier regions, and by intensive aerial seeding of selected flora of high obstacle potential, advantage is taken of the natural climatic and biological environment characteristic of the region to develop a barrier form alternative to (or capable of employment with) the various prevailing construction techniques. Attention is given to the possibilities inherent in "deep" natural barrier zones, to enfoliation in the climatic conditions extant in Vietnam, to infrared aerial detection of penetration in progress, and to multi-strain barrier design. The paper presents a strategic/tactical concept for employment and an analysis (limited by information available) of the contrasting advantages of this approach relative to existing barrier forms. This analysis considers dimensions of cost, relative vulnerability during construction and maintenance, relative flexibility, and probable effectiveness. The paper also briefly surveys, from population/resources control and tactical standpoints, the potential in South Vietnam of internal botanical barriers. The employment of plant barriers as part of the physical security of large-area or remote facilities, e.g. air fields and missile sites, is also examined. General criteria are specified for selection of plant strains to be employed. The paper concludes with test recommendations.

TITLE: Formation and Engineering Characteristics of Nuclear Craters for Construction Purposes
AUTHOR: HUGHES
Engineer Nuclear Cratering Group

ABSTRACT: This paper discusses the technology of nuclear excavation as developed to date in the joint Atomic Energy Commission/Corps of Engineers nuclear excavation research program. Detailed data are presented concerning crater formation phenomenology, engineering characteristics of nuclear craters, and potential nuclear crater construction applications. Techniques for predicting crater geometry using both computer calculations based on stress wave propagation analysis and empirical scaling laws are discussed. The various zones of disturbance surrounding a nuclear crater are identified and described and information is presented concerning the extent and physical characteristics of these zones. It is concluded that the nuclear excavation research program to date has confirmed the basic concept of crater formation phenomenology and resulted in the development of techniques for predicting, with a reasonable degree of accuracy, the geometry and engineering properties of nuclear craters. An understanding of these phenomena is required in order to assess the engineering usefulness of an explosion-produced excavation. It is anticipated that continuing advances will be made in the state-of-the-art over the next few years and the technology will exist for using nuclear excavation techniques to accomplish a number of construction projects.

TITLE: Homogeneous Nonionic Detergent p-n-Nonylphenoxydecaethoxyethanol
AUTHOR: KOLOBIELSKI
Coating & Chemical Laboratory, Aberdeen Proving Ground

ABSTRACT: The long range objective of the project is the development of a scientific method to select surface active agents for use in metal cleaning compositions. It was decided to synthesize a model compound, representing the nonionic surfactants of the alkylphenol-ethylene oxide condensate type, for future study of the relationship between molecular structures and detergency.

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TITLE: The Application of the Scientific Method in Analyzing the Man/Man/Weapon Combination in a Combat Test Environment
AUTHORS: KLEIN and MUIR
Infantry Board, Fort Benning

ABSTRACT: This paper describes the operations research and systems analysis techniques being employed in development of new test facilities at the US Army Infantry Board. These facilities will provide the instrumentation necessary to identify and quantify the various influencing parameters pertinent to evaluation of the man/weapon system in the simulated combat environment.

The problems of establishing appropriate experimental controls over the vast quantity of variables inherent in field experimentation are described. Controls necessary to apply the power of descriptive and inferential statistics without compromising the validity of the tactical situation are explained.

The final criteria for evaluation of a newly designed system are derived from the analysis of output data. The paper describes the results of the latest field experiment and the instrumentation systems, which gather accurate hit and near-miss data without encumbering the individual in the test situation.

Each new level achieved in testing procedures provides the stepping stone to higher and more sophisticated plateaus. The COMBATEST concept is an iterative process which has significantly advanced test methodology, and from which has evolved development of test facilities which permit more rapid, more accurate, more economical evaluation of the man/weapon system.

TITLE: HILIS - A High Intensity Light System for Algae Food Production
AUTHOR: MATTHERN
Natick Laboratories

ABSTRACT: The newness in use of algae as a food lies not in that it can be used as a food but in the application of modern fermentation technology to its production. Large culture volume requirements and poor energy conversion efficiencies have presented major obstacles to the practical economic production.

The approach to overcoming these obstacles has been the definition of nine growth parameters in a high light intensity system (HILIS). The results of the temperature and light intensity parameter studies confirm the rationale of the approach and demonstrate that high yields in a small volume are attainable. Culture volumes have been reduced from generally expressed values of 400 L/man in 1961 to 21.6 L/man in 1967 through attainment of dense culture (25.5 g/L dry weight) of Chlorella 71105. This was attained using 300,000 lumen illumination in a 7.7 liter culture operating in a continuous system with a dilution rate of 0.91 per day.

Initial results in light quality studies coupled with proposed work in light-dark phasing, gas exchange, heat transfer, availability of nutrients, pH, and maximum and minimum concentrations of nutrients offer prospects of a major breakthrough with vastly improved energy conversion efficiencies.

TITLE: Geoid Determinations
AUTHOR: FISCHER
Army Map Service

ABSTRACT: The characteristics of the astrogeodetic, gravimetric, and satellite methods of geoid determinations are explained. A combination of these methods leads to a geodetic world datum.

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long last we were moving, spottily in many places, but still moving in the right direction.

But a couple of months later, the nature of the reports from Vietnam began to change. Something strange was occurring out there, and it was hard to identify just what it was.

At Christmas the same condition existed; one could feel it while moving around the country; but you couldn't figure out just what it was. When the Tet offensive occurred, I sat down and thought back to August . . . to December . . . to the February period. To myself I said, "Johnson, where in the world were you so sour?"

Then I thought I would move—in my imagination, of course—to Hanoi and see how things looked from there in the summer of 1967. *Come with me to Hanoi. What could we see from there?*

We saw an enormous revolutionary development cadre training program at Vung Tau in South Vietnam, promoted by a real zealot. We can agree with him, or we don't have to agree with him, for all of the vigor he puts into the program, a real patriot for his own country.

We saw roads open that hadn't been open; we saw canals open that hadn't been open. Taking a look at our casualties, we saw that we were suffering more than ever before. We saw that we were not overrunning popular force and regional force outposts as easily as before. In many cases, we were not overrunning them at all. We were taking casualties where we didn't used to take them. We were not getting weapons where we used to seize them.

When we [Hanoi, that is] went out to recruit, we were getting 10 percent to 15 percent of what we had recruited the year before. When we went out to collect taxes, we were getting about 20 percent to 25 percent of what we had collected the year before. Something had to be done about this—particularly about those revolutionary development teams. *Even though some of them are spotty, some not very good, and some fairly good, here in our country we can't afford to have competition in the hamlets because we must have those people!* (Italics added.)

The government of South Vietnam can't have them! So what do we [Hanoi] do? We must get the peasants to believing us again. How do

we do it? Cut throats faster. Cut throats faster. So the word goes out.

Why Dakson?—an attack on a Montagnard village of simple hill people near the Cambodian border, in the backwater of the war, not helping one side or the other, insofar as we could determine.

Why slaughter in cold blood about 500 people? *Why*?

It just didn't make any sense, until you get this picture [from the Hanoi side]: We've got to get that peasant believing us again, so he will give us our sons, so he will give us our taxes, so he will give us his life. Yes, under duress, but he will still turn it over.

And that, then, begins to make some sense from Hanoi's point of view. Now comes Tet, because there is no assurance that the peasant would necessarily believe for long. So we've got to hit hard. When will we hit?

I was one who believed the offensive would come before Tet and that he would use the Tet period to consolidate. Others believed that it would come immediately after Tet, and that the enemy would use the Tet period for final preparation. When did he hit? During Tet.

Now there was a precedent for this, and I suppose that we should have been warned. Four hundred years ago, Vietnamese patriots launched an attack against a Chinese force in Vietnam to throw them out during Tet. But that was the last time an attack of this scale had occurred during Tet.

Now it was pretty hard to answer the question, "How come you were surprised like this?"—until we had Washington, D.C., in April. How come Washington? How could you get an uprising like that in the capital city of our nation and not know it was coming at the time it came? The same thing applies to Tet. In short, General Giap had to do something to regain the initiative and establish or restore a momentum in South Vietnam. The Tet offensive was his device.

Now I go back to his experience in the struggle movement in 1966 when there were some political and military defections by the South Vietnamese. But what happened in 1968? No political defections. No military defections. Yes, units were down in strength because the President had authorized a Tet leave for up to 50 percent of the force.

In some parts of the country commanders had canceled the leave, and all the men were present for duty. Every single Vietnamese commander was at his post. Two of them, as a

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TITLE: Pathophysiology of Staphylococcal Enterotoxin B

AUTHORS: VICK, KLEIN, TAYLOR, DeGRAAF, ROBERTS, MAHLANDT, REMMELE and LINCOLN
Edgewood Arsenal

ABSTRACT: Four staphylococcal enterotoxin B preparations identified as S6-R, B9-R, 10275-R and 10275-HMP were characterized by electrophoresis, and by their comparative physiological effects on the Rhesus monkey. The three toxin-producing strains used differed in the amount of enterotoxin synthesized and in the number of contaminating protein bands demonstrable by gel electrophoresis. Monkeys challenged at four dose levels differing by a factor of 200 times exhibited emesis, diarrhea and anorexia. The S6-R and B9-R preparations killed only at the highest dose, whereas the two preparations from the 10275 strain killed at medium and high doses. Typical terminal clinical signs were profound hypotension ultimately ending in cessation of respiration, bradycardia and death. No other preterminal abnormalities were observed except that significant cardiac irregularities occurred following challenge with 10275-HMP toxin. Tests on the isolated perfused monkey heart showed that only 10275-HMP toxin produced changes, namely, multifocal discharges, premature beats and ventricular fibrillation. The increased toxicity of the 10275-HMP product appears due to a marked cardiovascular effect evident in both the intact animal and in the isolated perfused heart. Subdural injection of high levels of 10275-HMP toxin produced immediate irregularities in heart and respiratory parameters, and death at about 5 minutes; low doses were nonlethal even though transitory cardiac and respiratory abnormalities were observed.

TITLE: Experimental Techniques Applied to Stress Analysis in Three Dimensions

AUTHORS: HUBBARD, KAHN, and LOWELL
Ohio River Division Laboratories

ABSTRACT: Complete insight into the mechanics of stress distribution around a discontinuity within a three-dimensional body requires experimental verification of existing theories. The simple case of the stress distribution on the boundary of a circular opening in the center of an elastic body was studied to provide correlation between experiment and theory. Test results were compared with theory and with one another to assess the relative effectiveness of five experimental techniques of full field representation. The experimental approaches were; slice analysis from a frozen stress model, critical plane analysis from a low modulus composite model, critical plane analysis from an embedded polariscope model, displacment field analysis from an embedded moire grid model, and slice analysis on a plane isolated by a sheet of laser light using scattered light photoelasticity.

TITLE: Propagation of Abnormal Infrasonic Waves

AUTHOR: KASCHAK
Fort Monmouth

ABSTRACT: It is well known that acoustic signals can propagate through the atmosphere over ranges greater than one thousand miles. These signals are detected by acoustic equipment which is sensitive between 0.5 and 25 Hz.

Since 1960 abnormal acoustic signals have been observed which exhibit transit times incompatible with calculations using tropospheric acoustic speeds. Their arrival times imply average propagation velocities of Mach 2. It is reasonable to state that this phenomenon, which cannot be explained by classical acoustics alone, requires the existence of inter-related physical mechanisms. On the basis of the specific information made available by infrasonic wide-band sensing, spectral processing, and cross-correlator processing, the data have been analyzed with a high confidence level.

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TITLE: Measurement of Organizational Communications and Program Effectiveness

AUTHOR: SHALLER
Civil Works Directorate, OCE

ABSTRACT: Part of the total problem of measuring organizational communications and program effectiveness depends upon the extent to which a determination can be made concerning how well an on-going program correlates with a stated mission -- not only in qualitative terms but in a quantitative way. One possible approach to making such a determination may be via a technique of projecting "program vectors" upon "mission vectors" as described in the paper.

Basic equations and relationships are described which, in the author's view, are associated with all rational mission-program structures. Solutions of these equations yield descriptions of the state of any program relative to a specified set of goals and objectives.

A precise and unambiguous definition of program effectiveness is offered along with a procedure for its measurement. The definition and procedure for measurement offer a possible basic reference standard and permit rational comparisons of alternative mission-program combinations.

The methodology for effectiveness measurement, in view of the nature of the process, includes a measurement of the extent to which organizational communications exist between the "organizational management" and the "organizational performers."

A hypothetical case study for determining the present state of an existing program is presented.

TITLE: The Ballistic and Mechanical Properties of Polymers

AUTHORS: MARTIN, LEWIS and THOMAS
Natick Laboratories

ABSTRACT: The ballistic resistance of some polymeric armor materials as influenced by processing variables was investigated. It was shown that process variations, including biaxial orientation, have little influence on the ballistic resistance for homogeneous polymers, while performance increases are possible for composite armor systems. The fracture surface energy was studied as a function of hot stretching and irradiation to provide insight into the fundamental failure processes for polymers.

A correlation between the ballistic resistance and the primary and secondary glass transitions was developed for homogeneous plastic armor which promises to be of great value to the armorer as well as to the polymer synthesist. The correlation should allow for the rapid screening of candidate armor materials and in the long run permit the design of polymer molecules for impact applications.

TITLE: A New Method of Depositing Silicon Carbide for High-Modulus Fibers

AUTHOR: NIEBERLEIN
Redstone Arsenal

ABSTRACT: Aerospace materials with superior modulus-to-density ratios have been fabricated recently using various kinds of fiber-matrix combinations to form a composite. The fibers used in these composites have deviated from traditional glass to carbides, graphite and other materials of high modulus. The favorite method of fiber fabrication for these newer materials has been vapor deposition.

Research at the Army Missile Command has led to a process which departs from conventional vapor deposition by employing a film-boiling technique in connection with an organic plating liquid. The method has been successful in making silicon carbide fibers rapidly, and in a very small apparatus.

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matter of fact, probably survived because they were at their posts. The VC sent to their houses to pick them up expecting to gain control of their units by seizing them during this Tet period—an elaborate plan. All of the corps commanders, with the exception of one, were at their posts.

So here in the aftermath of Tet, the enemy did not achieve the political gain that they had expected. They did not achieve the military gain that they had expected. But I think they got a very big, fat bonus in the psychological gain that they achieved because they did get a smashing psychological victory. A large part of it we created ourselves. (Italics added.)

Since Tet, there has been a continued effort to drive away at the major urban areas. You have heard about the state of affairs in the hamlets. We lost a little ground in some places and we have gained in some places. But I think the significant thing is that a very substantial leadership loss occurred for the enemy in the two months following Tet—the Tet offensive and in the two months following. *Because elements surfaced during that period that we had been searching for hard in the months and years preceding.* (Italics added.)

Yes, they can provide some substitute leaders—and will. Yes, they can provide replacements—and will. Yes, they can continue attacks—and will. But the vigor with which the attacks are pursued will be substantially less, certainly within the near time frame. Then one can ask—how long?

Here, I think, we have got to go back and take a look at the objectives of the enemy. Very simply stated, they are, first, to protect the homeland; second, to seize or overthrow the government in the south—to seize control of the country; and, third, unite the two halves of Vietnam.

The first objective will always be a standing objective. The second he must do while he has the necessary resources to accomplish the seizure. The third, if he accomplishes the second, he can do in his own sweet time, so that really has no time limit.

Now what are the prospects then for us? This is awfully hard to predict—and I am not going to try to do so. In January of 1965, replying to a question in Los Angeles, I said, "10 years." I said it might be

as much as 15 and it might be as much as 20. That's before we had the troops in there. I haven't seen any reason to alter that guess. So, we now have about 3 years and 4 months less than in January 1965.

I think the significant thing is that the level of violence will not remain as high. The major effort will gradually shift toward more development and less military activity. But I think we must remember all the way through that you cannot have a successful development in the country without assuring the physical security of the peasant every day.

Last September, talking to Army chaplains, I said that I expected we would see some kind of reduction in the level of violence in between 12 and 15 months. I may have been a little bit optimistic then, but not necessarily so. I still think that we will see in the next six to nine to 12 months a substantial lessening in the tempo of activity and in the level of violence.

But it is well to remember that the assassinations in 1967 were twice the number of 1966—something on the order of about 6,000 in 1967. And of the 6,000 [South Vietnamese] who were assassinated, about 92 percent of them were officials of one kind or another. This is the kind of grim contest in which the Vietnamese are engaged because anyone who steps forward into a leadership position out there is fair game.

I don't know how many of you are mayors of your communities, but it would be well to pause and think that if we were, how many of us then would be running for public office with this threat of assassination over our heads all of the time.

Now let me turn for just a moment to the problems in our cities.

I assumed the position of Acting Deputy Chief of Staff for Military Operations on Mother's Day, 1963. I was at home on a quiet Sunday afternoon about a quarter of three, when my telephone rang. It was my Executive Officer who said, "I thought you would be interested in knowing that the Secretary of the Army and the Chief of Staff are in the Army war room."

"You bet I am," I said. When I arrived at the war room, I found one of them talking to the President and the other one talking to the Attorney General about essentially the same subject. And by midnight that night, we had elements of five different divisions in motion. We picked up a little here. We picked up a little somewhere else and had them moving.

From a standing start on Mother's

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Army Science Conference Technical Papers

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TITLE: Calculation of the Horizontal Electric Field from a Predetermined Magnetic Field at an Air-Earth Interface

AUTHORS: DINGER and KLEBERS
Mobility Equipment R&D Center, Fort Belvoir

ABSTRACT: The assumption of infinite ground electrical conductivity in computer codes for calculating the electromagnetic pulse (EMP) environment produced in the region close to a surface or near-surface nuclear burst precludes calculation of the surface and subsurface horizontal electric field component which is the driving function for nuclear EMP induced currents and voltages in long cable runs. The physical and mathematical bases are described for a method for calculating the surface and subsurface horizontal electric field from the surface magnetic field in order to capitalize on the numerical results of the computer codes based on the assumption of infinite ground conductivity and to provide horizontal electric field descriptions for use in system studies. For the condition of a plane wave arbitrarily incident upon a ground plane of sufficiently high refractive index, the expression reduces to that previously found in the literature. A time domain solution and applicable bounds of validity are derived for the non-plane wave horizontal electric field condition. Representative numerical results are presented which demonstrate the importance of including the correction term arising from the non-plane wave condition and including the effects of displacement currents in calculating horizontal electric fields in time regimes of importance in nuclear EMP effects problems. Induced cable current calculations based on this method show good agreement with peak cable currents measured in nuclear weapons effects tests and with cable current time histories measured in various EMP simulation experiments.

TITLE: An Optical Data Link for Real-Time Remote Measurement of Fast Transients in the Presence of Large Electromagnetic Fields

AUTHOR: CAREY
Mobility Equipment R&D Center, Fort Belvoir

ABSTRACT: The electromagnetic effects of nuclear weapons pose a possible serious threat to sophisticated electronic systems depended upon by the modern Army. The state of knowledge in this area does not permit confidence in analyses of vulnerability without experimental verification. To perform meaningful experiments, there are two requirements: first, a "simulator" is required, to create electric and magnetic fields on the system being tested; and second, to measure these fields and their reaction on the system being tested. To a practical extent, the first requirement has been met. The subject of the paper is a concept to meet the second requirement. Details of this requirement are discussed, as well as possible approaches, with advantages and disadvantages of each. The technique selected is described in detail.

TITLE: An Electronic System for Locating Friendly Patrols

AUTHOR: TATE
Fort Monmouth

ABSTRACT: This paper covers an experimental electronic system for locating friendly patrols with a high degree of accuracy, thus permitting the patrol to direct friendly artillery fire on attacking enemy troops or armor concentrations. The system consists of two or more base stations situated on known base lines and one or more man-portable transponders. A commercial desk computer is programmed to solve a triangulation problem. A paper tape readout in map or grid coordinates is available for future reference. The entire location process takes some 45 seconds to complete. The system is active for a short period of time. Hence, countermeasures against the system should prove difficult.

The experimental system was developed within the USAECOM Laboratories and has been subjected to test and evaluation in the New Jersey woodlands with good results.

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TITLE: Host Influence on the Characteristics of Venezuelan Equine Encephalitis Virus

AUTHORS: HEYDRICK, WACHTER and DWYER
Fort Detrick

ABSTRACT: Venezuelan equine encephalitis virus (VEE) derived from chick embryo was comprehensively analyzed at two passage levels in check fibroblast (CF) monolayers in terms of phospholipids and the fatty acids of the phospholipid fraction in order to determine any specific lipid changes that correlated with alterations in plaque-forming and virulence characteristics during passage. The distribution of the various phospholipids in the check embryo-derived virus was similar to the distribution of phospholipids in virus from both the 1st and 10th passages in chick fibroblast monolayers, the most predominant being phosphatidyl choline (51-65 per cent of host phospholipid; 41-48 per cent of virus phospholipid). The fatty acids of the phospholipid samples of chick embryo-derived virus were composed chiefly of palmitic (C16), stearic (C18), and oleic (C18:1) acids. The predominant fatty acid was palmitic acid (23-29 per cent). The virus lipid characteristics were altered only during the initial passage of the virus in CF monolayers. Phospholipid samples of virus from the 1st and 10th passages in CF cells contained the same predominant fatty acids as the embryo-derived virus. However, the predominant fatty acid of the CF-derived virus was stearic (21-23 per cent), rather than palmitic acid. The results suggest that the virus phospholipid is not a major factor in influencing the selection by the host of a virus population having intermediate plaques and virulence characteristics.

TITLE: Freeze Desiccation - A New Method of Food Preservation

AUTHORS: STRASSER, KAPSALIS and GIFFEE
Natick Laboratories

ABSTRACT: A simple process of obtaining high quality freeze-dried food products, making use of inexpensive equipment and providing the means for exact control of the moisture content has been explored. In this method, freeze desiccation, the frozen food is brought in close proximity or direct contact with a solid desiccant under vacuum. The evacuated chamber is then placed in a refrigerator. The water of the food, which sublimes from the solid into the vapor phase, is adsorbed by the desiccant at a rate sufficient to keep the ice from melting. The heat evolved due to adsorption of water by the desiccant is utilized during the early stages of dehydration as the primary energy source for further sublimation. A variety of desiccants can be used, but silica gel and/or molecular sieves are most suitable.

Experiments were conducted which established optimum conditions of dehydration and the ability to predict or control the final moisture content of the food.

TITLE: A New Approach to Protection Against Intense Light Energy

AUTHORS: PROSSER and STAPLER
Natick Laboratories

ABSTRACT: Screening studies have shown that polyvinylidene fluoride gives comparatively excellent thermal protection when exposed to the intense light energy of the carbon arc-image furnace. This research shows that this protection is provided by polyenes, $-(CH{=}CF)_n-$, formed during pyrolysis. Decomposition products containing these structures are expelled into the region between the light source and the target by the gases formed where they intercept light photons from about 200 to 500 mμ and dissipate the energy to the air as heat. The concept of polyene formation clarifies the relative thermal protection offered by many other vinyl polymers. Instrumental evidence for polyene formation is given.

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Chief of Staff Johnson Gives Farewell Address

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Day, we had to scramble to find people that were available, in part. We had them moving from Forts Bragg and Hood and from Fort Benning and from Fort Campbell.

At 1:30 in the morning I was sitting there—most of the others had left—thinking about the events of that day and wondering how we were going to do things better, when the phone rang. The voice on the phone said, "This is the President. Give me a rundown of the situation."

Well, from that moment we went to work on an improved Army Operations Center. And, of course, since that time we have had something going on each summer. Since that time we have progressively improved the planning and our ability to react to conditions in our city.

Now I suppose I tend to be a little bit on the Pollyanna side concerning future trouble in our cities. We have been conducting courses at our Provost Marshal General's School for city and country and state officials for the last couple of years. Since Detroit of last summer, we have broadened the courses and have increased the numbers conducted so that we have had quite a few law-enforcement officials from across the land in that school.

We are not doing this on our own. It is not the Army that is doing the teaching, and I don't want the civilians here to get that notion at all, because we are working hand-in-glove with the Federal Bureau of Investigation. We are staying within the Constitutional limitations on the Army's military aid to the civil authority in our country.

As a matter of fact, no one is more conscious of the Constitutional restraints on the application and the employment of military power in our own country than are we. And I think the events at the Pentagon last October and the events in the more recent disturbances bear that out. We have acted with the utmost restraint.

Now we are criticized from time to time about not stopping the looting, not taking harsher measures to restore order more quickly. I would simply point out that in every city of the land, we cannot move until the senior official declares the existence of serious domestic violence that cannot be controlled with local resources.

This is a pretty tough decision to make. When that declaration has been made, it is up to the Commander-in-Chief to determine whether federal

forces will be dispatched. By the time we arrive, things obviously are very much out of hand.

At this point, just what level of force do you employ? Let me walk you through three or four questions:

Do you shoot a man if he has a pair of socks in his hand as he walks out of a store? Do you shoot a child if she is walking out with a doll? Do you shoot a man if he has a pair of shoes in his hand? Do you shoot him if he has a suit of clothes? Do you shoot him if he has a black and white TV? Do you shoot him if he has a color TV? At what point is property worth a human life?

Now I am the first to admit that you cannot answer that question in the abstract. It must be left up to the man on the ground. The instructions that I issued to the task force commander in Baltimore were very simple: Your job is to preserve life and protect property—*in that order.*

I expect we will continue to be subjected to a great deal of criticism on not moving more forcefully, and more quickly. But as long as I am doing this, I will just say this: A human life is pretty precious, and we must preserve it.

Summing up our present ability in the cities, I would say that the planning we have done and the close cooperation fostered between local, county, and state officials have achieved a much greater awareness of problems. I don't think that we understand them very well yet, but at least we know they exist. I don't believe we are going to find the same level of outbreak that we had last summer. I hope that I am not on the platform of false prophets—a mightly crowded platform, I might add.

Finally, I would like to talk just a little bit about the Army and the things that you do.

I am troubled personally, from time to time, by the extent to which we pursue things that are interesting but won't necessarily be very productive. I think the thing that troubles me most is our tendency to introduce sophistication.

The best example of that is when you send a piece of equipment to us to put to work, and we do not have an expert—one who has been in the laboratory—to run it. We do not have anyone to run it who has been on the proving ground. We do not have the men who operated it during the troop tests.

The man we have is the same type of youngster that many of you have with his feet under your tables—the lad whose ability to operate the

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TITLE: The Relationship Between Pressure Effects Upon Fracture Mechanisms and Ductility and Its Practical Implications

AUTHORS: DAVIDSON and NOLAN
Watervliet Arsenal

ABSTRACT: It has long been known that the ductility of materials can be enhanced if they are deformed while under a superposed hydrostatic pressure of sufficient magnitude. The effects of pressure upon the ductility of a variety of materials has been measured and it is observed that the magnitude of the effect and the form of the ductility-pressure relationship varies considerably between materials.

In this investigation, the mechanism, or mechanisms, by which pressure affects ductility and the reason for the observed differences in the form of the ductility-pressure relationship was examined for a series of Fe-C materials. It is shown that the form of the ductility-pressure relationship is structure sensitive in terms of the presence, amount, shape and distribution of the brittle cementite phase. The effects of pressure upon ductility, and the structure sensitivity, are interpreted in terms of the effects of pressure upon the stress-state sensitive stages of the fracture mechanism involved.

The possibility of cold reducing a variety of high strength materials by means of an extrusion process, which takes advantage of the enhancement of ductility by pressure, is examined and described. The effects of cold reduction to 65% on the atmospheric pressure mechanical properties of a series of nickel-base superalloys and 18% maraging steels is presented and discussed.

TITLE: Ion Migration in Frozen Soil

AUTHORS: MURRMANN and HOEKSTRA
Cold Regions R&E Laboratory

ABSTRACT: Radioactive waste disposal frequently involves placement of radioactive material into the ground. Permafrost or artificially frozen ground appears to be more suitable than unfrozen ground for disposing radioactive waste. Frozen ground is essentially impermeable to ground water flow, so that dispersion of the radionuclides due to flow is eliminated. Diffusion, however, is not eliminated.

In this paper the diffusion of Na-ions through frozen ground is investigated. When a water saturated soil freezes most of the water forms ice but a certain amount of water remains unfrozen, located as continuous thin films on the soil particle surfaces. These films provide a pathway for radionuclide ion diffusion in frozen soil. The rate of diffusion, however, is slower than in unfrozen soil and decreases with decreasing temperature below freezing due to a concurrent reduction in film thickness of the unfrozen water.

TITLE: Biochemical Toxicology of CA, CS, and CN

AUTHORS: CUCINELL, BISKUP, LOVRE, SNODGRASS and SWENTZEL
Edgewood Arsenal

ABSTRACT: The riot control agents react with biological anions. Enzymes and co-factors are inhibited by these agents. The inhibition produced by CS appears to be reversible while that of CN is irreversible. This reversibility of CS together with its rapid reaction with water and other non-essential nucleophilic sites probably accounts for its relatively low toxicity.

In dogs CS aerosol causes a peculiar syndrome episodic hyperventilation, hypothermia, erythrocytosis anoxia and acidosis.

There is a definite sensitivity to cyanide and barbiturates in CS exposed animals.

Thiocyanate in plasma and urine may be a qualitative and quantitative indicator of CS exposure.

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TITLE: Atmospheric Electrical Structure
AUTHOR: WEBB
White Sands Missile Range

ABSTRACT: Synoptic rocket exploration of the stratospheric circulation has revealed the presence of motions in the upper atmosphere which result in organized diurnal tidal circulations. These tidal circulations, which have their origin at the stratopause (50 km), are powered by solar ultraviolet heating of the ozonosphere and the rotational energy of the earth. Vertical segments of these tidal circulations are found in the boundary regions of high and low latitudes in the lower ionosphere. Differential transport of electrons and positive ions vertically across the earth's magnetic field in tropical regions of the sunlit hemisphere serves to generate opposing electric fields, which in turn generate dynamo currents near 100 km altitude as a result of the Hall effect. These dynamo currents are found to affect the electrical structure of the lower atmosphere through electrical circuits which include telluric current flows in the earth's surface and extend into the earth's magnetosphere through interhemispheric currents along magnetic field lines. This analysis indicates that the basic source of energy for atmospheric electrification resides in stratospheric tidal motions of the neutral atmospher, and the present fragmented picture of electrical structure simply separates the fair-weather electric field, thunderstorm electrification, auroral and airglow activity, upper ionospheric structure and radiation belt currents. These phenomena are local manifestations of this comprehensive global electrical system.

TITLE: New Knowledge on the Fundamental Limitations to Operation of Field-Effect Transistors
AUTHOR: PULLEN
Ballistic Research Laboratories, Aberdeen Proving Ground

ABSTRACT: A limitation to the active characteristics of field-effect transistors, an extension to Shockley's theory of these devices, has been found and is explained in terms of solid-state physics and electrodynamics. This breakthrough indicates that field-effect devices are more sensitive and at the same time more resistant to nuclear environment than had previously been realized.

In this paper, the modifications required to the Shockley theory to support physical experiments showing the existence of the new limitation are first discussed. The development of a channel theory leading to optimization of the use of the new limitation is next discussed. This is followed by a discussion of the ways in which resulting devices can be used to bridge some of the "gaps" existing in semiconductor electronics. Finally, the relation of the limitation to the resistance of field-effect devices to nuclear radiation is considered.

TITLE: In Vitro Growth of P. knowlesi: A Model to Study Metabolism of Malarial Parasites and Action of Antimalarial Drugs
AUTHOR: POLET
Walter Reed Army Institute of Research

ABSTRACT: A simple method is described to prepare a large number of cultures of erythrocytic forms of the primate malarial parasite, P. knowlesi. In these cultures the plasmodium develops for one growth cycle. This method has shown itself to be valuable in studying nutrition and biochemistry of plasmodia, in testing compounds for antimalarial activity and in investigating the mode of action of antimalarial drugs. It is further shown that l-isoleucine and l-methionine are essential for in vitro growth of erythrocytic forms of P. knowlesi.

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family lawn mower you sometimes doubt. He is the man who is operating our equipment, because 75 percent of the Army today has less than two years service. The average age of our men is somewhere between 19 and 20. That is the man for whom you are developing equipment.

I wonder how frequently you think of this. (Italics added.)

We have introduced what we hope will develop into real fine schemes to guard against oversophistication and guard against too much optimism in the ability of the human to handle something. We have built bridges between the researcher and producer. In our life cycle management system for a piece of equipment, we are going to charge the researcher with turning out the first production model so that he can't wash his hands of what he has dreamed up and gotten to work on a breadboard, and say, "Now, Mr. Producer, this is your job."

Hopefully, this bridge will stay in place but, like all bridges, I am sure that it will be dislodged one way or another with a lot of pressure over and under it.

Here's another source of trouble. The Army is an enormous, high-density outfit. There are not very many items of equipment that we get in limited number. So cost has, I think, an unusual significance for us, and particularly when you think again of the youngsters who are going to be banging them into ditches.

I would plead with you for simplicity and plead with you for reliability. I would take them at the expense of some degree of effectiveness. I would rather have something 80 percent effective 100 percent of the time than I would have something 100 percent effective 50 percent of the time. Some of the time, I think, we get the higher effectiveness, but we do not use it enough.

I would like to talk again just a little bit about people, because people are the most important thing we have, especially in the Army. We don't get a thing done that people don't do.

We have a lot of competing programs with regard to our people, because, on the one hand, in Calendar Year 1967, for example, we turned out something over 28,000 second lieutenants from Officer Candidate School. That was cream off the top of the youngsters who entered the

Army. Then we turned out warrant officer pilots. That was another body of cream.

Then we established what we called the Skill Development Base. That wasn't a very good title so the Artillery tacked a name on it, "Combat Leader's Course." These were people who were pushing ahead to be noncommissioned officers quickly but who were unwilling to spend extra time to go to Officer Candidate School. OCS extends the period of service by almost a year, and these men prefer not to spend that extra year with us. We don't fault them for that, if that's the way they feel.

At the bottom, pushing up, we have Project One Hundred Thousand. Coming down—picking off people for all quality programs that we have—we may face another problem. If we should ever have to dip into Project One Hundred Thousand for people to fill the quality programs, we may be in trouble.

At this stage, it is not a real problem. However, we ought to be taking a pretty hard look at it.

Yes, we are training the Project One Hundred Thousand fellow, and having a great deal of success, but at some expense in additional instruction and counseling time required for these lower category men.

Our training system was designed for the higher mental category of military personnel, and not necessarily to accommodate the slow learner, or the one who has real difficulty in learning. It just wasn't designed that way. But we are giving our training courses a thorough review to identify the difficult learning areas and revise to more simple terms those areas where the slow learner is expected to have trouble in grasping the subject matter being taught.

Of all the things that have been done in the past five or six years, the finest thing has been the alteration in the Army's training system. We have a first-class system and our people are superbly trained in their particular skills when they come out.

Also, these are the youngsters who are going overseas, who are heading for Europe where the risk factor is not as high, where they are making mistakes of commission and not of omission, and where they are measuring up to a responsibility that they would not get anywhere else in this particular stage in their life.

I am just enormously proud of all these men. This is a fine generation. Just last Saturday I was out at Fort Ord at one of our training centers. Somehow one undergoes a change

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TITLE: Stress Reversal in Bonding Materials Between Fibers
AUTHORS: PU and SADOWSKY
Watervliet Arsenal

ABSTRACT: For a composite reinforced by parallel fibers of high-strength and high-modulus, the investigation of the stress field generated in the matrix material is not only of theoretical interest but also of practical importance. The stresses in the region close to the line joining the centers (x-axis) of two identical fibers in close proximity would be little affected by nearby fibers of the same size. A study of stresses at the middle point (origin) between two centers of the fibers should suffice to give a reasonable approximation to the possible maximum stresses in the matrix in which a large number of identical fibers are randomly imbedded.

The mathematical model consisting of two identical rigid fibers of infinite length embedded in an infinite matrix is considered. Based on bi-polar coordinates, the solution of the plane strain elasticity problem is obtained as an infinite Fourier series for the cases that the matrix is subjected to unit tension at infinity in the direction of x-axis or y-axis.

Numerically, normal stresses at the origin are obtained for various values of parameter. β_0 , the characteristic shape ratio. The stress concentration becomes very high as expected for close proximity of two fibers (small β_0). An unexpected bi-axial compression in the matrix between fibers due to the pulling in the y-direction is detected.

TITLE: Fluidic Missile Control Systems
AUTHOR: CLAYTON
Redstone Arsenal

ABSTRACT: The Army Missile Command has been working in fluidics since 1961, and the eight flight tests made to date have demonstrated the feasibility of fluidic components for missile control systems. The first program developed a single-axis roll control system which used a vortex rate sensor, integrator, proportional and bistable amplifiers, and various restrictors and capacitors, with cold gas supersonic reaction valves functioning as the control actuator. This system was flight-tested on a modified LITTLEJOHN missile in March 1964, and was the first known missile flight with a fluidic control system. An improved version -- smaller components and a pulse duration modulator scheme to achieve proportional control with bistable actuators -- was successfully flight-tested in September 1965. The next program involved designing a two-axis control system, using the Directional Control concept for the Multi-Rail Rocket System (MRRS), and featuring a hybrid pneumatic two-axis attitude gyro, pulse duration modulation, and hot gas supersonic reactor valves as actuators. The six flight tests made with this system, using a near-tactical LITTLEJOHN missile as the vehicle, were highly successful; flight accuracies exceeded the design requirements.

TITLE: Controlled Degradation of Steel
AUTHORS: CORRIE and MARKUS
Frankford Arsenal

ABSTRACT: The studies presented in this paper were performed under DA Project 1TO24401A333, Controlled Degradation of Materials. The objective of this project is to investigate methods of intentionally degrading materials of military importance.

A mechanism for the controlled degradation of steel is described. The results of research performed for the purpose of more clearly defining this mechanism and of determining the major parameters associated with it are discussed.

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TITLE: A Parametric Study of Bio-Retardation
AUTHORS: STURDIVAN, THOMPSON and TERNER
Ballistic Research Laboratories, Aberdeen Proving Ground

ABSTRACT: To develop predictive models of retardation in biomaterials, spheres composed of aluminum, steel and bronze with diameters of 3/32, 1/8, 3/16, and 1/4 inch were fired through isolated skin. It was found that the resulting data fit very well to the generalized retardation equation

$$-MVdV/dx = AP + kAV + C\rho AV^2$$

where

M = mass of sphere
V = velocity of sphere
A = mean presented area of sphere
P = pressure of the reaction
k = a viscosity-like constant
dV = incremental loss of velocity
dx = incremental tissue thickness
C = drag coefficient
ρ = density of biomaterial

The resulting values of the retardation coefficients of skin, the first of a series of biomaterials to be tested, are

P = -23990.
k = 47.700
$C\rho$ = -0.41169

TITLE: Minimum Weight Design of Elastic Structural Elements
AUTHOR: HAUG
Rock Island Arsenal

ABSTRACT: In modern design synthesis the engineer is required to obtain much more than just a machine which does a given job. He is required to find a configuration which satisfies the given requirements and is "best" in some sense. In military applications, the best system is often the one of least weight, and the elements of the system are generally subject to limitations on stress, deflection, and natural frequency.

Meaningful optimal design problems are first stated in terms of optimal control theory. Recent developments in optimization theory due to Hestenes, Berkovitz, Pontryagin, and Denham are employed in their solution. Two complimentary methods of solution of the problems are considered. The first consists of a solution of the necessary conditions which result from an analogue of Pontryagin's Maximum Principal. The second is a direct solution of the optimization problem employing steepest descent methods developed by Denham and others.

A realistic optimal design problem is solved and a comparison of the relative advantages of the two methods of solution is given.

TITLE: The Use of Geopotential Heights for Great Lakes Vertical Datum
AUTHORS: FELDSCHER and BERRY
Lake Survey District, Detroit

ABSTRACT: Engineers leveling procedures for construction can assume that the earth is flat, but high precision geodetic levels are subject to the influences of the spheroidal figure of the earth and the variation of gravity with latitude. These effects can be calculated, and corrections applied to obtain either orthometric elevations or dynamic heights. The national level net is orthometric but a dynamic height system is used for the Great Lakes. A system of geopotential heights based on observed gravity instead of calculated gravity is proposed.

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when he enters this environment. Most of them don't want to be with us, but they have the attitude that as long as they must be in the Army, they are going to do the best possible job while they stay with us. I must say that they are doing a wonderful job.

At the West Point graduation this year I quoted a letter that I had received from the wife of a soldier who had been killed. In it was one of the most poignant lines I ever read. I want to close with it.

She said, "I was proud of my husband. He wrote me shortly before he died that he only regretted that he had but one life to give for his country." And then came the poignant line: "He may have used someone else's words, but he used his own life." We have many young women and we have many young men possessing that attitude. When you have people like that, there isn't much that the rest of us can do but to dig in and support them hard.

USACDC Separates Functions Of Deputy CG, Chief of Staff

Functions of the U.S. Army Combat Developments Command deputy commanding general and the chief of staff were separated in mid-August in a move to enable the deputy CG to oversee more closely developmental programs in widely dispersed areas.

Lt Gen Harry W. O. Kinnard, CG of the CDC, announced that Maj Gen William A. Becker will continue as deputy CG but will yield the other half of his dual role as chief of staff to Brig Gen Wallace L. Clement, formerly director of doctrine.

In the realignment of functions, the position of deputy chief of staff for administration was eliminated. Col Charles B. Hazeltine Jr., formerly deputy chief of staff for developments, was designated as deputy chief of staff. Col Louis Gellin, assigned as director of doctrine, recently returned from Vietnam where he commanded the 196th Light Infantry Brigade.

HQ Combat Developments Command is located at Fort Belvoir, Va., with responsibility for supervising three groups, six institutes, 19 field agencies at major Army Branch Centers, and the Experimentation Command at Fort Ord, Calif. Twenty-one liaison posts are maintained through the industrial centers, overseas with major commands, and with allies.

Army Research Director Discusses Coupling Need

Director of Army Research Brig Gen Charles D. Y. Ostrom Jr. discussed a subject of prime interest to the Army research and development community in a recent address to graduating students of an R&D Management Orientation Course at the Army Logistic Management Center, Fort Lee, Va., as follows:

* * *

May I congratulate you on completing this orientation course on R&D Management. I hope my remarks will add to your understanding of the topic since it is an area in which improved understanding is greatly needed.

The topic of my talk concerns the transfer of science to technology, or to use the stylish word, "coupling." I will offer some definitions, indicate why coupling or transfer is so important, discuss what we know and don't know, and what needs to be done; also, what you can do to help with the transfer of science to technology and, hopefully, to where it counts—a useful end item.

Coupling has many definitions. Prof. Quinn of Dartmouth calls it "Transferring research results to operations." Other acceptable definitions are: "Accelerating the application of research and exploratory development results to military applications, or, "Science and technology transfer to the would-be user at the earliest practicable date and in a language he can understand."

Coupling of research to technology to meet military and industrial needs has come into the forefront of science and engineering management problems with greater emphasis only recently in the United States, and for good reason—not that the problem hasn't been apparent over many years or that it is something new. What has highlighted the need for more effective and efficient coupling are the vast sums spent on research and development, most of which are provided by the Federal Government.

In the United States there has been an increasing tempo of heavy Congressional, Presidential, corporate, and public interest in getting more for the research and development dollar. Monies provided for R&D are leveling off and showing signs of diminishing —at least those funds publicly provided.

This situation is something the science and technology community

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TITLE: Bond Character and Metastability of Plosophoric Groups of Military Significance

AUTHOR: McMILLAN
Mobility Equipment R&D Center, Fort Belvoir

ABSTRACT: A new method for the calculation of bond energies in a molecular group provides a means of rapidly comparing different electronic configurations. As originally proposed, the method yielded values for the bond energy and ionization potential of many diatomic molecules and ions (i.e., H_2, N_2, O_2, CO, NO) in excellent agreement with experiments. Heavy atoms in heteronuclear molecules were not as tractable. Extension of the procedure to these more complex molecules has been achieved.

The electronic structure of N_3^-, N_3 and N_3^+ will be discussed in terms of bond energy. Changes in the bond character when the azide is covalently bonded to another atom produce changes in the stability of the azides.

The nature of the metal-azide bond is discussed. A criterion is developed for determining when to expect ionic or covalent bonding in the azide. This criterion involves both the ionization potential of the metal and the metal-azide bond length.

The extended model is used to calculate the bond energies for $Pb(N_3)_2$ and HN_3. Although the azide group remains linear in these compounds, the electronic structure and bond energy change. A comparison of these energies reveals two different mechanisms by which decomposition may proceed. Estimates of the activation energies for these mechanisms are made.

TITLE: Research Goals for Improved Blood Logistics

AUTHORS: SHIELDS, CAMP and SEEGER
Medical Research Laboratory, Fort Knox

ABSTRACT: Current problems in blood logistics have been under study at the Blood Transfusion Division laboratories at Fort Knox, Ky. Certain aspects have been worked out during WW II and Korea and need only to be rediscovered and reapplied to today's military blood bank operations. Other areas in need of resolution include official "cargo coding" of blood and methods of control to insure proper handling of whole blood and blood products. Another factor is the implementation of a usage probability factor to control issue of whole blood to replace the antiquated oldest-first method. A requirement for improved blood shipping containers has two possible innovations resulting from research; a method of renewing refrigerants without entering the blood storage compartments and a sensitive temperature monitor for each unit of blood and/or shipping container. The application of new materials for packaging has improved free fall and guide-chute loads for aerial delivery of blood and provides a completely new margin of safety for safe arrival of fresh frozen plasma. The final aspect to be presented involves the use of adenine-supplemented blood permitting use of whole blood in the logistics system up to 42 days.

TITLE: Laser Beam Disrupter

AUTHORS: SZTANKAY and HOLLAND
Harry Diamond Laboratories

ABSTRACT: The laser beam disrupter is a safety system for protecting the eyes of personnel working with optical sighting devices from laser radiation. Fundamental to the system is the initiation of a disruptive element by the incoming laser beam to disrupt it within 25 ns of incidence.

An experimental system has been assembled. Disruption times are measured with an oscilloscope; beam energies, with a thermopile; and energy densities, photographically.

Disruption times as low as 20 ns have been measured with focused energy densities of 10 joules/cm^2. It is thought to be feasible, though perhaps difficult, to focus laser beams with energy densities at the threshold level for eye damage to densities of the order of 10 J/cm^2. Work is continuing to reduce disruption times at 1 J/cm^2 to below the present 100 ns.

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TITLE: The Hazard Profiles of Laser Reflections From Military Targets
AUTHOR: BROWN
Aberdeen Proving Ground

ABSTRACT: The equations defining energy density at long distances in the direct and the reflected laser beam are presented and used to determine the distances the direct and reflected beam must range until the energy density reduces to a safe level - a level of no eye injury.

Since the reflected beam equation cannot be evaluated without a measure of target refelctivity, laser beam reflections were measured on an infrared search light filter lens, a tank periscope prism glass, jeep windshield glass, painted armor plate, a wet leaf, a dry leaf, tranquil water, and snow. These all represent significant battlefield targets either intended or accidental. Typical reflectivity profiles and laser beam reflections are presented graphically. These results show that spread reflections are far less hazardous than the specular reflections.

A typical plot of reflectivity versus angle of beam incidence is presented. The measured reflectivity values are then used to produce plots of laser hazard profiles around the laser beam and its targets. These profiles define the extent of the hazardous area around the XM23E2 laser rangefinder in the field.

The paper presents a general method for laser hazard definition along with reflectivity tests that demonstrate the method.

TITLE: A Ferroelectric Gamma-Ray Spectrometer
AUTHORS: McNEILLY and GLOWER
Edgewood Arsenal

ABSTRACT: Time-resolved gamma-ray spectral measurements are required by many investigators in studies of radiation effects. This is especially true for nuclear weapon tests experiments. In an attempt to satisfy this requirement, a gamma radiation detector has been developed that utilizes the pyroelectric properties of a ceramic material. The material, lead zirconate titanate, produces a current output that is proportional to the rate of energy absorption. The magnitude and time constant of the output signal may be controlled by a suitable size detector. Since the phenomenon is a surface effect, the signal is proportional to surface area and the time constant is related to the thickness of the detector. The ferroelectric detector requires no bias voltage or power supply, is of small size, and is easily adapted to electronic signal processing techniques.

A gamma-ray spectrometer, using ferroelectric detectors and a set of energy-selective metal filters, has been tested at a flash x-ray facility with excellent success. The mathematical model which describes the response of the spectrometer system yields a Fredholm equation of the first kind. The equation is solved for the unknown spectrum by an iterative unfolding method. Analysis of the time dependent data indicates a softening of the flash x-ray spectrum as a function of time.

TITLE: Pressure Enforced Ferroelectric to Antiferroelectric Phase Transition
AUTHOR: HOUSER
Picatinny Arsenal

ABSTRACT: The pressure-enforced ferroelectric-to-antiferroelectric phase transition in the system $PbZrO_3$-$PbTiO_3$-$PbSnO_3$-$PbNb_2O_6$ was investigated as a charge release mechanism for use in fuzing. One-dimensional strain and hydrostatic pressure were employed to produce the transition. Effects of temperature and reverse voltage were evaluated.

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Army Research Director Discusses Coupling Need

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has not had to be concerned with since the Korean War. R&D dollars are apparently to be more scarce, or at least, the utility thereof is going to be subject to considerably greater challenge than previously. Thus, it is most desirable to improve the fruitfulness of corporate and public dollars—and one of the more obvious ways is better coupling.

Not only money is involved in the transfer process, but lives can be, too. Take, for example, the discovery of penicillin by Fleming in 1929, followed by a decade to realize the full potential of penicillin in the 40s, or Waksman's preparation of streptomycin and its large-scale use, also roughly 10 years afterward.

The reason for better coupling, particularly in the military is, quite frankly, to stay at least one step ahead of the enemy by transforming significant data into innovations which are marketable to the operational user. This is also true for industry, except in this case the military enemy is the corporate competition and the operational user is the consumer.

Pictorial depiction of coupling is not a simple task. However, one of the best charts is in the 1966 Army Research Plan. The logical, sequential progression from research to engineering to end item is not a frequent occurrence. However, the chart does serve to give the various relations involved in coupling.

A study by the National Planning Association shows that new information can stimulate a need that apparently did not exist before. The study found that over one-quarter of the innovations examined were evoked by brand new technical information, including research data, which was properly transferred.

In the proceedings of the Conference on Technology Transfer and Innovation held in Washington in the summer of 1966, Harvey Brooks, dean of the Harvard School of Engineering, suggested that transfer or coupling occurs along two dimensions, vertical and horizontal.

In vertical transfer, the general is transformed into the particular: science becomes technology, and technology finally becomes hardware. Horizontal transfer occurs when scientific or technical information generated in one context is "borrowed" and adapted *vertically* to meet an organization's needs. Thus, vertical transfer normally takes place

within an institution and horizontal transfer takes place among institutions.

Horizontal transfer often involves specific hardware or "frozen information." But a good deal of intermediate information is also transferred in the abstract form: In the horizontal transfer process, one institution's output is another institution's input.

For example, in the case of the transistor, the research output of Purdue University was horizontally transferred as an input to Bell Telephone Laboratories. Bell, in turn, vertically integrated work done at Purdue University into its own transistor technology. Bell's research output was then horizontally transferred to other firms, this time in a fairly specific form.

Finally, the receiving firms further improved this technology, again vertically, and so we have transistors as we know them today. The Army and industry are obviously participants in and beneficiaries of both vertical and horizontal coupling.

To improve coupling is easier said than done. Why? Beacuse there is no one method or methods which are applicable to all situations and because of the many barriers which need to be overcome. Each corporation or government agency has coupling problems unique in many ways to itself and these must be attacked by means unique to the corporation or agency:

Barriers to effective coupling are numerous. Here are a few:

- *Language Barriers.* Scientists and engineers frequently talk different technical "languages." Good communication is essential and management must devise and keep open necessary channels.
- *Motivation Barriers.* Users must be motivated to communicate with the producers of new knowledge, e.g., the scientists—and vice versa.
- *Data Availability Barriers.* Information is frequently not easily available or in a form those in need can readily use.
- *Lack of Enthusiam for Change or Innovation.* Conservatism—how do we overcome this barrier?
- *The NIH (not invented here) Barrier.* If the data or idea was not originated here it is no good. Horizontal transfer fails.
- *Costs* of getting the necessary information by the user are frequently a barrier.
- *Size.* The sheer immensity of a company or government body as large as the Department of Defense, with the attendant communication

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TITLE: Shock Pressures Resulting from Impact Between a Solid and a Liquid

AUTHOR: KAMEL
Engineer Waterways Experiment Station

ABSTRACT: Shock pressures of high intensity and short duration may occur during breaking of waves on coastal structures, slamming of ships, landing of seaplanes, and water entry of naval projectiles. The phenomenon of shock pressures resulting from impact between a solid and a liquid is a water-hammer phenomenon wherein the elasticity of the solid and the compressibility of the liquid are the governing factors. The analytical formulation of shock pressures as a water-hammer phenomenon is presented in this paper. This analytical approach represents the extreme case since it neglects the effect of air which might be entrapped between the solid and the liquid at the moment of impact. Tests were conducted by dropping a plate, whose edge was hinged at the water surface, into a steel tank 3.0 by 3.0 by 6.0 ft which was partially filled with water. The shock pressures were measured by strain gage and piezoelectric type pressure cells mounted in the plate. The ratio between the recorded and the theoretical pressures was treated statistically and was found to fit Poisson's distribution well. Correlation between the recorded pressures and the shape of the surface of contact between the solid and the liquid at the moment of impact indicated that shock pressures occur only at some spots on the surface of the solid.

TITLE: Water Vapor Permeability in a Polyester Based Polyurethane

AUTHORS: SCHNEIDER, DUSABLON, and SPANO
Natick Laboratories

ABSTRACT: A study of the mechanism of water vapor transport in polyurethane elastomers was undertaken. Commercial samples, all with the same water solubility, exhibited a seven-fold range in moisture vapor transmission rates (MVTR's) which correlate qualitatively with the polymer glass transition temperature (Tg). Determinations were also made on a series of polyurethanes in which the nature of the flexible segment was varied to include poly (butylene adipate) and three polyethers representing an increasing frequency of ether linkages. The MVTR of these samples could not be correlated either with Tg or with the degree of swelling, which reached 100% in the most hydrophilic polymer. Resolution of the MVTR into a solubility coefficient and a diffusion constant, was made by vacuum sorption methods. In all cases the sorption isotherm was concave upward, the heat of mixing was zero, and the diffusion constant decreased with increasing water concentration. This behavior indicates that the association of water to form immobilized clusters dominates the water transport process with the effect of reducing the expected increase in MVTR with increasing water concentration. Nonetheless, the MVTR of the most highly swollen polymer approaches that of textile fabrics and it seems likely that a useful balance can be struck between the MVTR and polymer swelling by suitable variation of the polyurethane structure.

TITLE: 3.2 MM Radar - Radiometer

AUTHORS: PEARCE and FOIANI
Fort Monmouth

ABSTRACT: This paper describes a novel design for a simultaneously operated millimeter wavelength radar-radiometer and the results of a limited measurements program to demonstrate the usefulness of a dual mode operation for improved ground target recognition. The operating wavelength chosen for both sensors was 3.2 millimeters (94 GHz). It is shown that the radar and radiometer can be combined and simultaneously operated as one system utilizing a single receiving antenna, mixer diode, and RF power source for both modes.

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TITLE: Measurement of Damping in Fiber Reinforced Plastics
AUTHORS: GUSTAFSON, PAXSON and MAZZA
Aviation Materiel Laboratories, Fort Eustis

ABSTRACT: Internal damping is a major parameter affecting the mechanical behavior of viscoelastic materials. The interaction of constituent materials in a composite causes boundary conditions to be less well-defined than for the case in which experimental configurations use isotropic materials. Notwithstanding such difficulties there are two techniques for measuring damping which have been found to yield acceptable results; but, the energy losses of supports, specimen grips, instrumentation, and testing environment (whether in air or vacuum) cannot be neglected. These techniques are exponential decay of a vibrating beam (free-free mode) and forced vibration of a double cantilever beam. In applying these experimental procedures to A1 2024-T4, the investigator found excellent agreement between the observed damping factor and that determined by using Zener's anelastic theory of damping for metals. Armed with the knowledge that these experimental techniques will yield good results for metal beams, one can proceed to apply these methods to fiber reinforced plastic beams with confidence that the observed damping factors will be representative of the true value for internal damping. Measurement of damping in fiber glass specimens results in values which are in the order of magnitude of those obtained for aluminum.

TITLE: Radiation Induced Fracture of Silicon and Germanium
AUTHORS: OSWALD, EISEN and SCHALLHORN
Harry Diamond Laboratories

ABSTRACT: Experimental results show that rapid absorption of energy can produce brittle fracture in the semiconducting materials silicon, germanium, and indium antimonide. Samples were irradiated using the external electron beam having a peak electron energy of 2.2 MeV and a pulse duration of approximately 40 nsec. All irradiations were done at room temperature with the total exposure controlled by an appropriate choice of separation distance between sample and source. Samples of various sizes and geometry were prepared from single crystals of n-type germanium and silicon. Sample orientation was obtained through X-ray diffraction. Surface treatments were varied and included a final polish and etch.

Experimental results have established the fracture threshold for polished and etched bulk material for silicon, germanium, and indium antimonide. Surface treatment played an important role in the observed fracture level. No dimensional dependence of the fracture threshold was observed using polished and etched bars 1 by 1 mm in cross section and having lengths between 1 and 25 mm. The fracture planes in silicon and germanium were found to be the (111) crystal planes and in indium antimonide the (110) planes.

TITLE: Detection of Incapacitating Agents
AUTHORS: POZIOMEK, CRABTREE and MACKAY
Edgewood Arsenal

ABSTRACT: A detection method is described for chemical agents which exhibit marked incapacitating effects in man.

Attractive features include:

1. Simplicity of operation.
2. Selectivity for the more physiologically active chemical agents.
3. Rapid response.
4. Highest sensitivity known in chemical tests for the particular class of chemical agents.
5. Multi-disciplinary utility.
6. Wide choice of detector reagents.

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Army Research Director Discusses Coupling Need

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and transfer difficulties, causes coupling difficulties:

- *Excess Personnel Layering.* Too many people can be involved in the coupling process, with resulting communication, decision-making and other problems.
- Entrenched ideas and private interests are detriments.
- *Geographical Barriers.* Wide physical separation of scientists and the engineers from one another, as well as those who use their output, also causes problems.

Some people may dispute the assertion that wide separation of scientists and engineers constitutes a barrier to effective coupling. A Materials Advisory Board study several years ago did not find geographical separation an effective barrier. But the General Electric Co., Union Carbide Corp. and Bell Telephone will not agree: *Their* experience has been that placing scientists and engineers in close proximity has a better payoff than having these people widely separated.

Now you may ask what are we in the United States doing about improved coupling of research and technology, particularly in the Federal Government? In the Army a small group (currently two men) has been charged with examining, defining and recommending action to be taken. Ditto for the Air Force. The Navy has an ad hoc group made up of the six chief scientists of each of the commands and the Office of Naval Research.

The civilian agencies of the U.S. Government have also recognized the need for better utilization of science and technology results, as have some technical societies. About a year ago, the American Institute of Mining, Metallurgical and Petroleum Engineers held a Symposium on Research-Production Coupling Problems in the Metal Industry. The National Aeronautics and Space Administration is spending over $10 million a year in their technology utilization program.

The Department of Agriculture uses its extension program, which has been in existence for more than 50 years. This program as you may know, places the county agent as the coupler between the knowledge of the Department of Agriculture and the universities and the ultimate farmer user.

Industry is beginning to realize the beneficial results of better cou-

ling. Such prominent companies as Minnesota Mining and Manufacturing, General Electric and Union Carbide have recently instituted programs to improve coupling of science and technology. Bell Telephone has long had a program looking to better utilization of research results.

Overseas, several foreign governments have seen the handwriting on the wall. The French have recently established a new agency charged with hunting out fresh developments in basic research and finding industrial applications for them. The British have established the Ministry of Technology, the purpose of which is to move research out of the laboratory faster and to modernize outdated production methods.

A monthly publication entitled "New Technology" carries the message to British industry and government. Such importance has been attached to this problem that until recently the famous scientist, C. P. Snow, was second in command of the ministry.

Knowledgeable Britons have publicly stated that the lag in Britain's economic growth can be explained by the failure to put research results to profitable work—perhaps because of a breakdown in communications between development laboratories and plants, or, even more pertinent, because of a failure to transfer research results from the laboratory to the engineer and the limited ability to exercise scientific entrepreneurmanship.

To make the coupling effort more fruitful, not only must many of the aforementioned barriers be overcome; there are many needs, also barriers in a way, which require satisfaction, such as:

- We need more study on fundamental principles, such as the mechanisms of coupling and a methodology for evaluating coupling techniques.
- We need to sell the doctrine of coupling to the scientist, the engineer and the production man.
- We need information on how to motivate scientists, engineers and production people to communicate effectively with each other in a language each can readily understand.
- We need to evaluate the successes and failures of the recognized coupling efforts under way in industry and government and learn from them.
- We need to gather the limited knowledge and experience in sucessful coupling and to make the data available to all.
- We need to study the role of the academic world in the coupling

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TITLE: Bomblet Launchers Which Simulate Aircraft Release
AUTHORS: PRATT, PAULICK, SMITH and MOHAMMED
Deseret Test Center, Fort Douglas

ABSTRACT: Bomblet munitions are normally delivered to target by high speed vehicles and are released in large numbers from dispensers. Characterization of the performance of these munitions requires knowledge of the burst height pattern when released over forested terrain. To obtain this data, a means was developed in the form of a series of pneumatic launchers capable of imparting the proper velocity direction and spin to a range of bomblets which would simulate operational release.

One launcher was developed for the M143, M139 and E139 munitions. A second launcher was developed for the BLU 19/B23, and BLU 20/B23 munitions which were heavier and larger. For each launcher minor parts substitutions peculiar to each munition allowed a basic assembly to be used.

Both launchers operated on the tops of towers over 100 feet high and it was necessary to provide compensation for recoil in the case of the launcher for the heavier munitions to prevent destruction of the tower.

A citadel was provided on the towers to protect operators from premature detonation of a launcher round and all launchers were test fired and calibrated so that various impact velocities could be achieved by simple pressure setting on a control console.

TITLE: Electron Immunocytochemistry
AUTHORS: DONATI, PETRALI, CUCULIS and STERNBERGER
Edgewood Arsenal

ABSTRACT: The complexity of the mammalian cell as compared to that of the bacterial cell has imposed severe limitations upon the study of mammalian molecular biology and will require introduction of new methodology. In partial answer, we have now evolved methodology for the specific localization of subcellular macromolecules on the ultrathin section prepared for electron microscopy. As reagent for specific localization, immunospecifically purified antibody is used which has been exhaustively labeled with electron-opaque uranium. Immuno-specific protection during labeling prevents destruction of the specific antibody sites. Specific staining with labeled antibody is carried out on the ultrathin section and is further intensified by specific ligation of osmium onto the antibody label via thiocarbohydrazide. The specific subcellular localization of fibrinogen and lysozyme in normal and pathologic human blood cells, of Forssman antigen in guinea pig kidney and of early (submitochondrial) and late (extravirion and intravirion) antigen of poxvirus infected tissue culture cells is illustrated by electron micrographs. The most recent applications outlined in the bulk of the paper involve agent prophylaxis in which studies on the molecular biology of the immunocompetent cell is studied by the described method in conjunction with other established techniques.

TITLE: Rocket Assisted Artillery Projectiles
AUTHORS: NOVACK, MENKE, HARNETT and SMOLNIK
Picatinny Arsenal

ABSTRACT: Military requirements for modern tubed artillery emphasize the need for providing compact, lightweight, highly mobile weapons possessing greatly increased range and firepower over present weapon systems. In search of techniques to meet these requirements many countries, starting during World War II, have explored and continue to explore the principle of combining the advantages of the gun with the rocket. The discussion outlines what the Munition Command has accomplished inhouse since 1961 toward realizing this objective.

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TITLE: Chemical Thermodynamic Properties of Heteronuclear Diatomic Molecules of the Transition Metal Elements and Germanium

AUTHORS: KANT and STRAUSS
Materials and Mechanics Research Center, Watertown Arsenal

ABSTRACT: The molecules, GeX (X=Cu, Ni, Co, Fe and Cr) have been shown to exist in the vapor phase over liquid solutions of germanium and transition metal at temperature above 1600 K.

Using information derived from a combination of effusion and mass spectrometric techniques the equilibrium constants of the gaseous reactions

$$GeX + Ge = Ge_2 + X \quad (1)$$

$$2\,GeX = Ge_2 + X_2 \quad (2)$$

$$GeX = Ge + X \quad (3)$$

have been estimated between 160 and 2100 K. The bond dissociation energies D (Ge-X) were determined from both variations of the free energies of reactions (1), (2), and/or (3) with temperature (second law or slope method) and are compared with the corresponding values obtained by means of absolute entropy or third law calculations. The D (Ge-X) third law values are 39.6 ± 7, 49.4 ± 7, 56.1 ± 6, 66.2 ± 3, and 47.8 ± 5 kcal/mol for X equal Cr, Fe, Co, Ni and Cu respectively.

TITLE: Protection and Reversal of Lethal Mustard Damage Resulting in Recovery of Cell Viability

AUTHORS: PAPIRMEISTER, DAVISON and GROSS
Edgewood Arsenal

ABSTRACT: The mechanism of action of sulfur mustard (H) was studied in order to establish a rationale for therapy against its cytotoxic and vesicant actions. Investigations were carried out at the molecular, subcellular, cellular and tissue levels. It was concluded that cell death and tissue injury were consequences of primary lesions sustained within desoxyribonucleic acid (DNA), the genetic substance of cells. Two general types of DNA damage were considered: (a) Alterations of structure which led to widespread disturbances in DNA and major biological repercussions and, (b) modifications of a base(s) which resulted in coding errors and more subtle biological effects.

Many cells, including those in rabbit skin, contained enzymes which were able to repair H-damaged DNA and restored viability. The repair mechanism itself could be overtaxed or inhibited and this cellular imbalance became a major factor in pathogenicity. A model was proposed to explain the critical cause-and-effect relationships involved in the production of skin lesions. A surprising and potentially important feature was the pronounced stimulation of healing caused by DNA breakdown products.

TITLE: Emotional Response of Rhesus Monkeys to Chronic Psychological Stress

AUTHORS: LEVINE and GORDON
Aberdeen Proving Ground

ABSTRACT: This paper will summarize the results of some recent investigations in the area of emotional responsiveness of rhesus monkeys to psychological stress. The similarity between this data and that obtained in recent work with humans under stress has led to an examination of the significant variables accounting for the data, and to a proposal for a multidisciplinary research approach in this area.

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Army Research Director Discusses Coupling Need

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process, since they are prime producers of basic knowledge.

The art of coupling or transfer in the United States is basically in its infancy. However, this does not mean we have not discerned some of the more pertinent means of accomplishing coupling. Let me list a few which can be profitable:

1. Periodically develop a list of corporate or military problems and needs pertinent to the laboratory or research agency and make these available to the scientist so there can be more relevant research.
2. Periodically evaluate the outputs of each laboratory against corporate or military needs.
3. Add liaison and coupling activities explicitly to the goals and missions of organizations.
4. Add liaison and coupling activities explicitly to the job descriptions of pertinent individuals, such as project monitors.
5. Appoint two small groups of liaison individuals, one group to establish links between labs and basic research agencies and another group to strengthen the coupling between labs and operations.
6. Provide better opportunities for coupling activities by scientists and engineers, such as special symposia, which bring scientists and engineers together.
7. Insert translators, especially between science and technology.
8. Encourage the creative scientist where possible, to follow his work beyond the research stage into development, possibly as a consultant.
9. Try to select scientists for both in-house and contract work who are at home with both science and technology.
10. Recognize and otherwise reward individuals for their successful coupling efforts in challenging areas.
11. Consider (with some caution) the possibility of programing a coupling effort.
12. Study good and bad examples and find out why the crucial differences exist and what they would mean in terms of overhauling the present system.
13. Encourage face-to-face conversation between technical people rather than or in addition to going through the chain of command.
14. Minimize the physical space barrier between scientists and technologists—house them together or close by whenever possible.

The list of possible coupling activities could be extended many times. If we successfully incorporate half of those just enumerated, a major step forward will have been taken.

I am sure many of you will agree that not many major advances in science come along in a decade. It is, however, the little bits and pieces haphazardly strewn along the road which, when properly coupled to an idea or a need, can make major advances. These little bits and pieces can additionally provide the foundation for new capabilities, even if a basic requirement or market has not yet been established.

Also, it is my belief that more effective coupling will not come by coercion and direction but rather by persuasion, education and constant reminders. We need to be continually reminded that research and technology are fine, useful activities in themselves; but to be really useful to society and to the corporation or agency they must, as *often* and as *soon* as possible, fulfill a need as well as fill the fountain of knowledge.

I am firmly convinced that ideas and opportunities which become technological opportunities and marketable end items are more a function of competent, aware management and total organizational structure than the activities of the research or engineering community themselves.

MRC Plans Advanced Seminar At University of Wisconsin

An unusual training opportunity is afforded by an Advanced Seminar on Theory and Application of Spline Functions to be conducted by the Mathematics Research Center, U.S. Army, University of Wisconsin, Oct. 7–9.

Spline functions are a mathematical tool of great usefulness in approximation, curve fitting, numerical quadrature, and numerical solution of differential equations. These useful properties have been fully developed only in the last few years.

The purpose of the Advanced Seminar is to acquaint Army mathematicians with the theory and applications of spline functions. The only prerequisite for attendance is a knowledge of differential and integral calculus. Requests for information should be directed to T. N. E. Greville, Mathematics Research Center, U.S. Army, University of Wisconsin, Madison, Wis. 53706.

Mathematics Research Center personnel will be available for consultations before or after seminars.

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TITLE: A Theoretical and Experimental Analysis of Quasistatic Magnetic Field Transmission Through Circular Apertures
AUTHORS: BOMBARDT and BOSTAK
Mobility Equipment R&D Center, Fort Belvoir

ABSTRACT: A simplified method for determining transient magnetic field transmission through circular apertures in the time domain is useful in the analysis of military electrical system performance during and after exposure to large amplitude transient magnetic fields. Kaden's quasistatic analysis of a circular aperture in a conducting plane is reviewed and the field components of interest are obtained. Experimental techniques used to create spacially controlled transient magnetic fields are discussed and techniques used for time history measurement of interior and exterior magnetic fields are presented. The numerical results of Kaden's theory are correlated with experimental data obtained for an interior field component within an open-ended, long cylinder with circular cross-section and with a circular aperture on the lateral surface. Quasistatic analysis of multi-aperture problems is discussed and the approximation of linear superposition of independent solutions for a double aperture problem is made and numerical results obtained. These numerical results are correlated with experimental data obtained for an interior field component due to two circular apertures on the lateral surface of a cylinder.

TITLE: Large Nonsymmetric Deflections of Thin Shallow Shells
AUTHOR: MESCALL
Materials and Mechanics Research Center, Watertown

ABSTRACT: The geometrically nonlinear behavior of thin shells undergoing large non-axisymmetric deflections under symmetric and nonsymmetric loading is studied by use of the nonlinear Marguerre equations for shallow shells. A numerical procedure is developed which permits the derivation of detailed load-deflection curves, in terms of which the stability of the shell may be analyzed. The numerical technique involves a dual iterative procedure. An outer Newtonian type of iteration treats the nonlinear aspect of the problem by replacing the original differential equations by a sequence of linear differential equations. Each element of this latter sequence is replaced with its finite difference equivalent and an inner iterative procedure is used to solve the resulting set of algebraic equations. Numerical results have been obtained for the case of uniform pressure on a clamped spherical shell as well as for nonsymmetrical loads. Extension of the numerical procedure to other problem classes is discussed.

TITLE: Viscoelastic Rheology by Ultrasonic Interferometry
AUTHOR: PARKS
Tank-Automotive Command

ABSTRACT: The velocity and attenuation of compressional sound waves have been measured at ambient temperatures with the aid of a two-crystal ultrasonic interferometer of fixed-geometric design. Data acquisition included signal amplitude response, phase angle behavior, and signal transition phenomena as functions of frequency. The accuracy of the various measurement techniques is discussed and representative values of sound velocities and attenuation factors for several standard liquids and hydraulic oils containing additives are presented.

TITLE: The Optical Discrimination System (ODS) Program
AUTHOR: WOODS
Redstone Arsenal

Classified Abstract

OCRD Announces 35 Personnel Assignments

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Lt Col Frank P. Ringenbach was assigned as a staff officer with the Standardization Branch, International Office, following a tour as executive officer, J-1, Military Assistance Command, Vietnam.

He received a BA degree from the University of Cincinnati in 1943 and an MA degree in political science from Roosevelt University in 1962. He completed the Command and General Staff College (C&GSC) in 1959.

Military assignments include tours of duty at Fort Ord, Calif. (1965–67); HQ U.S. Army Europe, Heidelberg, Germany (1962–65); and HQ Fifth Army, Chicago, Ill. (1959–62).

Lt Col Leslie H. Gilbert recently began a third tour with OCRD Air Mobility Division, after completing a year of service in Vietnam. His earlier tours were from 1964 to 1967 and 1956 to 1959.

Other assignments include service with the 577th Engineer Construction Battalion at Fort Benning, Ga. (1963–64) and the 4th Logistical Command, Verdun, France (1959–63).

Col Gilbert has completed the Command and General Staff College course.

Lt Col Oliver N. Esco was assigned to the Programs Management Office, Advanced Ballistic Missile Defense Agency, after receiving an MBA degree from the University of Alabama. He earned his bachelor's degree in general education at the University of Omaha in 1960 and in 1963 was graduated from the Army Command and General Staff College.

From 1963 to 1966, he served with the 4th Missile Battalion, 43d Artillery, Fort Richardson, Alaska. He was division chief, Officer Instruction Division, High-Altitude Missile Department, Army Air Defense System at Fort Bliss, Tex., from 1960–62; and assistant S-3, 1st Cavalry Division (Artillery), Korea, 1959.

Lt Col Robert D. Cicchinelli, a new staff officer in the General Materiel Branch of the Combat Materiel Division, OCRD, is a recent graduate from the Army Command and General Staff College. He has a BS degree (1954) in military science from the U.S. Military Academy and an MS degree (1966) in nuclear physics from Tulane University.

Assigned to 1st Infantry Div. and HQ II Field Force in Vietnam in 1966–67, following a tour as assistant S-3, HQ and HQ Battery, 25th Infantry Division Artillery, USARPAC, he served earlier as S-2 of the same unit.

Lt Col Boyd T. Bashore was assigned to the Combat Arms Branch, Combat Materiel Division, OCRD, after graduating from the Army War College. He is a 1950 graduate of the U.S. Military Academy and in 1960 completed the Army Command and General Staff College course.

In 1966–67 he served in Vietnam as commander of the 2d Battalion, 27th Infantry (Wolfhounds), 25th Infantry Division, and later as special assistant for revolutionary development support with the same division. A tour as assistant head of the Southeast Asia Branch, MAP Division, Commander-in-Chief Pacific, preceded his assignment to the Army War College.

Lt Col George G. Tucker Jr. is a new staff officer in the Low-Altitude Systems Branch, Air Defense and Missiles Division, following graduation in June from Georgia Institute of Technology with an MS degree in electrical engineering. He has a BA degree in mathematics from the University of Florida and was graduated in 1964 from the Army Command and General Staff College.

In 1965–66 he served as a plans officer with the U.S. Military Assistance Program director, Military Assistance Command, Vietnam.

Lt Col John N. Albertson began duty July 15 as a staff officer in the Life Sciences Division, Army Research Office, following graduation from the Command and General Staff College. He is a 1966 graduate of the Army Medical Service Career Officers Course at Fort Sam Houston, Tex.

From July 1964 to August 1967, he served as chief of the Bacteriology Division. 1st Army Medical Laboratory, and later as chief of the Virology Division, Fort Meade, Md. He was a research associate at Hahnemann Medical College in Philadelphia, Pa., from August 1962 to June 1964, when he received an MS degree. He has a BS degree in chemistry and bacteriology from the University of Connecticut.

Lt Col John S. Chesbro is a staff officer in the Studies and Analysis Division and a June graduate from the Command and General Staff College. Graduated in 1954 from the U.S. Military Academy with a BS degree in engineering, he received an MS degree in aeronautical and astronautical engineering from the University of Michigan in 1962.

Col Chesbro was chief of the Research and Analysis Division, GMD, at the Army Artillery Center, Fort Sill, Okla., in 1966–67, following a one-year tour as field artillery adviser, Detachment 11, Joint U.S. Military Assistance Group, Thailand. He was assistant professor, Department of Ordnance, U.S. Military Academy, 1962–65.

Lt Col Herbert E. Friesen began a tour as staff officer in the Air Defense and Missiles Division after graduating from the Command and General Staff College. He has an MS degree in mathematics from Rensselaer Polytechnic Institute and is a 1953 graduate of the U.S. Military Academy with a BS degree in engineering.

Col Friesen served in Vietnam in 1966–67 as executive officer of the 2d Battalion, 320th Artillery. From August 1964 to April 1966, he was assigned to the 6th Artillery Group, Fort Bliss, Tex., with duty station at Fort Bragg, N.C.

Lt Col John T. Miller, a new staff officer in the General Materiel Branch, Combat Materiel Division, returned recently from a tour in Vietnam as executive officer, 1st Engineer Battalion, and then as assistant chief of staff, 1st Infantry Division. From 1964 to 1966, he was officer-in-charge of the SM-1 Nuclear Power Plant and executive of the Nuclear Power Field Office, Fort Belvoir, Va.

Col Miller is a 1954 graduate from the U.S. Military Academy with a BS degree in general engineering and in 1960 received an MS degree from Purdue University in electrical engineering. He is a graduate from the Command and General Staff College.

Lt Col Carl J. Odekirk is assigned to the Communications and Electronics Division as a staff officer and is a June graduate from the Command and General Staff College. He has a BS degree from Utah State Univ.

From May 1966 to May 1967 he was G-2 Air, 1st Field Forces, Vietnam. That assignment followed nearly four years in the Sensory Equipment Division, Target Acquisition Department, U.S. Army Artillery and Missile School, Fort Sill, Okla.

Maj Francis W. Matthews graduated from the Command and General Staff College in June and reported shortly thereafter for duty as a staff officer in the Scientific and Technical Information Division, OCRD. In 1966–67 he was a senior adviser at the U.S. Army Ranger Training Center in Vietnam, following a 1963–66 tour as aide-de-camp to the superintendent of the U.S. Military Academy. He is a 1956 graduate of the USMA.

Maj Thomas A. Banner also is a 1968 graduate from the Command

and General Staff College, with a new assignment as staff officer in the Medical and Biological Branch, Life Sciences Division, Army Research Office, OCRD. He has a 1956 BS degree in agricultural education from the University of Tennessee and an MS degree from Cornell University in food distribution and business management.

Maj Donald P. Whalen is a new graduate from the Command and General Staff College and is assigned as a staff officer in the Air Defense and Missiles Division, OCRD. He served in Vietnam in 1966–67 as S-3 of the 6th Battalion, 14th Artillery, following duty as battery commander, 2d Battalion, 320th Artillery. He has a 1962 MS degree in electrical engineering from Purdue University and is a 1957 graduate from the U.S. Military Academy.

Richard M. Whitaker is assigned as a digital computer systems analyst in the Research and Engineering Systems Branch, Scientific and Technical Information Division, Army Research Office. He was employed in the past five years in a similar capacity with the Computer Systems Evaluation Command at Fort Myer, Va. He has a BS degree in business administration from Northeastern University.

Eugene W. Stubbs, known for his unfailing good humor and sometimes affectionately termed the "Jolly Green Giant of ARO," terminated seven years as a contracts officer with the Research Contracts and Grants Branch, Research Programs Office. The change involved a promotion to assistant deputy director, Defense Supply Service, Washington, D.C.

Pershing System Involved in MICOM Project Swap

"Project Swap," related to the U.S. Army Missile Command's Pershing system, started in July in facilities at Cape Kennedy, Fla.

An agreement between the Army and the U.S. Air Force National Range Division, Eastern Test Range, makes the Cape's Hangar N a center for assembly and testing of the Pershing 1-A prior to shipment as battalion-size packages to operational units in the U.S. and Europe.

Pershing 1-A is newly developed ground support equipment required by recent Department of Defense decisions for giving Pershing a strategic deterrent role called Quick Reaction Alert as one of the Free World's important nuclear forces against possible aggression.

Under Project Swap, expected to last about two years, the Cape facilities will be the center for the massive job of changing all fielded Pershing units from their present tracked equipment to the new configuration. All elements of new equipment will be delivered to Hangar N. These will be mated with a new 5-ton 8-wheel-drive cargo truck being developed by Ford Motor Co. for the Army's General Purpose Vehicles Project Office.

Equipment will then be tested for operational readiness and packaged into battalion-size units, including spare parts, records and publications, for shipment to operational units. No live missiles will be involved in use at the Cape.

Directed by the Army Missile Command's Pershing Project Office, headed by Lt Col Edwin A. Rudd, Project Swap will not only form the P 1-A packages and deliver them to the operational units, but it will also supervise the equipment changeover. Subsequently, it will dispose of basic Pershing materiel excess to the new mission.

Coordinator Designated for Manpower Research

Assistant Secretary of Defense for Manpower and Reserve Affairs Alfred B. Fitt, who serves as chairman of the Manpower Management Planning Board, recently appointed Dr. Ralph R. Canter as military manpower research coordinator.

Dr. Canter succeeds Dr. Edmund E. Dudek, who had served since November 1966 and has returned to his position as technical director of the Naval Personnel Research Activity, San Diego, Calif.

Dr. Canter will furnish staff support to the board, composed of the chairman; the Deputy Director of Defense Research and Engineering; the Assistant Secretaries (Manpower and Reserve Affairs) of the Departments of the Army, Navy and Air Force; and the Assistant Secretary of Defense (Systems Analysis).

Dr. Canter graduated from DePauw University in 1943 and served in the U.S. Navy during WW II. He received his MA degree in 1947 and PhD in 1949 from Ohio State Univ.

From 1949 to 1955, he taught at the University of California, then joined the RAND Corp. and later was employed by the System Development Corp., Santa Monica, Calif., as Washington representative until his Defense Department appointment.

During his tenure at the University of California, Dr. Canter took a one-year leave of absence to serve as personnel psychologist at U.S. Air Force Headquarters, Washington, D.C.

Contract Begins Production of Dragon Antitank System

Plans to begin production of the Dragon antitank weapon system, fired from the shoulder but powerful and accurate enough to destroy armor and field fortifications, were announced June 28 by the Army.

Army officials said a contract calling for production engineering and production of the Dragon has been awarded to McDonnell-Douglas Corp. The $5.5 million contract has a total planned value of $133 million funded on an annual basis.

Production plans were disclosed by the Dragon Project Office which manages the program at the Army Missile Command. Col Kenneth C. Van Auken is project manager and Allan Platt is civilian deputy.

Dragon is being developed by the Army and McDonnell-Douglas as a guided missile system that is far superior in range, accuracy and lethality to the 90mm recoilless rifle it will replace. Weighing about 27 pounds, it is designed to enable the individual soldier to kill any enemy tank with one shot.

To fire the Dragon, a soldier simply looks through the telescopic sight and launches the missile. All he has to do is keep his sight on the target until it is destroyed. Once the target is knocked out, the tracker is removed and the launcher is discarded. The tracker then can be attached quickly to the next round and the soldier is ready to fire again.

Negotiating the contract for the Army was Systems Contracts, Division A, of the Missile Command's Procurement and Production Directorate, headed by Col S. C. Holmes. James S. Phillips was coordinator.

Dr. Mika Accepts New Post

Dr. Leonard A. Mika was appointed recently as chief of the Atomic, Biological, and Chemical Division of the U.S. Army Foreign Science and Technology Center, Washington, D.C.

Responsible for production of foreign technical intelligence in the atomic, biological and chemical areas, he has an extensive aducational and vocational background for his new assignment, including a PhD degree in microbiology from George Washington University. He was until recently assigned to the U.S. Army Laboratory at Fort Detrick, Md., as a medical bacteriologist and chief of the RDT&E Programs Division.

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physics. He was involved in major programs as a physicist and group leader at Oak Ridge National Laboratory, Tenn., with Dr. P. R. Bell and others from 1953 until be became one of the founders of ORTEC, Inc., in 1960. Since 1962, he has been vice president and technical director. The company has 225 employes and operates worldwide.

Concurrently with his administrative and research activities, Col Neiler has been active in the educational field. Since 1956, he has been on the staff of the University of Tennessee, teaching graduate courses in modern physics and supervising graduate theses in both physics and electrical engineering.

More recently he has participated in American Management Association courses in technical planning. His specialty is small corporation technical planning.

Col Neiler served as director of the recent Nuclear Science Training Sessions conducted by the 3252d USAR R&D Unit at Oak Ridge, Tenn. He is a strong believer that his rise professionally has been tied closely to his participation in the Reserve R&D Unit Program. He had a Mob Des assignment to the Office of Special Weapons Development at Fort Bliss, Tex., and is now assigned to the U.S. Army Nuclear Defense Laboratory at Edgewood (Md.) Arsenal.

Col Neiler distinguished himself in combat in World War II with the 517th Parachute Infantry Regiment until it was deactivated in December 1945. He served as battalion and (later) regimental intelligence officer in the Rome-Arno, Southern France, Rhineland, Ardennes and Central Europe Campaigns, winning the Purple Heart, Bronze Star (with OLC) and Silver Star.

LT COL MARTIN P. HINES is a member of the 3256th R&D Unit, Raleigh, N.C., and since 1964 has been director, Division of Epidemiology, North Carolina State Board of Health. He has been a visiting associate professor, School of Public Health, University of North Carolina, since 1960 and has served in the same capacity since 1966 at North Carolina College.

Col Hines' BS, MS and PhD degrees in bacteriology, public health, and veterinary medicine were earned at Louisiana State University, Harvard University and Ohio State University. He practiced veterinary medicine at Montgomery, Ala., and was assistant professor of bacteriology at the University of Georgia until 1951, when he started 13 years as chief, Veterinary Public Health Section, N.C. State Board of Health.

Honored with the Carl V. Reynolds Award for Outstanding Contributions to Public Health in North Carolina in 1958, he received the "Veterinarian of the Year" Award of the N.C. Veterinary Medical Association in 1965.

Col Hines is a past president of the N.C. Public Health Association the National Association of State Health Veterinarians, and the N.C. Academy of Public Health. He is a member of the Advisory Committee to the American Medical Association on Rural Health, the House of Delegates of the American Veterinary Medical Associate, a Diplomate of the American Board of Veterinary Public Health, and consultant to the World Health Organization.

COL PAUL H. WESWIG, a member of the 6161st R&D Unit since its inception, has served the past 2½ years as commander. Since 1946, after three years of military service in the European Theater in World War II, he has been at Oregon State University (OSU) and is a professor of long standing. He earned his BS degree from St. Olaf College in Minnesota and MS and PhD degrees from the University of Minnesota.

In the Department of Agricultural Chemistry at OSU, he has gained wide recognition for his research in animal nutrition. He has received grants from the National Institutes of Health and the U.S. Public Health Service, primarily for work in trace mineral metabolism, and from the National Cancer Institute to investigate the carcinogenicity of selenium.

Recognized for numerous publications in scientific media, he has served as a consultant to the National Institutes of Health and has participated in nutritional surveys for the Interdepartmental Committee on National Defense in Ethiopia (1958), Malaysia (1963) and Paraguay (1965). One of his duties was to determine the adequacy of military rations in countries surveyed.

Affiliated with numerous professional societies, Dr. Weswig has participated and made presentations at International Congresses of Nutrition in the U.S., Scotland and Germany. He is president of the Oregon State Employes Association, chairman of the Nutrition Research Institute Advisory Board, and a member of the OSU Faculty Senate.

COL GEORGE C. HOWARD is commander of the 4016th R&D Unit in Tulsa, Okla., and has been a Reservist since 1946, including 16 years as a director of ordnance instruction. During World War II, he served four years at Rariton Arsenal, Metuchen, N.J.

Col Howard, if he were a civilian employe scientist or engineer in the Army, would be among the strong contenders for the "man with the mostest" title for patents granted. He is listed individually or with one or two associates on 39 patents, all associated with his 28 years experience in drilling and completing oil and gas wells.

Concerned with research in the petroleum industry for 25 years, he has been employed the past 15 years in a supervisory capacity at the Pan American Petroleum Corp. Research Center in Tulsa. He is involved with mechanical and drilling procedures for both land and off-shore facilities, specializing in problems linked to oceanography and exploitation of the Continental Shelf.

Affiliated with the Society of Petroleum Engineers, American Institute of Mechanical Engineers, American Ordnance Association, National Security Industrial Association and the Marine Technology Society, Col Howard is author or coauthor of more than 20 publications in petroleum industry journals.

COL SIDNEY L. LOVELESS is a rarity among members of USAR R&D Units, in that he is a 30-year veteran of the insurance business, although he has a BS degree in agriculture and another BS degree in science from Texas A&M University. He is credited by associates in the 4004th R&D Unit at College Station, (Bryan) Tex., with a "significant contribution to revitalizing" the unit.

Commissioned in 1938, Col Loveless has continued his active interest in the Army to the degree that he was graduated from the Command and General Staff College in 1965 and from the U.S. Army Supply Management School the same year. His Mob Des assignment is deputy director, Plans Directorate, Deputy Chief of Staff for Logistics, HQ Department of the Army.

Col Loveless taught life insurance at Texas A&M from 1947 to 1951, was selected "Man of the Year" in the City of College Station, Tex., in 1952 and in 1961 was chosen the Col-

lege Station Kiwanis Club "Outstanding Citizen." He is serving as president of You-Tomorrow, a nonprofit educational organization for the benefit of youth and has been a Boy Scoutmaster since 1954.

CAPT GERALD M. LEIGH, 3356th R&D Unit, Auburn, Ala., was associate professor of civil engineering at Auburn University until June 3, 1968. He is now associate manager and chief project engineer for Black, Crow and Eidsness, Inc., a consulting engineers firm in Atlanta, Ga.

Capt Leigh received a BS degree in civil engineering from Georgia Tech and MS and PhD degrees in sanitary engineering from the Johns Hopkins University. Much interested in sanitary engineering problems in the developing nations, he serves as a consultant to a Johns Hopkins medical research team working in several remote areas of Peru. He was on active duty in 1956–58 and served a tour in Vietnam with a Military Assistance Advisory Group.

LT COL G. R. JUNGERMAN is a member of the 4001st R&D Unit in Houston, Tex., where he is superintendent of a Dow Chemical Co. benzene plant in nearby Freeport. He has a BS degree in chemical engineering from Purdue University and an MS in the same field from Texas A&M. He has been issued one patent on phosphate manufacture and has another application on file for benzene processing.

LT COL C. B. SHAPERO is a research scientist at the Ames Research Center, National Aeronautics and Space Administration, and is a member of the 5163d R&D Unit in Sunnyvale, Calif. His work is concerned with development and application of instrumentation and control systems for aeronautical environmental facilities, high-speed wind tunnels, and launch ranges.

With a World War II background of radar application and technical management of combat operations, he has received diplomas from the Artillery School, Command and General Staff College, Industrial College of the Armed Forces, and the Defense Strategy Seminar of the National War College. He is enrolled in the career program of the Army Logistics Management Center, Fort Lee, Va.

LT COL EDWARD H. LYNCH, commander of the 6152d R&D Unit, Oakland, Calif., is a chemical engineer with the Chevron Research Co. at Richmond. Educated at the University of Delaware and the University of California at Los Angeles, he is a specialist on refining technology for production of gasoline and jet fuel. He joined the USAR R&D Unit Program in 1948 after serving five years in Antiaircraft Artillery in World War II and changing later to the Chemical Corps.

CAPT S. L. CAMACHO, 5055th R&D Unit, Purdue University, Lafayette, Ind., is a senior research physicist with the Linde Division, Union Carbide Corp. His investigations are concerned with exploitation of plasma devices for applications requiring high temperature gases.

Born and reared in Agana, Guam, he attended the University of Colorado from 1952 to 1958, receiving a BS degree in electrical engineering, and entered active duty in the Corps of Engineers as an officer in 1958. In 1961 he became a civilian scientist with the NASA Ames Research Center in Mountain View, Calif.

Based upon his work in basic and applied research in electric arc plasma (magnetoplasmadynamics studies), he was selected for graduate study at Stanford University. He received an MS degree in aeronautics and astronautics in 1964, continued graduate studies in plasma physics at Stanford until 1967, and has published a number of research reports in this field.

Proud of his work in the R&D Unit in support of the International Science Fair for high school students each year, he stated: "I am convinced of the professional career-broadening advantages derived from participation in the R&D Units."

MAJ THOMAS J. PARISOT is assistant director, Fish Pesticide Research Laboratories, Bureau of Sport Fishing and Wildlife, Department of the Interior, in Columbus, Mo. He is concerned with studies, involving multidisciplined research on problems related to the impact of insecticides, herbicides and other commercial poisons on fish and their environments.

Prior to his present assignment, he was in charge of the Virology Section, Western Fish Disease Laboratory, Seattle, Wash. He has authored a number of publications on virus and bacterial-induced diseases of fish and was an invited participate in the International Symposium on Viral Disease of Poikilotherms sponsored by the New York Academy of Science.

Maj Parisot is a graduate from Idaho State College and earned an MS degree from Washington State University, both in bacteriology and public health. He is studying at the University of Washington for a PhD in natural resources administration.

CAPT ROBERT R. PERRY is an assistant professor of radiology at the University of Texas at Galveston and a member of the 4001st R&D Unit in Houston. In addition to teaching, he is interested in research related to application of physics in medicine. He has done considerable research in basic nuclear physics and the diffusion of neutrons in bulk media for neutron oil well logging. He has BA, MA and PhD degrees in nuclear physics from Rice Institute.

COL JAROSLAV V. KLIMA, 3353d R&D Unit in Huntsville, Ala., is a senior aerospace engineer in the Advanced Systems Office, Research and Development Operations, Marshall Space Flight Center, National Aeronautics and Space Administration. Currently he is working on orbiting space stations and the integration of astronomy and earth resources experiments. He has a BS degree in mechanical engineering from New York University.

LT COL L. L. REAGAN is commander of Detachment 2, 4001st R&D Unit, Dallas, Tex., and is employed as an electronics engineer in the Microwave Division of the Collins Radio Co. at Richardson, Tex. He has served with a number of consulting and electrical engineering industrial organizations since being discharged from active duty in World War II. He was recalled to active duty during the Korean conflict and Berlin crisis.

MAJ PHILIP DEIVERNOIS, 1620th R&D Unit, has been continuously active in the Reserves since 1947 and most recently was commander of the 1620th, one of several units he has commanded.

Employed continuously at the Union Switch and Signal Co., Pittsburgh, Pa., since he graduated in 1947 from Carnegie Mellon University with a BS degree, he is currently manager, Terminal Control Section. His duties involve promoting and engineering command and control systems for use by railroads at freight classification centers. He serves as an associate member and consultant to the American Railway Engineering Association and is a senior member of the Institute of Electrical and Electronics Engineers.

CAPT EDMOND NEUBERGER, executive officer of the 1620th R&D Unit, Pittsburgh, Pa., is a project manager with Calgon Corp. and has served in this capacity with Foxboro Co. in Foxboro, Mass., and Fisher Scientific Co.

Responsible for design, development, evaluation and application of complete analytical process instru-

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mentation systems, including primary measurement devices, transducers, computer systems and appropriate techniques for closed loop control, he has specialized in this field for much of his career. He also has been active in development of selective ion measurement and control systems, such as fluoride ion and sodium ion measurement in aqueous processes, wastes and stack gases.

LT REVERDY WRIGHT, 3355th R&D Unit, Gainesville, Fla., has been a computer specialist for 10 years, following graduation from the University of Florida with a BS degree in mathematics. He is now a PhD candidate in mathematics and is investigating use of sequential automata for parallel tasks. He holds a Mob Des assignment to the U.S. Army Information and Data Systems Command, Washington, D.C.

CAPT RONALD STRICKMAN is administrative officer with the 6150th R&D Unit, Fort Douglas, Utah, and has a Mob Des assignment to Dugway (Utah) Proving Ground as operations officer, Test Design and Analysis Office. Graduated from Dana College, Blair, Neb., with a BS degree in the biological sciences, he is doing graduate work in business administration at the University of Utah. He is employed as an operations research analyst, Biological Systems Division, Deseret Test Center, Fort Douglas, Utah.

LT RICHARD McCORMICK, 1416th R&D Unit, Columbus, Ohio, is one of the newcomers to the R&D Unit Program. He served two years with the 2d Armored Division Artillery and is currently employed by Western Electric Co. as a development engineer in electronic switching systems. Graduated from Youngstown (Ohio) University with a bachelor's degree in electrical engineering, he is working toward an MS degree at Ohio State University.

LT B. K. COOPER JR., 4015th R&D Unit, Austin, Tex., is another comparative newcomer to the program. He has BS and MS degrees from the University of Texas and is presently senior electronics engineer at Kaman Instruments Co. in Austin. His primary interest is in product development.

Combat Service Show Draws Top Army Chiefs at Pentagon

Secretary of the Army Stanley R. Resor and Army Chief of Staff Harold K. Johnson (since succeeded by General William C. Westmoreland) were among an impressive array of top Army and Department of Defense leaders who viewed a recent Pentagon exhibit.

On display was the Army's automated transportable Combat Service Support System (CS3), consisting of the IBM 360/40 computer and peripheral equipment. Each system is mounted in four trailer vans and communications terminals are on 2½-ton trucks. The system is being installed in six organizations in the United States and Europe in 1968.

The system which was shown at the Pentagon for a full week is now being set up at Fort Hood, Tex., where it is to be coupled with two similar CS3 computer complexes. Together they will be subjected to a year-long test of the CS3 logistics concept, involving logistic and financial data for the Army in the field, by the III Corps.

Managed and developed for the Army by HQ Automatic Data field Systems Command (ADFSC), Fort Belvoir, Va., commanded by Brig Gen Wilson R. Reed, the CS3 system is also under his control as project manager. Lt Col George R. Fullerton heads the CS3 directorate.

PRIMAR Probes Ways of Better Management

Selected management and action officers of HQ U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., were briefed recently on PRIMAR (Program to Improve the Management of Army Resources).

Brig Gen William O. Quirey, director of Studies, Office of the Chief of Staff of the Army, presented the briefing on new program practices designed to tie the many recent changes and improvements into an integrated Army resource management system.

The planning for the ideal system to provide top Army management with exact and timely information on the Army's mission-resources, includes 23 PRIMAR study projects. CDC's close and long-range planners learned from General Quirey that study areas include developing an integrated readiness measurement system plus readiness equipment distribution program, simplifying the Army Budget system, and improving force program procedures.

CDC, which was instrumental in developing and implementing the TASTA (The Administrative Support, Theater Army) concept, also has a strong interest in PRIMAR's project to improve the National Inventory Control Point programing data.

Advanced Studies Institute Undertakes Project FIRMA

FIRMA, short form for The Dynamics of Fire and Maneuver, is a study now under way at the Institute of Advanced Studies, U.S. Army Combat Developments Command (CDC) organization at Carlisle Barracks, Pa.

Basically, the study is to examine the relationship between maneuver units and fire-support units required for a given force. The Institute's Long-Range Division of the Plans Directorate, headed by Col William S. Barrett, is conducting the study.

CDC officials said it is too early to estimate how long the study will take. They are hopeful, however, that FIRMA findings and recommendations will assist commanders to accomplish their missions through better understanding of the five land-combat functions—fire, movement, control, intelligence and support.

Aspects of FIRMA are expected to help facilitate instruction in and employment of fire and maneuver, assist in force planning and provide a basis for structuring tactical organizations. Fundamental consideration will be given to establishing the tactical echelon at which the relationship of fire and maneuver can best be defined.

FIRMA initially will deal with battalion-level organizations, using the mechanized battalion as a starting point, and consider fire support normally available to battalions.

Essay Contest on Management

Promotion of management methodology is the purpose of an essay contest announced by the U.S. Army Management School, Fort Belvoir, Va., and open to military and civilian personnel.

Entries must be postmarked before Oct. 1, 1968, to qualify for consideration for 10 prizes totaling $600, with $200 as the first prize. Essays should be from 2,5000 to 10,000 words in length, submitted to the Fund for the Advancement of Management in the Armed Forces, Army Management School, Fort Belvoir.

WSMR Students Take New Mexico State University Tele-Lecture Courses

Sitting in a White Sands (N. Mex.) Missile Range classroom, 21 graduate students in physics recently received instruction from a professor in Boston, Mass., via a tele-lecture, tele-writing system.

The civilian employes of WSMR normally receive instruction by this method from New Mexico State University's Physics Department at Las Cruces. When Dr. Harold A. Daw, department head, had to go to Boston on business, he arranged to use the system over the longer distance.

Introduced in 1966, the system is a cost-saving method in the WSMR continuing program to insure employes an opportunity to further their education and increase their professional capabilities. Five courses were conducted last year. Current courses are Physics 476 (tensor analysis) and Physics 451 (intermediate mechanic).

Lectures are transmitted via a special communications system. The lecturer also uses a tele-writing apparatus to emphasize particular points or to transmit written formulas and diagrams.

The lecturer's voice is received by telephone or, when class is in session, over a speaker system so that all students can hear. Each student has a microphone with which to talk personally to the lecturer, and he can interrupt at any point.

As the professor lectures on a particular point or formula, he may write it down and the image is transmitted simultaneously to the classroom and is projected to a screen for all to see, analyze or copy.

Following class the students generally copy the information displayed from the reel of acetate used in tele-writing for review and retention.

WSMR introduced the tele-lecture program to help offset costs incurred because of the remoteness of the range from educational institutions. It is credited with saving thousands of dollars in travel expenses for instructors, students and the Army.

Carl G. Clifft, WSMR employment development officer, estimates the tele-lecture, tele-writing system of teaching costs about half as much as resident instruction. Closed circuit television is not available.

Personal contact between student and instructor is impaired little, if any, by the remote delivery of lectures, Clifft said. In the classes now in session, Dr. Daw addresses questions to the students on a first-name basis. He meets periodically with the class to give on-the-spot assistance as well as to administer examinations and to observe the students' progress.

WSMR STUDENTS receive instructions via tele-lecture, tele-writing from New Mexico State University's Physics Department at Las Cruces, N. Mex.

During the fall semester of 1966, technical difficulties hampered instructions to the extent that some of the students were disappointed with the results. The "bugs" have been eliminated.

Ramiro Gonzales states emphatically that he prefers instructions by way of the tele-lecturing method over that of most classroom studies. Employed as a mathematician with the Analysis and Computation Directorate, he is a graduate of the University of Texas, El Paso, and has worked five years at WSMR.

"Although tele-lecturing is not as effective as having an instructor teaching directly," one student said, "the method has proved itself as an acceptable substitute."

Tele-lecturing is especially suitable for graduate study in that it can be used for as few as five students, compared to 15 generally required for resident instruction.

Another advantage is the availability of notes and formulas exactly as the instructor uses them. Because of the remote delivery, both instructor and students appear to put forth more effort.

Dr. Daw said, as teaching demands increased on the main campus at Las Cruces, it became progressively difficult to allow faculty members the time required to travel and teach at White Sands twice a week.

"In presenting a tele-lecture," he commented, "the instructor has all his resources readily available, including notes, outlines and texts. Should he refer to any of these while lecturing, he doesn't distract students on the receiving end, because they see only the illustrative material he decides to transmit via tele-writing.

"The combination of overhead projections and audio instruction in the receiving location allows for a more expansive kind of teaching."

WRAIR Scientists Give Snake Study Results

Poisonous snakes of Southeast Asia are more potent than those indigenous to the United States, scientists at Walter Reed Army Institute of Research (WRAIR), Washington, D.C., have reported following a recent study.

Research was conducted by Maj James A. Vick and Capt Clifford R. Roberts of the WRAIR Department of Pharmacology, and Dr. Melvin H. Heiffer, chief of Pharmacology. Maj Vick reported the findings at the annual meeting of the Federation of American Societies for Experimental Biology at Atlantic City, N.J.

Venoms representing the four major families of poisonous snakes were given intravenously and intramuscularly to anesthetized and unanesthetized mice, adult mongrel dogs and monkeys. Lethal dosage of each venom is not significantly affected by either route of injection for anesthesia, it was found.

Although poisonous snakes do not present a serious danger to U.S. troops in Southeast Asia, the study provided the information necessary for scientists to produce an antidote to certain snake venoms. The most potent venoms are secreted by krait, cobra, coral and sea snakes, all indigenous to Southeast Asia. The less potent snakes are copperhead, cottonmouth and certain rattlesnakes.

Pharmacological data collected indicates that lethal doses of venom produce a decrease in heart rate, a fall in blood pressure and depression of respiration. Artificial ventilation prolonged survival but did not prevent death.

Scenes at 1968 Army Science Conference

SOCIAL HOUR gave the ladies and their husbands an opportunity to meet with old friends and make new ones. Assembled (l. to r.) are Mrs. and Brig Gen Charles D. Y. Ostrom Jr., Director of Army Research, Office of the Chief of Research and Development (OCRD); Mrs. and Lt Gen A. W. Betts, Chief of R&D; Mrs. and Dr. Russell D. O'Neal, Assistant Secretary of the Army (R&D); and Mrs. and Dr. Kenneth E. Clark, dean of the College of Arts and Sciences, University of Rochester, and chairman of Army Science Conference panel.

AMONG FOREIGN NATION participants were (from left) Dr. Henry Wilson, chief scientist, British Army; Brigadier Sir F. G. L. Coates, Director of Munitions (R&D), British Embassy Staff, Washington, D.C.; Col H. Edward C. Price, Assistant Canadian Military Attache (Army), Washington, D.C.; Richard P. Blake, deputy chief, Canadian Defense Research Staff.

"SOCK IT TO ME" seems to express this discourse shared by (l. to r.) Dr. William Van Royen, Army Research Office-Durham, N.C.; Dr. Leonard S. Wilson, Army Research Office, OCRD; Dr. Ralph G. H. Siu, Army Materiel Command; Wilbur S. Hinman, Jr., chairman, Scientific Advisory Committee, Harry Diamond Laboratories, Washington, D.C.; and Dr. Andrew Assur, chief scientist, Cold Regions Research and Engineering Laboratory, United States Army, Hanover, N.H.

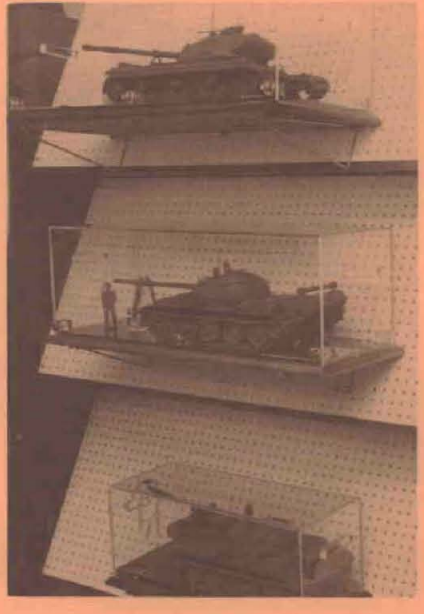
SHARING A RELAXING MOMENT are (l. to r.) Lee Taylor, Army Materiel Command; Carrol H. Staley, HQ Munitions Command, Dover, N.J.; Dr. Hamed M. El Bisi, Natick (Mass.) Laboratories; Dr. Galen R. Frysinger, Electronics Command (ECOM), Fort Monmouth, N.J.; and Kenneth M. Barnett, ECOM.

CORPS OF ENGINEERS representatives Fred P. Brown, Waterways Experiment Station (WES), Vicksburg, Miss.; Mrs. and Mr. Jerry W. Woodward, Engineer District, Galveston, Tex.; and James M. Polatty, WES.

JUST WHAT Billy M. Horton, technical director of the Harry Diamond Laboratories, Washington, D.C., was pointing out remains a mystery. At left is Willie L. Doxey, director, Research and Development, Electronics Command, flanked by Richard Trainor, director, Weapons Systems Analysis, Office, Assistant Vice Chief of Staff.

PACIFICATION PANEL which discussed the methodology of the U.S. Army Pacification Program in Vietnam consisted of (l. to r.) Col Thomas Huddleston, Office, Deputy Chief of Staff for Operations (ODCSOPS); Dr. Michael C. Conley, Center for Research in Social Systems, American University; Brig Gen William R. Desobry, ODCSOPS. Standing, Lt Col R. Bukoski, ODCSOPS; Dr. Kenneth B. Clark (moderator), University of Rochester; Dr. Gerald C. Hickey, RAND Corp.; Dr. Ithiel de Sola Pool, Massachusetts Institute of Technology.

MEDICAL PANEL DISCUSSION provided an insight into the phenomenal success of U.S. Army medical evacuation procedures and treatment which are saving lives of seriously wounded in Vietnam. Members were (l. to r.) Col Robert M. Hardaway, commander, 97th General Hospital, Frankfurt, Germany; Brig Gen James A. Weir, CG, William Beaumont General Hospital, El Paso, Tex.; Col Donald L. Howie (moderator), chief, Life Sciences Division, Army Research Office; Dr. David Jacobus, Walter Reed Army Institute of Research, Washington, D.C.



DISPLAYS OF FOREIGN EQUIPMENT and weapons attracted many conference participants. Observing Chinese field radios are (from left) James C. Williams, White Sands Missile Range (WSMR), N. Mex.; Thomas Carrera, WSMR; Tony Castelnovo, Behavioral Sciences Research Laboratory, Washington, D.C.; Stephen Doherty, Army Materials and Mechanics Research Command, Watertown, Mass.; John P. Kingman, Army Foreign Science and Technology Center, Washington, D.C.

Dignitaries at 1968 Army Science Conference

AMONG PRINCIPALS who attended the 1968 Army Science Conference (left to right) are Dr. Richard A. Weiss, Deputy and Scientific Director, U.S. Army Research Office, Office of the Chief of Research and Development (OCRD); Lt Gen A. W. Betts, Chief of Research and Development; Dr. William G. McMillan, science adviser, U.S. Military Assistance Command, Vietnam; Brig Gen John R. Jannarone, Dean of the Academic Board, U.S. Military Academy; Brig Gen Charles D. Y. Ostrom Jr., Director of Army Research.

Brig Gen James A. Wier (left), CG, William Beaumont General Hospital, El Paso, Tex., and Brig Gen Felix J. Gerace, CG, Army Natick Laboratories.

COFFEE BREAKS provided a time for many earnest conversations and exchanges of pleasantries. Shown (l. to r.) are Dr. E. J. Baldes, Army Research Unit, Fort Rucker, Ala.; John H. Thompson, Edgewood Arsenal, Md.; Dr. Alexander Hammer, Science and Technology Labs, Weapons Command (WECOM), Rock Island Arsenal, Ill.; Dr. Thomas E. Davidson, Physical and Mechanics Metallurgy Systems Lab, Watervliet Arsenal, N.Y.; Leonard Ambrosini, WECOM.

SESSION B CHAIRMEN included (from left) Lewis L. Gober, Mobility Equipment Command (MECOM), St. Louis, Mo.; Aldred W. Rogers, Electronics Command (ECOM), Fort Monmouth, N.J.; Benjamin S. Goodwin, Test and Evaluation Command (TECOM), Aberdeen (Md.) Proving Ground (APG); Dr. I. R. Hershner Jr., OCRD; Dr. R. J. Eichelberger, Ballistic Research Laboratories (BRL), APG; Dr. J. V. Richard Kaufman, Munitions Command (MUCOM), Dover, N.J.

Col (Dr.) John E. Canham (left) commanding officer, Medical Research and Nutrition Laboratory, Denver, Colo., chats with Col Edward M. Hudak, chief, Education and Training (R&D), Headquarters United States Continental Army Command, Fort Monroe, Va.