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1970 R&D Achievement Awards Recognize Record Total of 52

Picatinny Team Wins 6 Siple Medallions

Prestigious recognition of the best technical paper presented at the U.S. Army Science Conference achieved an all-time peak with the award of the first Dr. Paul Allman Siple Medallion, memorializing the Army world-famed cold regions explorer and scientific adviser, at the 1970 conference.

In the United States Military Academy's Thayer Hall, Assistant Secretary of the Army for Research and Development Robert L. Johnson joined June 19 with Mrs. Paul Siple, the explorer's widow, in presenting the Siple Medallion to a 6-man team of researchers at Picatinny Arsenal, Dover, N.J. Mrs. Siple also was honored with the medallion.

Emphasized during the presentation was that the medallion memorializes Dr. Siple as an Army civilian scientist of outstanding stature from 1946 until his death in November 1968—in addition to his illustrious career as an explorer and scientific leader with Adm Byrd on several expeditions and during the International Geophysical Year program in the Antarctic.

Accepting the award on behalf of the Picatinny team were Dr. Samuel F. Trevino and Dr. Henry J. Prask. With Dr. Chang S. Choi, Dr. Zafar Iqbal, Dr. Krishnarao R. Rao and Richard D. Mical, they coauthored a paper titled "Structure and Lattice Dynamics of Metal Azides and Their Relationship to Stability." All are recognized experts in explosives research.

In addition to the Siple Medallion, they shared a $1,000 honorarium provided through the Army Incentive

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R&D Leaders Observe CIDS Demonstration

Proved pilot system capabilities of the U.S. Army Chemical Information and Data System (CIDS) were demonstrated recently to research and development leaders in the Pentagon, Washington, D.C., and earlier to the Educators' Conference of the National Academy of Sciences.

Representatives of the Department of Defense, Office of the Chief of R&D, HQ DA, and the Army Materiel Command observed as CIDS performed typical searches for specified

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Featured in This Issue . . .

DR. PAUL A. SIPLE MEMORIAL MEDALLIONS were presented for the first time at the Army Science Conference to Dr. Siple's widow and to a Picatinny Arsenal team of 6 researchers for the best paper presented at the conference. From left are Army Chief of R&D Lt Gen A. W. Betts, Dr. Samuel F. Trevino of Picatinny Arsenal; Mrs. Ruth Siple; Dr. Henry Prask of Picatinny; and Assistant Secretary of the Army (R&D) Robert L. Johnson. Absent medallion winners at time of this picture are Dr. C. S. Choi, Dr. Z. Iqbal, R. D. Mical and Dr. K. R. Rao.

Fifty-two persons, including 31 members of nine teams, will receive 1970 U.S. Army Research and Development Achievement Awards in coming weeks, thereby establishing records for in-house RDT&E since the awards began in 1961.

Chief of Research and Development Lt Gen A. W. Betts will continue the policy he established in 1967 of presenting awards to the winners during visits to each installation. Each award consists of a lapel pin and an appropriately engraved wall plaque.

Criteria for the award require that nominees be directly responsible for a significant scientific or engineering accomplishment that:

- Establishes a scientific basis for subsequent technical improvements of military importance and/or;
- Materially improves the Army's technical capability and/or;
- Contributes materially to the national welfare.

Nominations of candidates are submitted by each of the major commands engaged in R&D activities. Senior scientists in each command review reports, thereby reducing the

(*Continued on page 4*)

STANO Division Monitors 55 Developmental Tasks

Indicative of the accelerated pace of activities in the Surveillance, Target Acquisition and Night Observation (STANO) Division, since it was established in the Office of the Chief of Research and Development in November 1969, is its present monitorship of 55 developmental projects.

Appointment of a STANO systems manager was announced in July 1969, leading to the creation of the STANO Division from the nucleus of the former Southeast Asia Division, OCRD Directorate of Developments.

STANO projects were thus structured in a cohesive and visible program with respect to research, development, test, evaluation and budget activities.

Special management for STANO originated from Army Chief of Staff General Westmoreland's concern that firepower and mobility had out-

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Army R&D Newsmagazine

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

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

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Packard Outlines Weapon Systems Acquisition Policy

Policy guidance on major weapon system acquisition was delineated by Deputy Secretary of Defense David Packard in a recent memorandum to federal agencies concerned and at a follow-up press briefing in which he reemphasized the important role of project managers.

"The prime objective of the new policy guidance," the memorandum states, "is to enable the Services to improve their management of programs. Improvement in the execution of these programs will be made to the extent the Services are willing and able to improve their management practices. The Services have the responsibility to get the job done. It is imperative that they do the job better in the future than it has been done in the past.

David Packard
Deputy Secretary of Defense

"It is the responsibility of the Office of the Secretary of Defense to *approve* the policies which the Services are to follow, to *evaluate* the performances of the Services in implementing the approved policies, and to make decisions on proceeding into the next phase in each major acquisition program. . . ."

Secretary Packard told the press that project managers for major weapon systems [the Army Materiel Command has a total of 42 PMs] must be given "more responsibility and more authority . . . the opportunity to use some judgment on these programs." He stressed, however, that there must be a "balance" between a "free rein" and logical control.

The new policy, he emphasized, will encourage more engineering design and component testing in the conceptual phase, prior to full-scale production. Use of this approach, he said, has indicated that "it does reduce the risks." With respect to the development process, he said the policy calls for establishment of milestones of control—"the key things that need to be done before you move on to the next stage."

Except for an introduction stating its purpose, the memorandum to the Service Secretaries follows:

* * *

Management in the Services will be improved only to the extent that capable people with the right kind of experience and training are designated to manage these major programs—in fact all programs.

In order to be effective, program managers must be given adequate authority to make decisions on major questions relating to the program both in the conceptual development stage and in the full-scale development stage.

If capable people are going to be willing to undertake these important program management assignments, ways must be found to give them some incentive to do so. Program managers must be given more recognition toward career advancement in all of the Services, and good managers must be rewarded just as good operational people are rewarded.

If our people are to develop the experience necessary for program management and are to utilize their experience, they must be assigned to a given program long enough to be effective.

The overall structure of the program management function in all Services needs to be considered. Changes must be made to minimize the numerous layers of authority between the program manager and the Service Secretary.

The entire management problem needs to be addressed under these simple guidelines: put more capable people into program management, give them the responsibility *and the authority* and keep them there long enough to get the job done right.

Development. The cost of developing and acquiring new weapon systems is more dependent upon making practical trade-offs between the stated operating requirements and engineering design than upon any other factor. This must be the key consideration at every step in development from the conceptual stage until the new weapon goes into the force.

The program schedule (structure) is another very key consideration. It must make sense. It must allow time for accomplishing important task objectives without unnecessary overlapping or concurrency. The ideal schedule is sequential with enough slack time for resolution of those problems which inevitably arise in any development program.

Conceptual Development. It is crucial that the right decisions be

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STANO Division Monitors 55 Accelerated Developmental Tasks

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stripped capabilities for finding the enemy in the Southeast Asia environment.

Headed since January by Col J. B. Love, who is scheduled to be succeeded in August by Lt Col W. J. Livsey, STANO Division consists of a STANO Branch and a Critical Projects Branch. Staff officers are Lt Col R. J. Cottey, Infantry; Lt Col C. J. Odekirk, Field Artillery; Lt Col J. R. Hay, Lt Col C. G. Herrmann and Maj D. A. Roberts, Signal Corps; Maj G. W. Williams and Maj J. E. Schaefer, Ordnance Corps.

Major STANO development programs exist in night vision, aerial surveillance, ground surveillance, target acquisition radars, and unattended ground sensors. Second-generation NV devices are being sent to Vietnam for evaluation.

Several aerial surveillance systems using image intensification, infrared and low-light-level television are nearing completion and evaluation in the United States and in Vietnam.

Two ground surveillance radar development programs were initiated recently to provide combat units with improved moving target locating capability. One of the developments is a lightweight, man-transportable company and platoon level radar (AN/PPS–15) using state-of-the-art miniaturized and integrated circuitry.

The second development is a long-range surveillance radar (AN/TPS–58) that will provide moving target data to field artillery units.

Development of ground target acquisition radars for enemy weapons location is progressing with two systems. The 360-degree mortar-locating radar, AN/TPQ–28, is nearing completion and is presently undergoing extensive testing at Aberdeen (Md.) Proving Ground.

The counter battery radar development program to detect and locate enemy rockets and artillery weapons has been initiated and will take advantage of developed technology in phased-array antennas.

Considerable progress has been made in the investigation of the Army's requirement for an unattended ground sensor system. Alternatives are being examined for developing and fielding a system called the Remotely Monitored Battlefield Area Sensor System (REMBASS). During Fiscal Year 1971, future program direction for unattended ground sensors will be determined.

In January, Chief of R&D Lt Gen A. W. Betts approved a change of name and mission for the U.S. Army Limited War Laboratory at Aberdeen Proving Ground. With its new name, the Land Warfare Laboratory retains the familiar abbreviation of "LWL." STANO Division monitors the LWL program.

LWL's new mission no longer restricts the laboratory's R&D efforts to a limited war environment only, but provides for a specialized quick-reaction R&D capability for needs of the Army in its general mission.

The STANO Division is the OCRD monitoring office for the Expedited Non-Standard Urgent Requirement for Equipment (ENSURE) program and Priority Research and Development Objectives for Vietnam Operations Support (PROVOST).

In addition, the division monitors ARPA projects of interest to the Army. A major on-going ARPA project is the Small Independent Action Forces (SIAF) program. SIAF is an effort to improve the over-all effectiveness of small Infantry elements on independent combat operations. Numerous studies and hardware development projects are included in the SIAF effort.

What about the future? The STANO Division is striving to insure that the Army of the late seventies and beyond has the surveillance and target acquisition capability to optimize ever-increasing firepower and mobility.

The immediate goal is to satisfy the surveillance and target acquisition needs of the combat forces in SEA. All this must be done in the face of the tightening budgetary constraints. The tactical radars program is progressing. The new counterbattery radar program will provide equipment to fill an unacceptable gap. The unattended ground sensor system offers a good chance for maximum surveillance with significant manpower reductions.

Col Livsey said a major problem will be a sifting of the several aerial surveillance systems to provide the optimum mix of airborne platforms for combat units of the future. Survivability on future battlefields will be a major factor in equipment and organizational design.

The men who use the Army's equipment in 1980, he said, will be able to tell best how STANO Division is doing today's job.

Report Claims Ultrasound Therapy Eases Pain

Ultrasound, acoustic vibrations inaudible to the human ear, is reported to have helped relieve certain types of pain in experimental treatment of patients at the U.S. Army Hospital in Heidelberg, Germany.

Maj (Dr.) Calvin P. Claxton Jr., a physician in the hospital's Department of Surgery, and Capt Thomas D. Jones Jr., a physical therapist, state that pain was significantly reduced in 7 of 10 patients. Their findings were reported in a paper delivered at a recent U.S. Army European medical conference.

Ultrasound therapy is said to be most effective when the pain is localized and superficial, involving the skin, subcutaneous superficial muscle or other superficial tissues. Emphasized is that other forms of therapy should also be used, including psychotherapy and exercise therapy when required.

Ultrasound vibrations used seven to eight minutes daily for one to two weeks were particularly effective when the pain emanated from hypertrophic scars and scar contractures.

The treatment is reported less effective when the pain involves large areas of the body, or multiple "trigger points."

Mrs. Robert J. Thomas receives Meritorious Service Medal awarded to her husband posthumously for service as chief, Critical Projects Branch, Surveillance, Target Acquisition, Night Observation (STANO) Division, OCRD. Col Thomas was killed in Vietnam in a helicopter crash on orientation flight prior to assuming command of a battalion of the Americal Division. Chief of R&D Lt Gen A. W. Betts presents the award.

1970 R&D Achievement Awards Recognize Record Total of 52

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number of entries before they are considered by a HQ DA panel of judges representing each of the major scientific disciplines.

Selection of this year's 52 winners was made by an 8-man panel of Office of the Chief of R&D (OCRD) judges, headed by Deputy and Scientific Director of Army Research Dr. Richard A. Weiss.

Others are Dr. Ivan R. Hershner Jr., chief of the Physical and Engineering Sciences Division, U.S. Army Research Office (USARO); Dr. Carl Lamanna, deputy chief, Life Sciences Division, USARO; Colonel Albert L. Romaneski, deputy chief, Environmental Sciences Division, USARO; Maj Carl Herrmann, Directorate of Developments; Lt Col Peter D. Borras, Directorate of Missiles and Space; Paul Turner, Directorate of Plans and Programs; and Lt Col Elwood A. Lloyd, Directorate of Advanced Ballistic Missile Defense.

The 1970 awards indicate the diversity and depth of research, development, test and evaluation conducted at Army in-house laboratories and installations of the Army Materiel Command, Office of the Chief of Engineers, Office of the Chief of R&D, and Office of the Surgeon General.

A brief description of the accomplishments and listing of installations at which winners are employed follows.

ARMY MATERIEL COMMAND—Harry Diamond Laboratories (HDL), Washington, D.C. An individual and two team awards will honor 10 HDL employes for accomplishments in an automated testing procedure for a proximity fuze, invention and development of an electronic heart monitor, and for solution of problems associated with nuclear effects on Army weapon systems.

Raymond J. Baker and *David J. Buscher*, electronic engineers, *Roger P. Chase* and *John A. Frantz*, physicists, and *Donald A. Link*, mathematician, originated the concept, programed the computer and worked on every developmental phase of a high-speed automated tester to be used with the first automated proximity fuze production line in the U.S.

According to the recommendation for the R&D award, the success of the entire XM596 fuze program was as dependent upon this low-cost, high-speed testing technique as on any other facet of the production system. It reportedly reduces significantly the risks of obtaining even lower-cost, higher-rate electronic fuzes for 30mm and 20mm rounds under consideration.

R&D Achievement Award winners for team effort at U.S. Army Topographic Command include (from left) Robert H. Nichols, Frederick M. Gloeckler Jr., John G. Armistead, Richard T. Malone, G. W. Bunch, Walter E. Simpson Jr.

Charles W. Ragsdale, an electronics engineer in the HDL Fluidic Systems Development Branch, is credited with invention and development of an electronic device that monitors electrical activity of the heart. It sounds an alarm when certain conditions exist, giving advance warning to permit proper medical measures.

Designed for use in stateside hospitals or in the field where a compact, rugged device is required, the portable, battery-operated unit is the only device known to have the capability of diagnosing a high or low heart-beat rate, excessive electrical noise, cardiac arrest or ventricular fibrillation.

Other important devices utilizing the unique concept of Ragsdale's heart monitor signal processing system are being developed. These include an audio heart monitor, a cardiac programer, and a premature ventricular contractions recognition system.

John E. Tompkins, John A. Rosado, William L. Vault and *Raine M. Gilbert* were selected to receive R&D Achievement Awards for their initiative in solving a major problem associated with nuclear effects on Army weapons systems.

The citation states that they "conducted both computer-based analysis involving modeling of the radiation phenomena and the confirming experiments at the Nuclear Test Site in Nevada.

"Their contribution has established a scientific basis for design consideration in major weapon systems, which materially improves their potential ability to survive in a nuclear environment."

U.S. Army Natick Laboratories (NLABS), Natick, Mass. *Gregory DeSantis* conducted a comprehensive study using wind-tunnel models and novel instrumentation techniques to develop knowledge of the relationship of the flow field to the dynamics of parachute inflation.

Seven models representing various stages of parachute inflation were studied over a range of velocities in a wind tunnel. The novel application of a hot-wire anemometer system to obtain the flow characteristics was paramount in the production of useful data.

Use of conventional pitot tubes or survey rakes would not have enabled measurement of the extremely low values of velocity that were encountered in the experiment. Data acquired are expected to enable a more accurate prediction of parachute loads, filling times and trajectories.

DeSantis serves as principal aerospace research engineer and technical specialist and adviser for materials and structures at the Natick Labs. He reported on the results of his work at the recent Army Science Conference (see page 58 for an abstract of his paper titled "The Internal and External Flow Field Associated With Parachutes During Inflation").

U.S. Army Aberdeen Research and Development Cener (AARDC), Aberdeen Proving Ground (APG), Md. Four individual awards and a 2-man team award go to AARDC employes.

Bryant R. Dunetz was selected for his efforts associated with a high-priority DoD program involved in extensive testing and evaluation.

Dunetz is chief of the Target Analysis Group, Vulnerability Laboratory,

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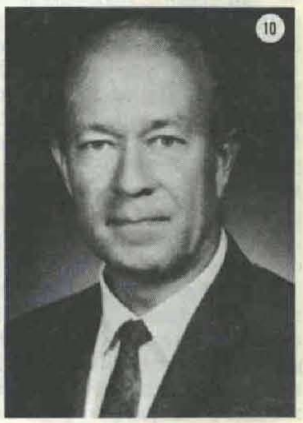
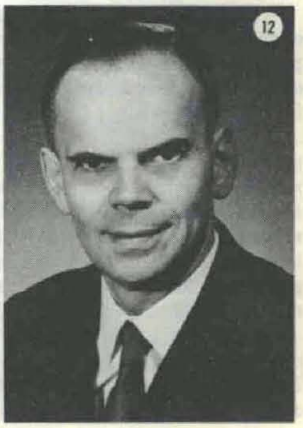


R&D Achievement Award Winners

(1) Dr. Angel A. Baldini, *U.S. Army Topographic Command, Washington, D.C.* (2) Dr. Henry Gisser, *U.S. Army Munitions Command (MUCOM), Dover, N.J.* (3) Harold C. Baumann, *MUCOM.* (4) Bransby W. Bushey, *MUCOM.* (5) Forrest C. Burns, Mrs. Grace L. Priest and Dr. Homer F. Priest, *U.S. Army Materials Research Center, Watertown, Mass.* (6) John N. Strange, *U.S. Army Waterways Experiment Station (WES), Vicksburg, Miss.* (7) William J. Flathau, *WES.* (8) Joseph Kervitsky, Marilyn A. Jasper, William A. Gutierrez and Dr. Hans D. Pommerrenig, *U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J.* (9) Samuel Stiber, *ECOM.* (10) Dr. Friedrich H. Reder, *ECOM.* (11) William Fishbein, *ECOM.* (12) Otto E. Rittenbach, *ECOM.*



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Ballistic Research Laboratory (BRL) at APG. He has been "keenly alert to the Army's needs for vulnerability information, and has done much to advance the knowledge and scientific approach to the solution of these complex problems."

Sixteen major tasks were incorporated in the program as a result of his "direct influence and personal effort." The notable contributions to the program, for which he is cited, made it possible to collect quantitative data on important target equipment and munitions which can be applied to design, development and assessment.

Dr. John Frasier, chief of the Solid Mechanics Branch, Terminal Ballistics Laboratory, BRL, was commended for outstanding contributions in the field of solid mechanics. He was cited for developing "a complex rationale that allows design of specialized stabilized shells significant to defense of our country."

Dr. Frasier was one of the first to recognize the importance of target material strength on response of targets to hypervelocity impact. This has resulted in a major advance in understanding of target penetration phenomena.

His research provides an improved basis for design of better weapons and material through a knowledge of deformation of target and penetration under the impulsive loading occurring on impact.

Dr. Franklin E. Niles, a senior project leader in the Signature and Propagation Laboratory, BRL, was selected for developing an extensive computer code of the chemistry of the lower ionosphere.

Named AIRCHEM, the code improves the Army's technical capability to evaluate planners' predictions on how communications systems, radars and other systems will operate in the lower ionosphere.

AIRCHEM also is being used to coordinate Army efforts in ionospheric probes and laboratory measurements of reactions of importance in the ionosphere.

Dr. Joseph H. Spurk was cited for pioneering studies of gas dynamics which have made possible the rational analysis of the gas cycle of the M–16 rifle. His research computations establish a "clear procedure for systems engineering of a broad class of automatic weapons."

Dr. Spurk is chief of the Fluid Dynamics Branch, Exterior Ballistics Laboratory, BRL, and recognized as one of the Army's leading authorities in the field of theoretical and experimental research in fluid dynamics and aerodynamics.

Dr. David C. Hodge and *Georges R. Garinther* were chosen for research and application efforts at the Human Engineering Laboratories (HEL), APG. The citation states they "have achieved a position of international leadership in development of weapon noise design criteria and hearing damage-risk criteria."

Noise specifications which they developed have been embodied in Military Standard 1472 and Military Specification 46855, Human Engineering Requirements for Military Systems, Equipment and Facilities.

Results of their work have been utilized widely by Army development agencies, their contractors, and other DoD agencies. The noise criteria are being considered for use as international standards.

Dr. Hodge serves as a research team leader in the HEL Behavioral Research Laboratory and Garinther is senior engineer in the HEL Engineering Research Lab.

U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, Mass. Three AMMRC employes cooperated as a team to establish a scientific basis for a "new 100 percent nondestructive system" for quality inspection of pellet weight in M34 primers.

Credited with development of the system are *Forrest C. Burns*, a chemist in the Nuclear Reactor Division; *Mrs. Grace L. Priest*, a physical chemist, Materials Science Division; and *Dr. Homer F. Priest*, a supervisory physical chemist, Materials Sciences Division, all with the Materials Research Laboratory.

The system reportedly advances the state-of-the-art in the application of a sophisticated neutron activation analysis and in high-rate inspection of components.

Adoption of the inspection system, the citation states, could result in improved reliability of the Minigun by minimizing a number of cartridge hangfires caused by lightweight pellets in the M34 primer. Visual spot checking, rather than 100 percent testing, is the current usual procedure for inspection of more than 10 million M34 primers per day.

U.S. Army Aeronautical Research Laboratory (AARL), Ames Research Center, Moffett Field, Calif. *Dr. William J. McCroskey*, research scientist, was cited as "directly responsible for significant achievements in rotary-wing boundary-layer research," by developing basic understanding of the viscous phenomena that limit performance and efficiency of existing and potential flight vehicles.

R&D ACHIEVEMENT AWARD WINNERS James W. Walker and Thelma C. Robinson, U.S. Army Topographic Command, Washington, D.C.

Dr. McCroskey's research at AARL has contributed to "a thorough understanding of the phenomena associated with hovering flight and the laminar boundary layer and is progressing toward the even more important understanding of the flow in forward flight and turbulent boundary layers."

U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J. Two individual awards, a 2-man team award and a 4-man team award honored ECOM employes for their work on radar improvements, image intensification technology, analysis of VLF propagation phenomena, and electronic intelligence.

William Fishbein, research physical scientist, and *Otto E. Rittenbach*, electronics engineer, were cited for their pioneering work in the areas of continuous wave correlation radar, balanced signal processing techniques for MTI radar, and adaptive filter techniques for MTI radar.

They developed and built "one of the first successful MTI radars using the correlation technique that is in wide use by industry and is the basis of a foreign radar developed under a Mutual Weapons Program." The AN/PPS–9, which may become the standard Army lightweight radar, uses the technique.

The team is credited with developing the first practical electronic balanced processing technique currently used in most MTI radars under development or proposed for development. Adaptive filters, for which this team has the basic patent, are used for clut-

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R&D Achievement Award Winners

(1) Alfred P. Feldman, *Walter Reed Army Institute of Research, Washington, D.C.* (2) Ben F. Wilson, *U.S. Army Missile Command, Redstone Arsenal, Ala.* (3) Guenther E. Frankenstein, *U.S. Army Cold Regions Research and Engineering Laboratories, Hanover, N.H.* (4) Dr. William J. McCroskey, *U.S. Army Aeronautical Research Laboratory, Ames Research Center, Moffett Field, Calif.* (5) Robert J. Iverson, James W. McGarvey and George E. Van Damme, *U.S. Army Weapons Command, Rock Island Arsenal, Ill.* (6) Raine M. Gilbert, John E. Tompkins, John A. Rosado and William L. Vault, *Harry Diamond Laboratories (HDL), Washington, D.C.* (7) Raymond J. Baker, *HDL.* (8) Donald A. Link, *HDL.* (9) David J. Buscher, *HDL.* (10) John A. Frantz, *HDL.* (11) Roger P. Chase, *HDL.* (12) Charles W. Ragsdale, HDL.

1970 R&D Achievement Awards Recognize Record Total of 52

(*Continued from page 6*)

ter suppression and automatic alarm in MTI radars, and are found in most modern radars of this type.

Dr. Hans D. Pommerrenig, William A. Gutierrez, Joseph Kervitsky and *Marilyn A. Jasper,* Materials Research Team, Image Intensification Technical Area, Night Vision Laboratory, ECOM facility at Fort Belvoir, Va., are credited with accomplishing a major breakthrough in third-generation image intensification materials technology.

The citation says their "outstanding creativeness, initiative and technical competence . . . have provided the foundations for a quantum jump improvement in the Army's night vision capabilities under all field operating conditions."

Dr. Friedrich H. Reder, chief of the Geophysical Effects on Communications Research, Institute of Exploratory Research, was recognized for his achievements in "analysis of VLF propagation phenomena." He was recommended especially for detecting and monitoring Polar-Cap Absorption phenomena, in contributing to better understanding of the physics of the lower ionosphere, and in R&D of atomic clocks.

"These achievements," the citation states, "materially improve the Army's capability in such diverse fields as high-precision frequency and time control at communications and calibration centers, long-range navigation, air-traffic control, long-baseline surveillance systems, HF propagation forecasting in polar regions, and nuclear-radiation effects on the ionosphere."

Samuel Stiber was selected for providing the U.S. Army with a technical feasibility of performing operations in intelligence gathering through initiation of several novel electronic concepts.

Stiber, a supervisory electronic engineer in the Supporting Developments Technical Area, Electronic Warfare Laboratory, presented a paper at the 1970 Army Science Conference. See page 64 for an abstract of the paper, coauthored with G. Haber, "Feasibility Study, RF Detonation of Command Detonated and Pressure-Electric Mine."

U.S. Army Missile Command (MICOM), Redstone Arsenal, Ala. *Ben F. Wilson* will receive an R&D Achievement Award for his investigations in the field of liquid propulsion as chemical engineer in the Liquid Propulsion Technology Branch, Army

R&D ACHIEVEMENT Award winners from the Aberdeen (Md.) R&D Center. (1) Dr. Franklin E. Niles. (2) Dr. Joseph H. Spurk. (3) Bryant R. Dunetz. (4) Dr. John Frasier. (5) Georges R. Garinther. (6) Dr. David C. Hodge.

Propulsion Laboratory and Center. He is recognized for substantially advancing a program on the ignition of hybrid propellants and performing an experimental evaluation of a deep throttling engine with a mechanical variable injector.

He has represented the Army for four years on the steering committee of the Joint Army-Navy-NASA-Air Force Performance Standardization Working Group. This group is acclaimed for significant contributions to standardization of performance calculations and evaluation for liquid propulsion engines.

U.S. Army Weapons Command (WECOM), Rock Island, Ill. *James W. McGarvey, George E. Van Damme* and *Robert J. Iversen,* Science and Technology Laboratory, developed new high-speed-scanning, infrared temperature-mapping instrumentation. Their techniques are used for remote noncontact measurement of operational temperatures of stationary, rotating or reciprocating gun barrels.

The methods reportedly have resulted in very significant improvements in speed, accuracy and reliability of gun barrel temperature-mapping, and have provided gun barrel design engineers with valuable information formerly unavailable. The method effectively remedies disadvantages of conventional thermocouples and can be practically applied to many areas of weapons research and development.

U.S. Army Mobility Equipment Command (MECOM), St. Louis, Mo. *William T. Wyatt Jr.* was commended for results of research involving the complex phenomenon associated with generation of the electromagnetic pulse (EMP) nuclear weapon effect by high-altitude explosions.

Wyatt is employed in the Physics Division, Electromagnetic Effects Laboratory, Mobility Equipment R&D Center (MERDC), Fort Belvoir, Va.

He established a theory for calculating the EMP from nuclear detonations (as developed in the early 1960s by scientists at the Los Alamos Scientific Laboratory and the Rand Corp.). The method has been implemented and improved by additional and more

exact physical models and by numerical integration schemes.

Edward A. Gillis, acting chief, Power Sources Branch, Advanced Development Division, Electrotechnology Laboratory, MERDC, was selected for an Army R&D Achievement Award in recognition of his conception and development of the Open-Cycle Fuel Cell for electric power generation.

The concept has been hailed as possessing the "greatest potential of any known fuel cell system to provide a practical family of logistically-fueled fuel cell power sources for tactical military use." His results are said to have "opened doors for development of electric power generators of unprecedented military advantage."

U.S. Army Munitions Command (MUCOM), Dover, N.J. *Bransby W. Bushey* was selected for an R&D Achievement Award for outstanding contributions in related areas of weapons design and production technology. He is chief of the Artillery Ammunition Laboratory, Ammunition Development and Engineering Laboratories, Frankford (Pa.) Arsenal.

The citation places particular significance on his efforts in successfully combining an advanced artillery carrier design with capacity increase ranging from 44 percent to 77 percent. Meanwhile he established an optimum design approach for future high-capacity carriers for complete families of ballistically matched ammunition.

Dr. Henry Gisser, Pitman-Dunn Research Laboratories, Frankford Arsenal, was selected for contributions to polymer and surface science and exceptional results as director of the Chemical Research Laboratory.

The citation notes that his successful polymerization of the a-alkylstyrenes and studies of friction and wear behavior of adsorbed polymer films on solid surfaces "have valuable applications to the fluids and lubricants technologies, leading to materials important for military and civilian needs."

Harold C. Baumann, an electronic engineer in the Ammunition Engineering Directorate, Picatinny Arsenal, Dover, N.J., was selected for his conception and feasibility demonstration of a unique and effective personnel intrusion detection system. His work established the basis for large-scale development and production programs. Deployed recently in Southeast Asia, the system reportedly has materially improved the Army's capability to detect enemy troop movements.

OFFICE, CHIEF OF ENGINEERS—U.S. Army Topographic Command (TOPOCOM), Washington, D.C. Nine employes were adjudged deserving of R&D Achievement Awards for scientific investigations at HQ TOPOCOM and at the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, Va.

A 6-man USAETL team was acclaimed for achievements in development of the Sequential Collation of Range (SECOR) System and launch of 11 satellite payloads. Their R&D support permitted continuous operation of the system in all-weather, day-night conditions. They are credited with achieving a precise geodetic network between continents and islands.

A belt of geodetic control, the first of its kind to encircle the earth, has been successfully completed. Data accumulated during this worldwide operation reportedly permit an improved determination of the size and shape of the earth.

Team members are *John G. Armistead, Richard T. Malone* and *Frederick M. Gloeckler Jr.*, electronic engineers; *Robert H. Nichols, Walter E. Simpson Jr.* and *G. W. Bunch*, electronic technicians; all with USAETL Surveying and Geodesy Division.

Dr. Angel A. Baldini, a research geodesist with the Research Institute, USAETL, was recognized for developing a unique series of independent geometrical solutions to the problem of finding the exact center of mass of the earth to an accuracy far exceeding previous solutions.

Establishment of this point, to which all the constructions of mapping, geodesy, long-range ballistics and orbital theory can be referred, has given a new order of accuracy to all these disciplines, the citation states.

One of Dr. Baldini's significant contributions is the introduction of equations of condition to the problem of 3-dimensional location. This new concept has potential application in many areas related to geodesy and astronomy.

TOPOCOM mathematicians *James W. Walker* and *Thelma C. Robinson* were selected for contributions to development of a routine for overprinting LCRAN (LOng RAnge Navigation) grids on large-scale maps of Southeast Asia.

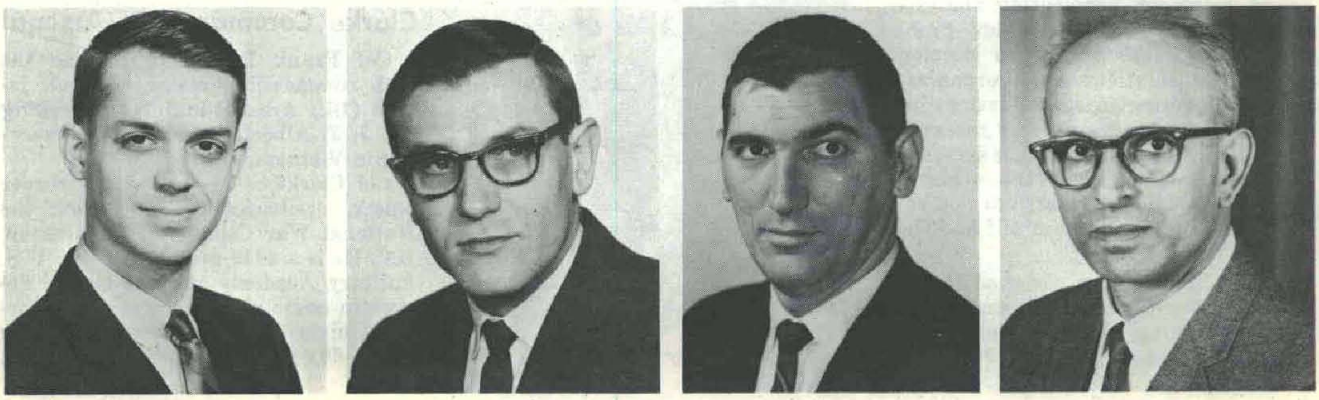
The routine is being used successfully by TOPOCOM, other DoD elements and contractors in gridding of map sheets and LORAN data analysis.

U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss. *William J. Flathau*, chief, Protective Structures Branch, Nuclear Weapons Effects Division, was selected as an R&D Achievement Award winner for investigations of qualities of protective structures.

"From the results of recent research investigations carried out under his technical guidance," the citation states, "timely provision of heretofore unavailable structural design data is currently enabling designers to significantly better evaluate the capability of existing hardened structural systems to resist the effects of atomic weapons and to develop more

(*Continued on page 10*)

R&D ACHIEVEMENT Award Winners. From left, William T. Wyatt, U.S. Army Mobility Equipment Command (MECOM), St. Louis, Mo.; Edward A. Gillis, MECOM; Gregory DeSantis, U.S. Army Natick (Mass.) Labs; Jacob Wenig, U.S. Army Land Warfare Laboratory, Aberdeen (Md.) Proving Ground.



1970 R&D Achievement Awards Recognize Record Total of 52

(*Continued from page 9*)

economical designs for structural systems yet to be constructed."

John N. Strange, chief, TOPOCOM Engineering Research Branch, Nuclear Weapons Effects Division, will receive an Army R&D Achievement Award for directing the development of an analytical solution to the partitioning of energy from a point explosion at a water surface.

In addition, his efforts "have provided methods for predicting the behavior of water waves generated by explosions in deep water such that it is generally believed within DoD that little if any further experimental work will be necessary in this area."

U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, N.H. *Guenther E. Frankenstein,* research civil engineer, was selected for his achievements in connection with a Strategic Air Command Disaster Team recovery of nuclear armed bombs in Greenland; also, for his work on the historic voyage of the tanker *Manhattan* in seeking a Northwest Passage to the new Alaskan oil fields.

The primary purpose of the *Manhattan* voyage was to determine the feasibility of navigating through thick sea ice with a commercial tanker. Studies directed by Frankenstein, however, yielded much data never before available on the pressures exerted by sea ice on marine structures such as piers, docks, etc.

OFFICE OF THE SURGEON GENERAL—Walter Reed Army Institute of Research (WRAIR), Washington, D.C. *Alfred P. Feldman,* a research chemist at WRAIR, invented the Army Chemical Typewriter (ACT), which encodes chemical structural formulae so they can be processed, stored and retrieved by computer. He was cited for modification improvements to a model introduced in 1961.

ACT and a supporting computer system were chosen to improve the Army Scientific and Technical Information System. Similar machines are now finding their way into industry.

OFFICE, CHIEF OF R&D—U.S. Army Land Warfare Laboratory (LWL), Aberdeen (Md.) Proving Ground. *Jacob Wenig* will receive an R&D Achievement Award for direction of activities of the Applied Physics Branch, Advanced Development Division, LWL. The citation states:

"Through effective planning and supervision, as well as through his direct technical contributions, he has been able to maintain a short R&D cycle from the time a requirement is placed on his Branch to the time when the device or the material is ready for delivery to the Army user."

Some of the more significant achievements of the branch during the past year include development of an Improved Position Locator, Listening Post Surveillance Device, Man-Pack Foliage Penetration Radar (FOPEN), Base-Station FOPEN, and an Acoustic Azimuth Locator.

Col Jester Succeeds Col Vincent as ISO Director

Six years in a leadership role in a complicated, controversial, highly technical, fast-moving field is unusual by way of military assignment, but Col Dale L. Vincent concluded that feat July 31 when he retired to end a 31-year military career.

Col Guy E. Jester, a Class of '51 U.S. Military Academy graduate with an MS degree in structural dynamics and a doctorate in engineering, both from the University of Illinois, succeeded Col Vincent as chief, Information Systems Office, OCRD, and director of Army Technical Information.

Chief of Research and Development Lt Gen Austin W. Betts presented Col Vincent with the Legion of Merit at a retirement ceremony during which he listed highlight achievements of his career as a Chemical Corps officer.

The citation states, in part: "His sound judgment, penetrating analysis of many exceedingly complex problems, exceptional ability to develop practicable solutions . . . organizational perception in consolidating, integrating and unifying Army research and development information systems, and total dedication to the achievement of established objectives . . . reflect great credit upon himself and the United States Army."

COL JESTER was assigned to the Office of the Chief of Research and Development as a staff officer in the Plans Division Sept. 15, 1969, and since February had been a special assistant to Maj Gen Edward L. Rowny, past Deputy Chief of R&D. His military schooling includes graduation from the U.S. Army War College and the Command and General Staff College.

In 1968–69 he was division engineer and commander of the 15th Engineer Battalion, 9th Infantry Division, Vietnam, following an assignment as deputy director and (later) acting director, U.S. Army Engineers Waterways Experiment Station, Vicksburg, Miss. (1965–67).

Col Jester served from 1962 to 1965 as an instructor and then assistant professor at the United States Military Academy. His assignment as post engineer at Schweinfurt, Germany, with the Northern Area Command (1959–61) followed duty as chief, Engineering Branch, Engineering Division, NAC in Frankfurt.

Col Guy E. Jester

While assigned to the Waterways Experiment Station, he was instrumental in development and installation of the automated financial and research management system. His publications include "Management of R&D Activities" and "An Experimental Investigation of Soil-Structure Interaction in Cohesive Material."

Col Jester has been awarded the Legion of Merit, Civic Action Honor Medal with OLC, Air Medal with 2 OLCs, Bronze Star Medal with 3 OLCs and "V" device, Armed Forces Honor Medal with OLC, Army Commendation Medal, and Purple Heart.

Clarke Commands RI Arsenal

Col Frank P. Clarke became the 26th commanding officer of Rock Island (Ill.) Arsenal in July, succeeding Col J. J. Albertson, who is now serving in Vietnam.

Col Clarke, a 21-year Army career officer, graduated in June from the National War College in Washington, D.C. He is a 1949 graduate of the U.S. Military Academy and has an MS degree in engineering science from Purdue University. He served in Vietnam (1967–68) with the Americal Division.

SECRETARY OF DEFENSE Melvin R. Laird poses with DoD Distinguished Civilian Service Award winners during ceremonies at the Pentagon in Washington, D.C. From left are Secretary Laird, Dr. Henry P. Kalmus, Mary V. Klicka, William Wegner, David T. Leighton, Peter R. Murray, Walter G. Ingerski, and Frank M. McKernan.

2 Army Employes Among 7 Honored by DoD Awards

Chief Scientist Dr. Henry P. Kalmus of the Harry Diamond Laboratories and Mrs. Mary V. Klicka, ration design specialist with the Army Natick (Mass.) Laboratories, were among seven recipients of the Department of Defense Distinguished Civilian Service Award at July 7 ceremonies.

Secretary of Defense Melvin R. Laird presented the highest award that can be bestowed by the Department of Defense on a civilian employe.

Dr. Kalmus was cited for "numerous significant contributions to military electronics," including "professional brilliance and inventiveness to produce achievements . . . currently in use by all of the military services." One of his important new inventions was cited as substantially increasing ability "of our Armed Forces to detect infiltration in Vietnam."

Mrs. Klicka was cited for numerous "significant contributions" to the feeding of combat soldiers and astronauts, including planning and design of operational, survival and special rations for the Armed Forces since 1957. In consultation with officials of the National Aeronautics and Space Administration and the U.S. Air Force, she developed menus for Projects Mercury, Gemini and Apollo.

Other recipients of the DoD Distinguished Civilian Service Award on July 7 are representative of the Air Force, Navy, Defense Supply Agency and the Office of the Assistant Secretary of Defense for Manpower and Reserve Affairs (OASDM&RA). They are:

David T. Leighton, associated with the Navy's Nuclear Reactor Program since 1951, six years after he was graduated from the U.S. Naval Academy, was cited for outstanding contributions to the program. He served as principal adviser to Vice Adm H. G. Rickover, the Director of the Naval Nuclear Propulsion Program. Presently he is program manager for Surface Ship Nuclear Propulsion of the Naval Ship Systems Command and associate director for Surface Ships and the Light Water Breeder, Division of Naval Reactors, Atomic Energy Commission.

William Wegner, deputy to Vice Adm Rickover since 1963, was cited "for outstanding contribution to furthering the development and use of nuclear propulsion for ships of the United States Navy through his inspiring leadership and professional competence in the fields of nuclear engineering, training, safety, intelligence and international relations." Graduated from the U.S. Naval Academy in 1948, he served on active duty until 1964.

Peter Ross Murray, Deputy Director of Laboratories, Air Force Systems Command, received his award in "recognition of his exceptionally meritorious devotion to duty and his significant accomplishments during a career of over 34 years with the Air Force." As director of the Air Force Avionics Laboratory and deputy director of Laboratories for the Air Force, he was the first civilian employe to be appointed to these two positions. He has been associated primarily with remote control guidance systems, first with drones and aircraft and subsequently in missile guidance fields, including television and radar guidance.

Walter G. Ingerski received the DCSA in "recognition of his noteworthy performance" as staff director, Civilian Personnel of the Defense Supply Agency, since its establishment in January 1962." Ingerski previously served as chief, Civilian Personnel Division, Office of the Quartermaster General, Department of the Army.

Frank M. McKernan, Director of Transitional Manpower Programs, Office of the Assistant Secretary of Defense for Manpower and Reserve Affairs, was honored with the DCSA for his exceptional service in planning, organizing and operating the Transition Program for the Department of Defense since its inception. Under his guidance, more than a half-million men leaving military service have received vocational counseling and another 80,000 received additional training to assist them in obtaining civilian employment.

McKernan has been with the Department of Defense since 1966 and previously had been employed by the U.S. Army, beginning in 1942.

AMC Selects Brig Gen Kogstad For International Logistics

Designation of Brig Gen Arthur W. Kogstad, former Army Materiel Command director of Maintenance, as director of International Logistics was announced July 22 by General F. J. Chesarek, CG of the AMC.

General Kogstad is a World War II combat veteran who held high command posts during the Korean and Vietnam wars. He has served as director, J–1 (Personnel), U.S. European Command, and assistant commander, 4th Armored Division.

A large portion of his military career was spent in personnel assignments in Austria, the Far East Command, UN Command in Korea, and in the Office of the Joint Chiefs of Staff, Washington. He received his master's degree in international affairs from George Washington University.

R&D Leaders Observe CIDS Demonstration of System Capabilities

(*Continued from page 1*)

chemical information in from six seconds to one minute of machine time (depending upon the desired level of specificity).

Under development since 1964 as one of the major system concepts of the Army Scientific and Technical Information Program, CIDS is ready for intensive user testing. Pilot system users are reported favorably impressed with service being provided.

The user test phase continues the CIDS philosophy of responsiveness to the needs of U.S. Army and allied scientists. CIDS progress has been guided by bench-level investigator requirements and by recommendations from advisory groups of ranking professions in potential areas of application.

The test configuration consists basically of a DEC PDP–8 computer functioning as a communications front-end to an IBM 7040 computer equipped with a 1301 disc unit used as file and index storage. This configuration is located at the University of Pennsylvania in Philadelphia. A file of 17,000 organic compounds is continually being expanded, using the IBM 7040 for the registry and updating process.

The entire system is scheduled for shifting to an Army in-house Univac 1108 configuration at Edgewood (Md.) Arsenal, beginning in the third quarter of FY 1971. The 1108 is estimated conservatively at three to five times faster than the IBM 7040 in the context of CIDS searches.

CIDS is a formula image and document reference system, accomplishing computerized searches remotely, on-line and in real time via teletype terminals connected by commercial lines. Its data bank and output records currently consist of:

- A permanent registry number automatically assigned to the unique compound in the record.
- Molecular formula of the compound.
- The compound's structural formula image depicted in conventional chemical format.
- Nomenclature(s) for the compound as designated by source document.
- Information descriptors related to document content, and the identification and location of each source document.,

Figure 1 shows a typical CIDS record originally generated for file input by the DURA 1041A Army Chemical Typewriter (ACT), and output on a high-speed chemical printer via search. The permanent registry number (A0103526) and the last two references were provided by the system's computerized registry and update capabilities.

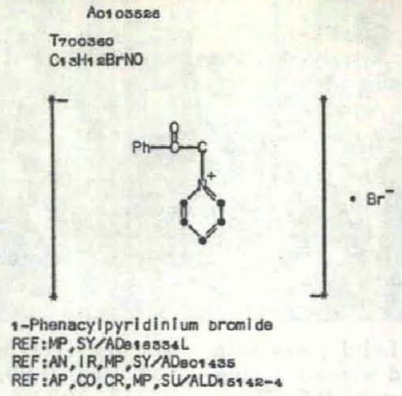


Fig. 1. CIDS RECORD generated originally for file input by DURA 1041A Army Chemical Typewriter and output on a high-speed printer.

This illustration presents two significant Army Scientific and Technical Information Program accomplishments in the chemical area—development of the ACT capability to depict structural formula images by direct typing; and the ability to computerize the input, storage, search and output of 2-dimensional chemical structures.

Three major characteristics establish the uniqueness of CIDS in the computerized chemical information field. The first is a combined capacity for registering only those compounds new to the file while updating existing records with new or amended information.

A second distinguishing characteristic is CIDS' powerful random-access indexing technique. This permits rapid narrowing of potential responses. On-line searches thus can be made on the basis of logic combinations of whole structures or structural fragments (functional groups, whole cyclic nuclei or individual rings, hydrocarbon radicals, etc.), molecular formula ranges and specific documentation requirements.

CIDS' third notable feature is that it is interactive, permitting remote on-line dialogue between user and data bank, with the final printout reduced to the minimum determined necessary by the user. Queries may be initiated in the broadest possible terms. Interim outputs are statistical counts of records responsive to the stated level of specificity.

More definitive searches are then confined only to the records so identified; the query may be edited, with its latest form retained. The operator may call out the query at any time in that form for verification and possible further alteration.

Record printout is actuated only on command by the user. This characteristic permits query refinement at the user's option without requiring restarts. After response printout, the system is ready for a new query. Past queries are retained for possible later processing until an instruction reinitiates the system.

Machine search time may double for each tenfold increase in file size, according to an estimate based on two considerations. The first is that searches are accomplished by intersection of inverted list indexes of keys machine-assigned to the record during the registration process—the variable therefore is the relative length of the selected lists searched rather than total file content. Secondly, greater file content will isolate larger numbers of records for searching at any level of specificity.

Short-range plans for CIDS include extensive file expansion, and improved input/output devices. Early in FY 71, Model 37 Teletypes, with spacing capability and type font to permit direct printout of structural images, will be included in the system.

Current printout is accomplished by Teletype (Model 33 or 35) generation of ACT-coded paper tape in the response mode, and input of that tape to the reader head of the ACT for typing. (High-volume output can also be shifted by teletype command to the Data Products printer.)

During the second quarter of FY 71, a digitally coded magnetic tape collection of 1¼ million compound structures from Volumes 67 and 68 of Chemical Abstracts will be made searchable by random-access techniques cross-indexed to the appropriate abstracts.

This collection is under contract rental from Chemical Abstracts Service for CIDS tests through August 1971. Benefits possible by real-time remote searching are being evaluated in comparison with current techniques of searching that file by off-line, card-to-tape, batch modes.

Plans provide for locating Model 37 Teletypes at the CIDS central location at Edgwood Arsenal, its laboratories, and at several other Army installations to form the basic user test net-

CIDS Communications Center, with teletypist entering queries to remote computerized data bank. On-line responses, including chemical structures, are punched on teletype tape for printout on DURA Army Chemical Typewriter (center) or shifted directly to Data Products 1,000 line-per-minute printer (left). Magnetic tape deck (right) accepts high volume responses on-line for 1,000 line-per-minute printout in off-line mode when necessary.

work. The over-all network will involve several types of users, consistent with volume demand and resource availability.

Organizations with relatively large traffic requirements and resources to train and support a part-time operator could communicate directly with the data bank via Teletype 37. The operator, basically a chemist, would be trained in use of CIDS formats to formulate queries from chemists' questions and in the techniques of data bank querying.

Locations of this type would be required periodically to submit traffic data to the CIDS central on standard forms; all participants would feed back system evaluation data as required.

Less active user groups, which can support a teletype location (floor space and originating telephone costs) and train an individual to submit questions, including structural formula images—a technique which can be rapidly developed by a capable typist—can transmit the question rapidly to CIDS central. The queries will be formated there, searches conducted, and output punched on paper tape for playback to the user's teletype in a followup cycle.

Other users can submit questions to CIDS via mail, with responses batched and mailed back. It is expected that the last two types of traffic will involve 48 hours waiting time between receipt of questions and transmittal of responses. A 24-hour turn-around time for these indirect users has been established as a goal for design of the fully operational CIDS.

Col Dale L. Vincent, former chief, Information Systems Office (ISO), Office of the Chief of R&D, commented on CIDS' progress: "With continually reduced R&D budgeting, the speed and accuracy that computers can provide in accessing information become increasingly significant. Manpower saved by eliminating requirements for manual literature searches can be effectively utilized for effort at the bench.

"Equally important is the potential reduction in elapsed time between research on and fielding of materiel. A system enabling chemists and allied scientists to comprehensively search technical efforts in their 'native tongue' should permit starts farther down the path of progress, reduce the frequency of false starts, and contribute appreciably toward eliminating unnecessary duplications.

"In establishing a central repository to identify Army-developed chemical information located at many laboratories and other installations, currently accessible only by the quasi-techniques of serendipity and the use of the grapevine, CIDS can also give some form to 'the invisible college.'

"As a result of the built-in updating power of the system, a compound once identified by a unique registry number can be accessed from the files by that number at any future time to determine if further information has been developed on it. Simple logging techniques also make it possible to tell any user which other users have been interested in the compounds retrieved. This makes a colleague interchange system entirely feasible."

Spence T. Marks, the HQ DA staff officer for the CIDS project, is with the ISO.

As a U.S. Army Materiel Command project, CIDS is managed by the Munitions Command. Project officer is Stanley A. Goldberg, chief, Technical Data and Value Engineering Management Office, Edgewood Arsenal.

Questioned on the project's next step, Goldberg responded:

"We now face two interdependent challenges inherent in any new dynamic information system, regardless of the results of its proof-testing. The first is to motivate its use, with users recognizing that its content is not all-encompassing. The second is to expand that content so that the services provided can continually improve.

"As use and contents grow, continual analyses and evaluations in a realistic environment will define the directions of augmentation and improvement. For these reasons, we invite Army installations and organizations to participate in the use of, and contributions of information to, the CIDS data bank."

Demonstrations similar to those presented at the Pentagon and the National Academy of Sciences can be provided on call wherever a day's use on site of a Model 33 or 35 Teletype with either a Dataset or an acoustical coupling device can be provided.

Goldberg is confident a demonstration will convince observers of the eventual worth of an operational Army Chemical Information System.

"CIDS has no intent to 'capture' chemical information systems, automated or otherwise in development or operational," he said. "Where such systems exist, the direction will be in establishing interfaces to result in an over-all network."

Goldberg can be contacted for further information at Edgewood Arsenal, Md. 21010, ATTN: SMUEA–TSTD (Autovon 584–2807, or commercial 301–671–2807).

New IG, Staff Judge Advocate Announced by STRATCOM

Assignment of Col Jack Mittelstadt as inspector general and Lt Col Eugene J. Murphy as staff judge advocate was announced recently by the Army Strategic Communications Command, Fort Huachuca, Ariz.

Col Mittelstadt served with the II Field Force, Republic of Vietnam, prior to joining the STRATCOM staff. Other assignments in recent years have included Korea, Thailand, the U.S. Military Academy at West Point, N.Y., and HQ U.S. Continental Army Command at Fort Monroe, Va.

He is a senior paratrooper who has twice earned the Combat Infantry Badge, along with the Bronze Star Medal with "V" device and 2 OLCs, Distinguished Flying Cross, Air Medal, two awards each of the Legion of Merit and Army Commendation Medal, and Vietnamese Cross of Gallantry with Silver Star.

LT COL MURPHY's previous assignment was with the U.S. Army Aviation Systems Command, St. Louis, Mo. In World War II he served in the Marine Corps. Graduated from the University of Suffolk Law School after being honorably discharged from military service, he practiced law until he entered the Army in 1952. He is a member of the American, Federal, Boston and Georgia bar associations.

DoD Approves 6 New Army JSHS Advisory Council Members

Renewal of the U.S. Army Junior Science and Humanities Symposium charter, appointment of six non-U.S. Government members to the JSHS Advisory Council and reappointment of nine members were approved recently by the Department of Defense.

The additional members, all prominent in their fields of specialty, are Prof. George G. Acker, Mrs. Adalie Brent, Dr. Edward M. Eyring, Franklin D. Kizer, Robert H. Rines and Reverend A. John Wilson III.

Established in 1960, the council assists the Chief of Research and Development in establishing objectives and plans to assure that the JSHS Program meets the needs of today's youth; to insure that it does not duplicate existing programs; and to recommend and meet program goals. Members serve without reimbursement for time and travel expenses.

More than 145 exceptionally gifted science students and 100 teachers, representative of about 5,000 high school students who participated in 1969–70 regional competitions, took part in the 8th National JSHS, May 5–6, at the University of Tennessee. (See May–June issue of this Newsmagazine.)

Appointment of the six new council members was considered necessary to compensate for retirements during the 2-year period the members serve. The council usually consists of two military representatives, an executive secretary and eight nongovernment representatives.

Robert H. Rines

Dr. Edward M. Eyring

Dr. George G. Acker

Mrs. Adalie Brent

Franklin D. Kizer

Rev. A. John Wilson

PROF. ACKER is with the Department of Biology, Bowling Green (Ohio) State University. He received an AB degree from Allegheny (Pa.) College in 1937 and a 1939 MS degree from Oklahoma University.

He served in the U.S. Army (1941–46, 1951–53), and was a National Science Foundation Fellow at Ohio State University (1958–59). He has served as an instructor, assistant professor and associate professor at Bowling Green State University.

MRS. BRENT is director of the Louisiana Arts and Science Center at Baton Rouge, has a BA degree in art education from the University of California at Los Angeles (UCLA), and has pursued advanced studies at UCLA and Louisiana State University (LSU).

Listed in *Who's Who in American Art*, she has served as an instructor and art teacher in the Los Angeles Public School System at LSU and at the Saint Joseph Academy, Baton Rouge. Well-known for her professional work in art, including stained glass and faceted glass window art and murals in numerous churches, cathedrals, schools and chapels in Louisiana, she has been prominent in leading youth activities.

DR. EYRING, Department of Chemistry, University of Utah, earned BA (1955), MS (1956) and PhD (1960) degrees, and served as an assistant and associate professor at the same university. The 39-year-old scientist and scholar has specialized in kinetics of fast chemical reactions in solutions, acid dissociation constants, pulsed lasers and mass spectrometry.

KIZER has served 14 years as supervisor of science for the State Department of Education, Commonwealth of Viriginia. He has AB and MA degrees in science and science education from East Carolina University (1942–1949), and has done postgraduate work at Columbia University, Cornell University, University of Colorado, University of Virginia and Nebraska Wesleyan University.

His career includes four years as a high school teacher and experience as a research chemist in industrial and U.S. Navy laboratories. He was the first president of the Council of State Science Supervisors, has served as chairman of several national conference committees, and was director of the CS³ NASA Spacemobile Program Evaluation (1968–69).

RINES is president of the Academy of Applied Science, Belmont, Mass. He received a BS degree in physics from the Massachusetts Institute of Technology (1942) and an LLB from Georgetown University (1947).

Known for his success in science and law, he has broad experience as a lecturer and author on inventions and innovations. Admitted to the Massachusetts Bar in 1947, he has been a partner in Rines and Rines of Boston and director of various laboratory and manufacturing corporations.

REVEREND WILSON, a member of the North Carolina Conference of the Methodist Church, was appointed assistant chaplain of the U.S. Military Academy in March 1966. He was associate director of religious activities at Duke University, from which he graduated in 1961 with an AB degree in political science.

He received the bachelor's degree from Duke Divinity School in 1965 and has held numerous offices at Needham Broughton High School in Raleigh. He was an outstanding participant in track and football.

Present military members of the council are Brig Gen George M. Snead Jr., Director of Army Research, Office of the Chief of R&D; and Col William J. Lynch, former Assistant Director of

Army Research, now serving as commanding officer of the U.S. Army Research Office-Durham (ARO–D). Mrs. Grace Boddie, ARO–D, is executive secretary of the council.

Dr. Ernst Weber, president emeritus of the Polytechnic Institute of Brooklyn, N.Y., is chairman of the council. Other members are Dr. S. C. Donnelly, director of Sentinel Projects Operations, Western Electric Co., Greensboro, N.C.; Dr. Donald D. Bode, research professor, University of Utah; Dr. Ralph Gibson, director, Applied Physics Laboratory, Johns Hopkins University; and

Dr. Sherwood Githens Jr., professor of education, Duke University; George F. Leist (Col, USA, Ret.), treasurer, Toledo (Ohio) Technical Council; Dr. Harry F. Levy, professor of humanities, Fordham (N.Y.) University; Dr. George R. Seidel, Delaware (Dover) State College; Dr. M. H. Trytten, director, Office of Scientific Personnel, National Academy of Sciences.

Col Lewis Assumes Command of MERDC

Activities at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., are now under the command of Col Bennett L. Lewis, a recent graduate from the Army War College.

Col Bennett L. Lewis

Announcement of his assignment to head the Army Mobility Equipment Command's principal field agency, staffed with about 50 military and 1,400 civilians in research, development and engineering, came July 21.

Col Lewis graduated from the U.S. Military Academy at West Point, N.Y., in 1950 and is a native of Boston, Mass. He obtained a master's degree in civil engineering from Harvard University in 1955, and was graduated from the Command and General Staff College in 1963.

In 1959–60 he served in Europe as a construction engineer; in Korea as S–3 and executive officer of the 8th Engineer Battalion, 1st Cavalry Division; and in Vietnam (1968–69) as CO of the 14th Engineer Combat Battalion and, later, as assistant chief of the Construction Division, HQ USARV.

Stateside assignments have included instructor at the Engineer School; studies officer and chief of the Special Weapons Division, Office of the Chief of Engineers Strategic Planning Group; instructor at the Command and General Staff College; staff assistant, Land Forces Division, Office of the Assistant Secretary of Defense for Systems Analysis; and chief, Readiness Division, Office of the Assistant Secretary of the Army (Manpower and Reserve Affairs).

Lt Col Gillespie Takes Command of AMMRC

Responsibilities of deputy director and commanding officer of the U.S. Army Materials and Mechanics Research Center, Watertown, Mass., were assumed recently by Lt Col John W. Gillespie.

The AMMRC is the Army's principal facility for research and exploratory development in materials and mechanics, involving ceramics, organics and composites as applied to advanced concepts for armor, cannon, missiles, missile launchers, aircraft and various ordnance materiel.

Col Gillespie's previous assignment was personnel management officer, Colonel's Division, Officer Personnel Directorate, Office of Personnel Operations, HQ DA, Washington, D.C.

In 1968–69 he participated in three campaigns in Vietnam, where he was chemical officer of the 4th Infantry Division and chief of staff of Task Force Winner, a combined U.S. and Vietnamese force of three brigades.

In 1944 he entered the Army Air Corps as an aviation cadet, served 16 months, then returned to Clemson A&M to receive a BS degree in chemistry in 1948. He remained there eight years as an instructor in qualitative, quantitative and instrumental analysis, meanwhile continuing his studies to earn an MS degree in entomology.

Commissioned in the Army Chemical Corps Reserve in 1950, he returned to active duty in 1956, gaining Regular Army status. Among his assignments have been CO of Nike Site 15, Beverley, Mass.; instructor, Chemical-Biological-Radiological Section, Seventh Army Combined Arms School, Vilsecki, Germany; nuclear engineer, G–3 Section, HQ Seventh Army, Stuttgart, Germany; and executive officer, HQ 548th Supply and Services Battalion, Fort McClellan, Ala.

Col Gillespie has completed the Surface-to-Air Missile Battery Officer's Course, Air Defense School, Fort Bliss, Tex.; chemical officer's advanced course, Fort McClellan; and Army Command and General Staff College course.

He has received the Silver Star, Distinguished Flying Cross with OLC, Air Medal with "V" device and 10 Oak Leaf Clusters, and Vietnamese Cross of Gallantry with Palm.

Lt Col John W. Gillespie

ABCA Representatives Discuss Tactics, Equipment, Logistics

Representatives from the ABCA countries (America, Britain, Canada and Australia) attended the recent 5-day annual Tactics, Equipment and Logistics (TEAL) Discussions in London, England.

Lt Gen George I. Forsythe, commanding general of the Army's Combat Developments Command (CDC), headed the U.S. Army delegation at the high-level conference. Lt Gen Sir Victor Fitzgeorge Balfour, Vice Chief of General Staff, United Kingdom, was conference chairman.

TEAL discussions are designed to review progress and issue guidance in the ABCA Armies' Standardization Program. The program, which was begun in 1947, seeks to promote maximum standardization of procedures, weapons and equipment among the four armies.

The New Zealand Army, which became an associate member of the ABCA program in 1965, was an observer during the London discussions.

TEAL discussions are held in each of the four member countries on a rotating basis.

TACOM Announces Hybrid Engine With Reduced Exhaust Emission

Development of a hybrid engine, embodying a new combustion concept that sharply reduces harmful gas exhaust emissions, was announced by the U.S. Army Tank-Automotive Command at a high-level meeting to consider automotive air-pollution problems.

Representatives of the U.S. Department of Transportation, Department of Health, Education and Welfare, General Services Administration, Post Office Department, U.S. Bureau of Mines, Departments of the Army and the Navy, and Southwest Research Institute were among participants.

Assigned responsibility as the principal developer of vehicles for the Department of Defense, the Army Tank-Automotive Command (TACOM) performs test and evaluation of a great variety of vehicles, engines and components designed for special conditions of terrain and environment.

In announcing the hybrid engine concept, Dr. Ernest N. Petrick, TACOM chief scientist and technical director of laboratories, termed it an "attempt to reduce pollution rather than to clean up emission of harmful gases."

The process combines the unthrottled operation of a diesel engine with the soft, controlled combustion in the spark ignition engine. Instead of a conventional carburetor for air-fuel mixture, the system uses a fuel injection system similar to that of a diesel engine.

Fuel injectors at each cylinder inject precisely the amount of fuel needed to operate the engine at any given horsepower output requirement. This results in a leaner air-fuel mixture and lower exhaust emissions at low and intermediate engine loads than can be achieved with the same engine equipped with a carburetor.

"We have been particularly interested in coming up with an engine that operates on many fuels, including gasoline and kerosene," Dr. Petrick said. "Because we never know where military vehicles will be required to operate, we must have the ability to use various types of fuels."

Until now the hybrid combustion principle has been applied exclusively to the Army's ¼-ton M151 jeep, which is powered with a 4-cylinder engine displacing 141 cubic inches. Tests have indicated that pollution control already meets or approaches federal exhaust emission standards for 1975.

Wayne Anderson, director of the TACOM Propulsion Systems Laboratory, explained:

"We refer to it as a stratified charge engine, which simply means that we burn the fuel at the location where it has the best mixture of air and fuel to give us the most efficient combustion and therefore cut down on a number of pollutants."

Improvements now under development, he said, could further reduce pollution from this engine to meet proposed 1980 goals. With unleaded fuel and a catalytic reactor, however, emissions can be reduced to the proposed 1980 levels without any further advances in combustion control.

The Texaco system employs a swirling motion through compression of the air charge. As the piston approaches the top-dead-center position, fuel injection begins in a downstream direction relative to the air motion. At approximately the same time, the ignition cycle begins, so the first increment of the fuel-air charge is ignited as soon as it is formed. A stationary flame front is established and the remaining mixture is burned at essentially the rate it is formed.

Consequently, no combustible mixture is present in the chamber long enough to undergo spontaneous ignition regardless of the octane number of the fuel. Anti-knock quality has thus been eliminated as a relevant fuel characteristic, researchers stated.

One major difference between FCP and TCP is that the latter uses no throttling to control the incoming air; engine load control is achieved by fuel injection control alone. In contrast to the FCP low-pressure air-fuel injection process, TCP uses a commercially available, high-pressure diesel-type system, featuring also a transistorized ignition system.

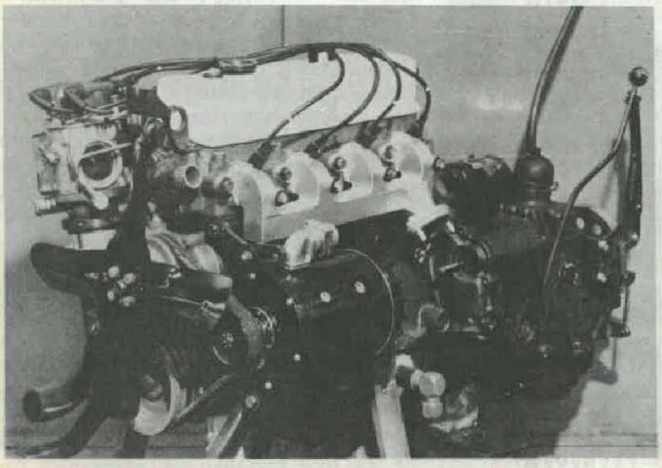
Texaco has built and tested one single-cylinder and two 4-cylinder engines. The latter have been evaluated in naturally aspirated and in turbocharged designs in an M151 vehicle. The engines have been operated 1,770 hours in dynamometer tests and 330 hours (7,300 miles) in the vehicle.

The National Air Pollution Control Administration has cooperated recently by helping to fund this program and has conducted official exhaust emission tests on hybrid systems. In addition, commercial independent research organizations and prominent universities sponsored by TACOM have contributed resources.

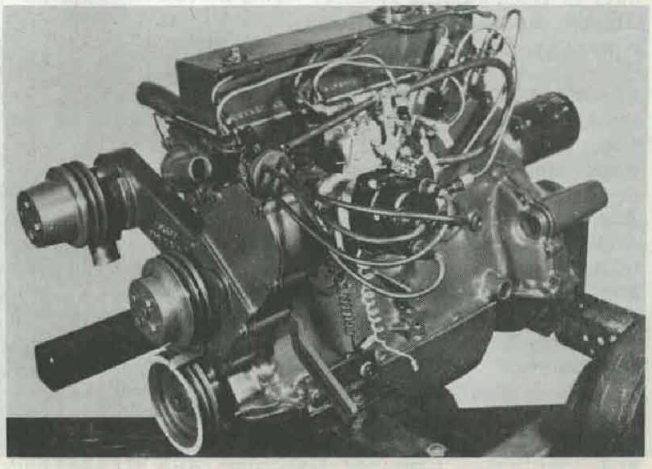
Wayne Anderson said his Propulsion Systems Lab is now ready to move into the final phase of the exploratory development program. A new minimum pollution military engine offering improved fuel economy, he said, could be rolling off production lines by 1975.

The hybrid process is relatively insensitive to proposed unleaded fuels.

Laboratory engineers anticipate fuel



FORD L–141 Hybrid Engine



TEXACO L–141 Hybrid Engine

economies ranging from 20 to 40 percent. Durability, simplicity, reliability and low maintainability are other benefits expected to cut costs, in line with objectives set by the Department of Defense.

The Department of Health, Education and Welfare has cooperated recently with TACOM R&D personnel by helping to fund the development program, and has conducted official exhaust emission tests on hybrid systems.

Under TACOM contracts, commercial independent research organizations and prominent universities have contributed their resources to the success of the developmental program, which has been in progress about 10 years.

One system developed by Texaco, Inc., uses a different combustion process than one developed by Ford Motor Co., referred to by TACOM Propulsion System Laboratory engineers as TCP and FCP.

TCP has been under refinement since 1963 and a similar contract with Ford was negotiated in 1967. Contract money to these firms by the end of FY 1970 totaled approximately $1,269,000, TACOM reported.

In the FCP the air charge is compressed at an 11:1 ratio and fuel is injected at low pressure, with a special long-reach spark plug igniting the mixture, timed for efficient combustion and low exhaust emissions. Injection timing is advanced as a function of speed, and characteristics are virtually the same as for a conventional spark ignition engine.

Two L–141 engines equipped with FCP ran a total of 1,500 hours on dynamometers and 4,600 vehicle miles. The total single- and multi-cylinder dynamometer time with FCP is in excess of 20,000 hours, and total vehicle experience is about 60,000 miles.

USMA Seeking Candidates For Mechanics Dept. Post

Selection of a permanent professor and deputy head of the U.S. Military Academy Department of Mechanics at West Point, N.Y., has been turned over to a committee appointed by Maj Gen William A. Knowlton, superintendent of the academy.

Applicants must have at least a master's degree in mechanics or a mechanics-related field and the demonstrated desire to work toward a doctorate in mechanics while serving as deputy head of the Mechanics Department. Application forms and supporting papers should be submitted to Col F. A. Smith Jr., head of the Mechanics Department.

Maj Gen Ploger Commands Engineer Center, Fort Belvoir

Maj Gen Robert R. Ploger took over from Maj Gen William C. Gribble Jr. as CG of the Army Engineer Center and Fort Belvoir, Va., at recent ceremonies, following a tour of duty as director of Military Engineering, Office of the Chief of Engineers.

Graduated from the U.S. Military Academy at West Point, N.Y., in 1939, General Ploger has two master's degrees, in engineering from Cornell University and in business administration from George Washington University.

He has completed courses at the Army War College and at the Industrial College of the Armed Forces, winning a special award at the ICAF for "outstanding achievement in helping to bring about a better understanding of the American way of life."

Maj Gen Robert R. Ploger

While serving as director, Military Engineering, he was principal adviser to the Chief of Engineers on matters related to organization, doctrine and equipping all engineer units in the Army, as well as the engineer planner for activities relating to operations of military forces.

General Ploger was the first commander and the organizer of the U.S. Army Topographic Command, and also served as topographer of the Army. He served three years on the staff and faculty of ICAF as a lecturer with a National Security Seminar team.

While in Vietnam for two years, he served as the U.S. Army Engineer there and as senior adviser to the Chief of Engineers of the Republic of Vietnam. He also served three years at Supreme Headquarters Allied Powers Europe (SHAPE) before enrolling in ICAF.

General Ploger has been awarded the Distinguished Service Medal, the Silver Star Medal with OLC, Bronze Star with OLC, Joint Service and Army Commendation Medals, the Purple Heart, the Korean Order of Military Merit Chung Mu, and the Distinguished Unit Citation.

Col Etkin Assumes Command of Deseret Test Center

Col (Brig Gen designee) Max Etkin assumed command of Deseret Test Center (DTC), Fort Douglas, Utah, July 10, succeeding Col Robert Muldrow, USAF, who remains as deputy commander.

Col Etkin has 28 years of military service and prior to his new assignment was commanding officer of the Lexington-Blue Grass Army Depot in Kentucky.

In 1967 he served in Vietnam as commander of An Khe Sub-Area Command and later as acting chief of staff, Security, Plans and Operations for the 1st Logistical Command.

In 1954–55 he attended the Chemical Advanced Course at Fort McClellan, Ala. Following graduation, he attended Georgia Institute of Technology, receiving an MS degree in industrial management in 1957. After a 2-year assignment as special assistant to the commanding general, U.S. Army Chemical Center, Edgewood (Md.) Arsenal, Col Etkin became deputy chemical officer, HQ Seventh Army, Europe, in 1960.

Upon completion of this tour of duty, he attended the U.S. Army War College at Carlisle Barracks, Pa., and then was assigned to the Office of the Joint Chiefs of Staff, Washington, D.C., for two years.

He has been honored with Legion of Merit, Bronze Star Medal, Air Medal and Army Commendation Medal (all with the Oak Leaf Cluster), the Purple Heart, and numerous campaign and service medals for duty in World War II, Korea and Vietnam.

Col Max Etkin

Dr. Rousselot Heads DoD Health, Environment Office

Establishment of an Office of Assistant Secretary of Defense for Health and Environment, as authorized by Public Law 91–121 signed by President Nixon Nov. 19, 1969, and operating under pollution control guidance of Executive Order 11507, Feb. 4, 1970, was recently effected.

Secretary of Defense Melvin R. Laird announced that President Nixon had nominated Dr. Louis M. Rousselot to head the new office. Department of Defense Directive 5136.1 incorporates the above-cited authorities.

Dr. Rousselot has served as Deputy Assistant Secretary of Defense (Manpower and Reserve Affairs) for Health Affairs since Jan. 2, 1968. Until then he was professor of clinical surgery at New York University School of Medicine and director of surgery at St. Vincent's Hospital and Medical Center in New York City.

The position makes Dr. Rousselot responsible for health and sanitation matters throughout the Department of Defense as the principal staff adviser and coordinator for Secretary Laird.

His duties include care and treatment of patients, preventive medicine, clinical investigations, hospitals and related health facilities, medical materiel, nutrition, and health personnel. Procurement, education, training and retention of personnel are within his functions.

Dr. Rousselot also is responsible for coordination of DoD matters regarding environmental quality with other appropriate agencies. Heretofore this has been a responsibility of the Office of the Assistant Secretary of Defense for Installations and Logistics.

Among additional functions will be those associated with the recognition of environmental quality problems related to the development, production and use of new materials and providing guidance to insure pollution abatement and control.

Consultation with other government officials in the earliest feasible planning stage of new activities related to environmental quality, to ensure that the best available techniques and methods are used for the protection and enhancement of the environment, is listed as one of Dr. Rousselot's important responsibilities.

The Assistant Secretary of Defense for Installations and Logistics will continue to be responsible for the DoD Natural Resource Program, including development, protection and conservation of forest and other vegetative cover, and for soil and water conservation programs on military installations. He will continue to plan projects designed to prevent, control and abate pollution.

Matters of mutual interest and concern will be coordinated between the Assistant Secretary of Defense for Health and Environment, Assistant Secretary of Defense for Installations and Logistics and other appropriate DoD components.

Dr. Louis M. Rousselot

Engineers' Publication Features ECOM Employe

Featured recognition in the "Who's Who" section of "Transactions on Parts, Materials and Packaging," published by the Institute of Electrical and Electronics Engineers," was accorded recently to Milton Tenzer.

Tenzer was featured for his more than 25 years of military and civilian service with the U.S. Army Electronics Command and its forerunner organization, the Signal Corps Engineering Laboratories, at Fort Monmouth, N.J. He is now chief of the Electronic Parts and Materials Division, Electronics Components Laboratory.

The division has research and development responsibility for a wide variety of passive components, transmission line systems, microwave devices, test equipment and materials. Tenzer was recently delegated responsibility for the Army R&D program on electronic materials.

In recent years Tenzer has participated in preparation of technical planning documents in support of the DoD programs in electronic intelligence and command control communications. He is Army liaison member of the Ad Hoc Committee on Electronic Materials and Devices, National Advisory Board. For five years he has been cochairman of the annual International Wire and Cable Symposium cosponsored by the U.S. Army and industry.

Born in Poland, Tenzer graduated from Cooper Union in New York City with a BE degree in electrical engineering in 1940. He has done graduate work at Rutgers and at Polytechnic Institute of Brooklyn. He is a registered professional engineer in New York and New Jersey, and is adjunct instructor at Monmouth College.

Milton Tenzer

USARIEM Study Upholds Stiff-Starched Fatigues

Stiff starch requirements of commanding officers have survived an Army medical research study conducted by scientists from the Army Research Institute of Environmental Medicine (USARIEM) near Natick, Mass.

Scientists studying the effect of laundered and starched fatigue uniforms on the soldier's combat performance found that the washing and stiffening do not significantly alter the insulation qualities of the fatigues, nor their "vapor permeability."

Insulation values and vapor permeability refer to the clothing's ability to allow air and perspiration to pass through, thus cooling the soldier's body.

In warm weather the body produces perspiration that evaporates on the skin, cooling nearby blood that then flows to internal organs and maintains constant body temperature. The amount of available air near the skin partially determines the rate of evaporation.

Researchers used an electrically heated copper manikin dressed in fatigues to measure the effects of the uniforms. Volunteer soldiers walked in a tropic wind tunnel, too, wearing both new and starched fatigues.

Although there was a minute reduction of insulation values after repeated washing and starching, the scientists concluded that this was a result of uniform shrinkage—and tigher fit—rather than a change in the insulation of the material.

USARIEM is one of 13 major units of the Army's Medical Research and Development Command.

USMA Emphasizes Basic Research, Offers More Science Electives

Advanced science elective courses and the number of instructors with PhD degrees are increasing at the United States Military Academy, along with growing interest in basic research supported by grants.

In July 1969, the Academy established a Science Research Laboratory and results during its first full year of operation indicate that it is stimulating faculty-level research in a way that augurs well for the future. Emphasis is on the physical sciences.

One of the research papers resulting from effort to encourage more basic scientific investigations was selected for presentation at the 1970 Army Science Conference, which has been held at the Academy continuously since it was initiated in 1957.

Lt Col William B. Streett and Maj James Hill were coauthors of "Phase Behavior in Fluid Mixtures at High Pressue I: (Experimental)." Col Streett also was awarded a grant from the National Aeronautics and Space Administration in March to support his experiments directed toward understanding of Jupiter's "Red Spot," a centuries old puzzle of the planets.

Another research project, supported by the U.S. Atomic Energy Commission, is directed toward measurement of densities of liquid mixtures of neon and hydrogen. Results are expected to find application to design and operation of a new generation of bubble chambers to serve as detectors in high-energy physics research.

Astronomers have been wondering about Jupiter's Red Spot for some 300 years. Col Streett's hypothesis about the tinted oval that at times appears on the visible surface to be more than twice the diameter of the Earth (Jupiter is about 10 times larger than the Earth) is receiving attention.

"The Red Spot appears to float around in the atmosphere of Jupiter," he explains, "drifting slowly back and forth in longitude while nearly fixed in latitude. No one has yet offered a reasonable explanation of how anything could float in an atmosphere of the two lightest elements, hydrogen and helium.

"Our experiments at the Academy on other gas mixtures suggest that a hydrogen-rich solid can exist under pressures and temperatures like those deep down in the atmosphere of Jupiter. Under certain conditions, the solid is lighter than the fluid surrounding it, making the solid float upward to reach the level where it remains suspended in the atmosphere.

"This offers a plausible explanation for the Red Spot and explains how a solid object could float in a hydrogen-helium atmosphere. Many of the observed motions of the Red Spot are explained by this hypothesis."

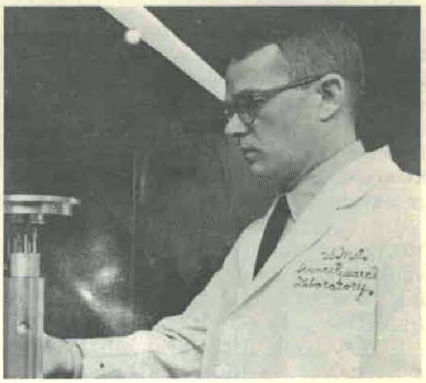
Under requirements of the NASA grant, Dr. Streett will conduct experiments on hydrogen and helium under high pressures and temperatures similar to those that might be found in the atmosphere of Jupiter and Saturn.

His research will submit H_2-He mixtures to pressures up to 10,000 atmospheres (150,000 psi) over the temperature range 25° to 300° Kelvin. Compositions of equilibrium fluid and solid phases will be measured, and the gas-liquid critical line and gas-liquid-solid 3-phase boundary will be located for the H_2-He mixtures at high pressures.

"Atmospheres of the Jovian planets may be very deep," he said, "and we are uncertain whether they have a solid surface. We hope to reproduce in the laboratory the conditions which exist in the outer few percent of the radius of each planet."

Graduated from the United States Military Academy in 1955, Lt Col Streett was recently named a permanent associate professor in the Office of the Dean and Director of the Science Research Laboratory, Brig Gen John R. Jannarone, who was instrumental in establishing the lab.

Almost all of Lt Col Streett's work at the Academy has grown out of research sponsored by the U.S. Army



Lt Col William B. Streett

Research Office-Durham, N.C., though his research on Jupiter began while he was working on his doctorate at the University of Michigan in 1962, which also was sponsored by NASA.

Maj Hill, research officer in the Department of Chemistry, and Lt Col Arthur Erickson, Department of Earth, Space and Graphic Sciences, assisted Lt Col Streett during the 1969–70 experiments and the latter will work full-time in the lab in 1970–71.

PFC Harry Ringermacher, Dr. Streett's lab assistant, has contributed calculations in developing a model for the Red Spot hypothesis. Two cadets who graduated in June, Robert Cousar and John Lazzeri, also took part in the research.

Lynn Succeeds Davies as Edgewood Arsenal Deputy

Col George A. Lynn is Edgewood (Md.) Arsenal's new deputy commander, succeeding Col Walter J. Davies, who served from March 1967 until assigned recently to Fort McPherson, Ga.

Col Lynn was chief, Plans Division, Office of the Assistant Chief of Staff, G3, HQ U.S. Army Vietnam, until reassigned to Edgewood, an Army Munitions Command activity.

Graduated from the U.S. Military Academy in 1947, he received a 1954 master's degree in physics from the U.S. Naval Post Graduate School in Monterey, Calif., and a master's in mathematics from Rensselaer Polytechnic Institute in 1957.

Col George A. Lynn

Col Lynn was a staff analyst with Land Forces Programs, Office of the Assistant Secretary of Defense (1963–66), following duty as a staff officer with the Chemical Section, HQ Eighth U.S. Army, Seoul, Korea. He was graduated from the Army Command and General Staff College in 1962, after four years as an assistant professor at the Military Academy.

Other assignments: chief, Radiological Laboratories at Dugway (Utah) Proving Ground; depot supply operations officer, Hanau Chemical Depot, Germany; platoon leader, troop executive officer and battalion staff officer, 15th Constabulary Squadron, Weiden, Germany.

Col Lynn received officer training at the Ground General School, Fort Riley, Kans., and at the Armored School, Fort Knox, Ky., after serving as an enlisted man from March 1943 to June 1944.

Sperrazza Climaxes 29-Year Climb to GS-17 Job

Good things piled up for Dr. Joseph Sperrazza, an Aberdeen (Md.) Proving Ground scientist for 29 years, when he was promoted to GS-17 rating as new director of the Army Materiel Systems Analysis Agency and awarded special honors for Vietnam research.

Dr. Sperrazza had served since May 1968 as acting director of AMSAA, in addition to primary duty as a consulting weapons technologist with the Ballistics Research Laboratories. AMSAA and BRL are subordinate activities of Aberdeen R&D Center.

Announcement of his promotion to the highest classified grade at APG came two days before he was honored, along with Col Joseph R. Blair of Edgewood (Md.) Arsenal, for coauthoring a technical paper presented at the 1970 Army Science Conference at the U.S. Military Academy. Col Blair is deputy for Medical Sciences, Research Laboratories.

Titled "Wound Data and Munitions Effectiveness as Based upon Battlefield Surveys in Vietnam," the paper reported on an Army-Navy-Marine Corps and Joint Technical Coordination Group study from June 1967 to June 1969. Dr. Sperrazza was credited with the methodology and initiation of the study. The paper was one of two selected for special honors at the ASC. (See ASC summary article, page 46.)

Dr. Joseph Sperrazza

Twenty-nine years at the APG did not automatically win Dr. Sperrazza his new title. Under the Federal Executive Assignment System, he had to be selected from all qualified aspirants in all branches of government.

His new duties make him responsible for systems analysis within the U.S. Army Materiel Command as pertains to technical and economic evaluation in ground warfare systems, air defense and support systems, and systems engineering.

Dr. Sperrazza was born 50 years ago in New York City and was graduated there from Cooper Union School of Engineering with a bachelor of mechanical engineering degree in 1941. He joined the APG research staff shortly thereafter and continued studies at Johns Hopkins University to earn master's and doctoral degrees (1950–61).

COMPSY Tests System Of Psychiatric Information

Concepts for an integrated, Army-wide psychiatric information system are being developed and tested under the Computer Support in Military Psychiatry (COMPSY) project.

The proposed system would objectify, systematize and make readily available information about psychiatric patients from their identification in the field, through hospital course and treatment, to their reintegration into the military community.

Psychologists, psychiatrists, social workers, psychiatric nurses and computer scientists are engaged in the clinically oriented project.

COMPSY was established as a pilot project in June 1968 in the Department of Psychiatry and Neurology at Walter Reed General Hospital in Washington, D.C. Computer and data processing support is provided through the Data Processing Branch of Walter Reed Army Medical Center.

Development and testing of field mental hygiene applications are conducted by the Mental Hygiene Consultation Service (MHCS) at Fort Benning, Ga. Clinical applications being developed and tested include automation of psychiatric nursing notes, psychological testing procedures, a collateral social history, and computer assisted instruction programs.

Immediate objectives of COMPSY include installing and programing telecommunications equipment; implementing and validating all automated clinical applications; searching published and unpublished papers and reports for literature related to MHCS for and establishment of an MHCS library; and collecting data for before-and-after studies of the effectiveness of the proposed system.

Ambrosini Gains Promotion as USASASA Director

Leonard R. Ambrosini is the new technical director of the U.S. Army Small Arms Systems Agency (USASASA) at Aberdeen (Md.) Proving Ground after filling the job in an "acting" capacity for 20 months.

Chief systems engineer, U.S. Army Materiel Command from January 1968 until November 1968, he entered U.S. Government service after 20 years as an industrial scientist.

Born in Leghorn, Italy, he studied at the Italian Scientific Lyceum, the Geneva Calvin College, and obtained an MS degree at the Zurich Federal Polytechnicum in aerodynamics and thermodynamics in 1948. He continued doctoral studies at the University of California at Los Angeles.

Leonard R. Ambrosini

Ambrosini began his ordnance career with Hispano-Suiza, Switzerland, where he was chief engineer, after inventing, developing and marketing automatic weapons, antiaircraft automatic weapons, antiaircraft fire detectors and related equipment.

In 1957 he joined Lear Inc. (subsequently Lear-Sigler, Inc.) of Grand Rapids, Mich. He moved to California as assistant to the corporate chief physicist, held progressively responsible positions, and was vice president for company-wide ordnance development until employed by the Army Materiel Command.

Known for his success in generating and directing new activities and products from theoretical concepts to production, he holds patents on about 60 inventions.

Among his most notable accomplishments are development of an automatic North-Seeking Gyro and the first Hispano-Suiza antiaircraft fire director, for which he holds four patents. Other inventions include hydraulic servo valves, encoders, automatic landing devices, hypervelocity torpedoes, planetary reentry and landing space equipment, hypervelocity guns, hydraulic sonars, fly-by-wire sensors and barometric altimeters.

Picatinny Discloses New Pyrotechnic Flare System

Experimentation with an advanced pyrotechnic flare system at the Army's Picatinny Arsenal, Dover, N.J., as reported in a technical paper at the 1970 Army Science Conference, indicates it offers several advantages over solid flares in current use.

The system uses gas and thus has the advantage of on-off control, in contrast to solid flares which, once ignited, have to burn out or be extinguished and cannot be used again.

Abraham Kirshenbaum and Dr. Frank Taylor, pyrotechnic specialists in the Feltman Research Laboratory developed the system after two years of research.

Using a mixture of gases to produce bright white flames, the system permits illumination levels and burning times to be varied readily, and it has a time range of a fraction of a second to hours. Most solid flares burn only a short time.

While solid flares are smoky and therefore subject to wind and other weather conditions, the pyrotechnic system is relatively free of particulate matter and can be made directional. Military commanders involved in guerrilla warfare have expressed a need for flares which are directional.

Gaseous flares can also be magnified by reflectors. In testing, directional light efficiencies have been increased 12 times by using an aluminum reflector to produce efficiencies of one-quarter to one-half million candleseconds per gram.

Another advantage of gaseous systems is that they do not require atmospheric oxygen. The reproducible, homogeneous mixtures can be used and stored for long periods at high and low temperatures without loss of efficiency.

Gas systems, which can be used on the ground or dropped by a parachute, require a burner, two tanks and an emitter. They can be ignited by remote control, either by electric fuse or an electric spark.

In experimentation, Kirshenbaum and Dr. Taylor have added gaseous boron-containing compounds such as boron trifluoride (BF_3) and diborane (B_2H_6), to pale, high-termperature flames to produce high intensity, visible emission.

MICOM Develops System To Assist in Procurement

Measuring existing contract performance and more accurate forecasts of similar work is now possible for the Army, Navy, and Air Force through development of a Procurement Information Reporting (PIR) system by the Army Missile Command in Huntsville, Ala.

Approved by Department of Defense for all-Service use, the system reports on costs actually incurred. It is being used to implement PROMAP-70, the Army Materiel Command program to improve the Army weapons system acquisition process.

Joseph Huie, MICOM's PIR action officer, was named by the Department of Defense as chairman of a PIR tri-Service study group, charged with developing a better way to get more realistic cost data from contractors. The DoD wants the information to forecast costs, cover costs on all items, and reduce report forms used by the Military Departments.

PIR sets uniform requirements for all U.S. Government contractors in engineering, tooling, quality control, manufacturing, and related costs for components. Contractors must report periodically on manhours and dollars actually expended on the contract element.

"Thus the actual experience of a manufacturer is available for making estimates for same item costs in the future," Huie said. "We must make appropriate adjustments for rise in labor or materiel costs, size of run, or any other circumstance which may influence the contract.

"With uniformity in reporting, the information is readily comparable with previous reports, the performance by two or more contractors working on the same items is easily assessed, and the data can be put in data banks for quick retrieval when needed."

Wagner Goes to Vietman; Castro Heads CRREL

Assignment of Lt Col Joseph F. Castro as commander and director of the U.S. Army Cold Regions Research and Engineering Laboratory at Hanover, N.H., was recently announced.

He succeeds Lt Col John E. Wagner, who has been reassigned as engineer, I Field Force, Nha Trang, Vietnam.

Lt Col Castro is a graduate of the U.S. Army War College at Carlisle Barracks, Pa., and the U.S. Army Command and General Staff College, Leavenworth, Kans. He holds a BS degree in civil engineering from the University of Rhode Island and master's in civil engineering and nuclear engineering from Illinois University.

From August 1968 to July 1969 Lt Col Castro was staff officer in the Office of the Chief of Research and Development. He has served in Vietnam as CO of the 39th Engineer Battalion (Combat) and the 26th Engineer Battalion (Combat), Americal Division. He was assigned to the Army Nuclear Power Program at Germantown, Md. (1960–63) and served in various assignments in Germany (1964–67).

He has been awarded the Legion of Merit, Bronze Star Medal with OLC, Air Medal with four OLCs, Army Commendation Medal with three OLCs, and Republic of Vietnam Gallantry Cross with Gold Star.

Lt Col Joseph F. Castro

DoD Picks ECOM Employe for Systems Analysis Course

Stephen W. Klein, an Army Electronics Command employe, has been selected by the Department of Defense to attend the 15-month Defense Systems Analysis Education Program conducted by the University of Rochester and the Center for Naval Analysis in Washington, D.C.

Klein is chief of the Methodology Division, Systems Cost Analysis Office. Six Department of Defense military personnel will participate in the program, designed to enable them to choose weapons systems and determine force levels through the effective relation of cost and performance considerations to national policy objectives. Courses include economics, mathematics, statistics, operations research, and strategic studies and analyses of Defense policy decisions.

Klein has a BS degree from Worcester Polytechnic Institute and an MS degree from Newark College of Engineering.

Stephen W. Klein

Col Van Lydegraf Commands Natick Labs

Col (Brig Gen designee) Dean Van Lydegraf has assumed command of the U.S. Army Natick (Mass.) Laboratories after completing a tour of duty as CO, Atlanta (Ga.) Army Depot, one of the largest U.S. logistical bases.

In Vietnam, he served until December 1967 as chief of staff, Support Command at Cam Ranh Bay and assumed additional responsibilities as deputy commander until October 1968. He was chief, Assignments Branch, Colonels Division, Office of Personnel Operations (OPO), HQ DA, Washington, D.C., in 1966–67.

While serving in 1964–65 at the Army Infantry Center, Fort Benning, Ga., he was CO, 2d Supply and Transportation Battalion and then CO of the Support Command, 2d Infantry Division. For three years he was assistant executive to the Quartermaster General.

Col Van Lydegraf has a BS degree from the University of Oregon, master's in business administration from Babson Institute, and was graduated from the Management Program for Executives, University of Pittsburgh. He is a graduate from the Industrial College of the Armed Forces, the Command and General Staff College, basic and advanced courses at the Quartermaster School, and Infantry Officer Candidate School.

During World War II, he served in Europe with the 301st Infantry Regiment, 94th Infantry Division, and in Korea was assigned to the Eighth U.S. Army as chief, Class II and IV Branch, Support Division, Quartermaster Section.

Among his decorations are the Legion of Merit, Bronze Star Medal with "V" device and Oak Leaf Cluster, Army Commendation with OLC, and the Purple Heart.

Col Dean Van Lydegraf

Chief of Nurse Corps, WAC Director Gain 1-Star Rank

Secretary of the Army Stanley R. Resor and Army Chief of Staff General William C. Westmoreland officiated at recent ceremonies promoting the first two women brigadier generals in United States history.

Chief of the Army Nurse Corps Anna Mae Hays and Director of the Women's Army Corps Elizabeth P. Hoisington were promoted under provisions of Public Law 90–30, enacted in November 1967, which authorized women to hold general officer rank.

Brig Gen Anna Mae Hays

General Hays, a native of Buffalo, N.Y., earned her RN diploma from Allentown (Pa.) Hospital School of Nursing and a BS degree in nursing education from Teachers College, Columbia University. She has an MS degree from the Catholic University of America in Washington, D.C.

Appointed Chief of the Army Nurse Corps in 1967, 25 years after she joined the Army Nurse Corps, General Hays served in India during World War II and subsequently in Korea and Japan.

She has been awarded the Legion of Merit with Oak Leaf Cluster and the Army Commendation Medal.

General Hoisington was appointed director of the WAC in August 1966. She is a graduate of the College of Notre Dame of Maryland, a native of Newton, Kans., and enlisted in the Women's Army Auxiliary Corps in 1942, receiving her commission in 1943.

She is a recipient of the Legion of Merit with Oak Leaf Cluster, the Bronze Star Medal, the Army Commendation Medal and the French Croix de Guerre with Silver Star.

USAEPG Announces Assignment Of Enderle as Commanding Officer

Assignment of Col Wallace O. Enderle as commander of the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz., was announced July 14. He succeeds Col Maynard C. Raney, reassigned to HQ Sixth Army at the Presidio of San Francisco, Calif

Col Enderle's previous assignment was in Vietnam where he commanded the Communications Systems Engineering and Management Agency at Long Binh. He is also a veteran of the Korean War, where he served in five campaigns. He has received three Bronze Star Medals and the Army Commendation Medal.

Graduated from the United States Military Academy at West Point, N.Y., in 1948, he continued advanced studies at the University of Michigan to receive a master's degree in electrical engineering in 1955. He graduated in 1962 from the Command and General Staff College, Fort Leavenworth, Kans.

Col Wallace O. Enderle

SCIENTIFIC CALENDAR

International Electronic Circuit Packaging Symposium, Los Angeles, Calif., Aug. 26–27.

2d International Conference on the Strength of Materials and Alloys, sponsored by ARO-D, NASA and AFOSR, Pacific Grove, Calif., Aug. 30–Sept. 4.

AIAA 8th Electric Propulsion Conference, Stanford, Calif., Aug. 31–Sept. 2.

4th International Heat Transfer Conference, sponsored by ASME and AICE, Paris, France, Aug. 31–Sept. 5.

8th International Congress of Biochemistry, Rome, Italy, Sept. 3–9.

12th International Conference on Low-Temperature Physics, Kyoto, Japan, Sept. 4–10.

6th International Symposium on Microchemistry, Graz, Austria, Sept. 7–11.

6th International Quantum Electronics Conference, Kyoto, Japan, Sept. 7–11.

Symposium on Advanced Experimental Techniques in the Mechanics of Materials, sponsored by AFOSR and Southwest Research Institute, San Antonio, Tex., Sept. 9–11.

Eastern Convention on Aerospace and Electronic Systems, sponsored by IEEE, Washington, D.C., Sept. 14–16.

International Symposium of Institute of Electrical and Electronics Engineers, Columbus, Ohio, Sept. 14–18.

3d International Congress on Physics of Noncrystalline Solids, Sheffield, England, Sept. 14–18.

5th International Forum for Air Cargo, posnsored by the ASME, Frankfurt, Germany, Sept. 15–17.

Joint Force Tests Capabilities of World's Largest Cargo Aircraft

Airlift and airdrop capabilities of the world's largest cargo airplane are being tested in a year-long effort involving the largest joint test force in military aircraft history at Fort Bragg and Pope Air Force Base, N.C. The project is titled TADJET.

Lockheed's C-5A Galaxy stands six stories (65 feet) tall at the tail, is 248 feet long, has a wing span of 223 feet, weighs almost 800,000 pounds fully loaded, and can fly anywhere in the world at speeds over 500 mph.

Designed to deliver 100,000 pounds well over 6,000 statute miles, the C-5A is reported capable of carrying 200,000 pounds about 3,000 miles.

Under emergency conditions, its maximum payload of about 265,000 pounds could be carried almost 3,000 miles at about 530 mph, if design calculations are correct. TADJET teams will seek to verify these claims.

The Galaxy has the potential to carry more cargo longer distances in a shorter time and to paradrop bigger loads than any previous aircraft. TADJET denotes Transport-Airdrop-Jettison Test.

Tests at Fort Bragg and Pope AFB are under over-all supervision of the Air Force Systems Command, supported by the Military Aircraft Command.

Test teams are representative of the U.S. Army Airborne, Electronics and Special Warfare Board, an element of the Army Test and Evaluation Command, and elements of the Air Force Flight Center, along with Lockheed-Georgia personnel.

In the experiments, all sorts of Army equipment will be loaded into the C-5A's warehouse-like cargo compartment (145 feet long, 19 feet wide and 14 feet high), including some materiel that has never been inside of an aircraft because of size limitations.

Loads up to 50,000 pounds will be strapped to platforms with cargo parachutes attached and airdropped into special zones at Fort Bragg. In cargo handling and loading tests, 257,000 pounds of cargo have been unloaded in a half-hour. Army vehicles ranging from ¼-ton to 5-ton trucks have been driven from the aft end through the nose of the Galaxy.

The C–5A already has claimed the world airlift mark, having flown at a total weight of 789,200 pounds. A special troop compartment, well above the cargo area, can accommodate 75 troops. An additional 275 can be seated by adding seat pallets to the cargo floor.

Dubbed the "Troop Scoop," the special compartment also has a 150-meal galley capability and a double-unit lavatory. Troops taken on two 3½-hour flights have compared facilities to those on commercial jetliners.

Test schedules (later phase) call for Army paratroopers to jump from the huge aircraft. Preliminary tests will use "sticks" of 250-pound "rope-head" dummies to simulate mass troop drops. Paratroop provisions include jump platforms and deflector doors on either side of the fuselage.

Ideally, it was pointed out, paratroopers occuping the upper deck en route to a drop zone would be crews for the weapons and equipment on the cargo floor below. Paradropping of men and equipment from one plane would result in less dispersion, quicker mobilization and "unit integrity."

Special loading and unloading equipment and procedures have been developed for the C-5A, and these also will be tested in the year-long program. One of the main new items is an air-transportable loading dock (ATLD) designed to hold the immense loads the Galaxy will haul.

The dock can be flown into remote or undeveloped landing areas by two C-5As, assembled and put to work—then disassembled and flown to another area to be put in service again. The ATLD has room for three full payloads.

Since both ends of the C-5A fuselage open up to the same dimensions, any cargo vehicle can drive in the aft end and out the front. Officials believe this could "revolutionize" battlefield supply operations.

Another notable C-5A feature is ability to "kneel" to facilitate loading. Normally the main deck stands 105 inches off ground, but special motors on each landing gear can lower the plane to reach the level of truck beds or loading docks.

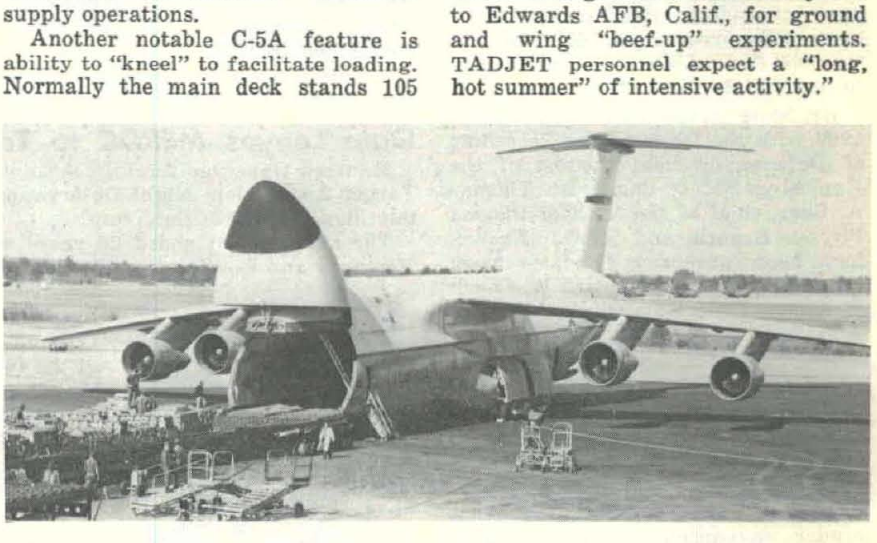
The C-5A landing gear, consisting of 28 wheels on four main and one nose gear struts, provides a capability of delivering cargo to battlefields and landing areas like those found in many parts of Vietnam—areas normally restrictive to many types of smaller, lighter aircraft.

Because of its high-flotation weight distribution over all the large balloon tires, the C-5A will not sink into the ground. It is designed to land on a dirt strip equivalent to the surface of a football field.

Preliminary testing leading up to the big lifts and drops is reported nearing completion. Army and Air Force testers have made many tow tests with various-sized parachutes to determine drag and extraction forces. Airflow characteristics have been recorded while the C-5A was flying in 14 different flap and deck-angle configurations.

TADJET teams are busy testing even when the plane is on the ground —rolling loads over the cargo floor to see how well rollers and winches operate, measuring and stressing parts and fixtures to determine the most efficient ways of using them, mating cargo ramps with the loading dock, and transferring cargo back and forth.

The Galaxy was returned to Pope AFB in mid-June for resumption of active testing after a 2-month sojourn to Edwards AFB, Calif., for ground and wing "beef-up" experiments. TADJET personnel expect a "long, hot summer" of intensive activity."



RECORD 257,000-pound cargo pours from C–5A during recent tests at Fort Bragg/Pope Air Force Base, N.C. The huge cargo compartment of the Galaxy aircraft accommodates two rows of pallets that can be winched in train onto the loading dock. The cargo was offloaded in 18 minutes during a recent test.

MICOM Investigates Laser Extermination of Aquatic Plants

Laser beam extermination of aquatic plants infesting navigable waterways is being investigated by U.S. Army Missile Command researchers as part of the Army Corps of Engineers Aquatic Plant Control Program.

Application of this concept was first reported in the *Army Research and Development Newsmagazine* in a page 1 article in the April 1969 edition. Dr. Ralph A. Scott Jr., then chief of the Corps of Engineers Aquatic Plant Control Program, filed a patent disclosure on the laser control method.

Acceleration of the long-sustained program was made possible in 1958 when Congress recognized the rising national importance of the problem. Section 104 of Public Law 85–500 authorized an expanded control effort.

The Chief of Engineers administers the weed control program under direction of the Secretary of the Army, in cooperation with federal and state government agencies. Federal agencies include the Department of Agriculture, Public Health Service, Fish and Wildlife Service, Tennessee Valley Authority, and the Water Pollution Control Administration.

Missile Command scientists normally concentrate efforts on missile and rocket programs, but remain alert to the potential of application of Army R&D technological advances to deal with civilian population problems.

When Dr. Scott contacted the Plasma Physics Branch, Physical Sciences Laboratory of MICOM, regarding initiation of an experimental program of aquatic plant control using laser CO_2 irradiation, MICOM responded favorably to the opportunity to test out its 178-foot-long laser.

Dr. Scott accepted a new position in 1969 with the Office of the Secretary of Defense, as chief chemist of the Explosives Safety Board. Dr. Thomas A. Barr, chief of the MICOM Plasma Physics Branch, and John J. Ehrlich have been continuing the laser beam research with Prof. Richard W. Couch of Athens College and assistance from Auburn University.

Results to date are encouraging but admittedly inconclusive, pointing to the need for sustained effort to overcome some technical problems. However, findings support the hope of eventual effective control of water hyacinths and other aquatic plants that hinder navigation, provide breeding places for disease-carrying insects, prevent fishing and discourage other recreational use of water resources.

Many waterways and streams in Alabama and throughout southern states are infested with water hyacinths and other weeds that choke them with luxuriant growth. National concern about pollution when chemical control agents are used, aggravated by discharge of industrial effluents, some of which stimulate aquatic growth, has accented interest in the laser beam technique of killing plants selectively without injury to wildlife.

Potential applications listed by Dr. Scott in the April 1969 *Army R&D Newsmagazine* article included control of weeds along roadways, railroad right-of-ways, vacant or "soil bank" land resources, truck-farm operations, and water supplies where "this means of control is favored over use of chemical eradication systems." The patent disclosure states:

"The method can be modified by selection of the proper laser energy so that weed control can be both on land or at the water surface, and also below the water surface for control of suspended and bottom-rooted plants."

Utilizing the 178-foot-long laser

Maj Gen Kalergis Assigned as Logistics Support DCG

Assignment of Maj Gen W. N. Redling to the Office of the Joint Chiefs of Staff set the stage for Maj Gen James G. Kalergis to succeed him July 1 as deputy CG for Logistics Support, Army Materiel Command.

In turn, Col Hal E. Hallgren, who had served as his assistant for cost analysis, stepped up to succeed General Kalergis as AMC comptroller. Col Hallgren has been nominated for the rank of brigadier general.

General Kalergis spent 18 months in Vietnam (1968–69) as I Field Force Artillery Commander and later as I Force's chief of staff, earning the Distinguished Service Medal. Previously he was deputy director, Force Planning and Analysis, Office of the Chief of Staff and executive officer to the Assistant Vice Chief of Staff.

Graduated in 1938 from Boston University, he obtained his master's degree in international affairs from George Washington University in 1961. He completed the advanced management program at Harvard Business School in 1966.

Col Hallgren was a division chief in the Safeguard System Office until

Maj Gen James G. Kalergis

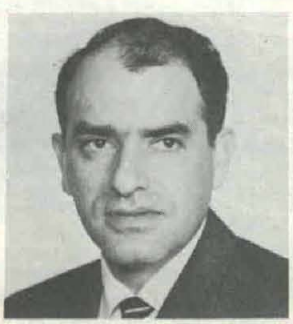
reassigned to his new duties. He served in Vietnam during 1967–68 as commander, 52d Artillery Group, following duty as assistant secretary of the General Staff, Office of the Army Chief of Staff.

Graduated from the U.S. Military Academy in 1946, he has since obtained master's degrees from the University of Pennsylvania (MSEE) and from George Washington University (MS in international affairs).

Gale Leaves MERDC to Take STANO Adviser Job

Manfred Gale was recently appointed scientific adviser to the Surveillance, Target Acquisition, Night Observation (STANO) Systems Manager, Office of the Chief of Staff of the Army.

The appointment ended 20 years with the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., where he last served as associate deputy for research and development. Starting as a project engineer, he advanced through responsible assignments to become chief of the Intrusion Detection and Sensor Laboratory.



Manfred Gale

Gale graduated from the University of Virginia in 1949 with a BS degree in electrical engineering. In World War II he was a recipient of the Bronze Star with three Clusters, the Purple Heart, and a Presidential Citation.

Before leaving Fort Belvoir, he was awarded a Certificate of Achievement, citing him for promoting programs concerned with mine detectors and sensing devices "with the result that the center became a mainstay among the Army's laboratories for these systems."

built by MICOM for experimental work on missile and rocket components, Ehrlich, Barr and Couch conducted their first tests on water hyacinths in May 1968. Since it was a pioneering effort, research procedures were established as they progressed.

First they exposed plants a maximum time until wilting and other changes were visible. Then they tried minimum exposure well below the range where any visible effect would show up within a brief time after the tests.

The first 16 tests involved different exposures and a variety of mirror configurations affecting the laser beam direction and area of exposure. Twelve plant samples then were taken to Auburn University and to the Corps of Engineers facilities in Washington, D.C., for observation.

Four irradiated plants were kept at MICOM's Redstone (Ala.) Arsenal for study. As part of the experiment, plants were given weekly changes of water and exposure to sunlight and fresh air to record the reaction. After six to eight weeks, the plants turned yellow-brown and later died.

Researchers evaluated the first series of experiments as far from conclusive, although indicative of possible control of water hyacinths through laser irradiation.

Ehrlich, Barr and Couch initiated a second program of experiments in 1969 to determine: (a) minimum laser energy required for damage to the plants, (2) types of damage, and (3) variation in damage due to seasonal and/or physiological age of plants at the time of irradiation.

Water hyacinths received from Lake Seminole, Ga., were acclimated at Athens College and then brought to Redstone Arsenal for irradiation. Some plants were put in a control pool at Redstone to allow for comparison and observation.

One of the problems was that while irradiated portions of the plants turned brown and died, new growth began to emerge from their meristematic area just beneath the surface of the water. After 40 weeks, irradiated plants were all dead or dying. The only living plants were the daughter plants produced between the treatment time and the time irradiated specimens died.

The second series of experiments established that laser irradiation did produce lethal responses and ill effects on water hyacinths. Exposure did not eradicate the plants, but irradiated plants produced smaller and actually fewer daughters. Experiments on more than 1,200 plants showed that laser treatment has potential for the control of spring and early summer-treated plants, without pollution of the environment.

New experiments now under way are aimed at a method of treatment that will kill daughter plants along with the parent. Ehrlich and Barr pointed out that the CO_2 laser used in the experiments is capable of killing only the plants above the water. Plans are under way to construct a copper vapor laser that will be effective against submerged plants.

Although their experiments have been conducted using the 178-foot-long laser, scientists say there exists within the state-of-the-art capabilities to make a 10-kilowatt laser that will fit on the back of a 2½-ton truck or on a small barge or boat. This mobility will allow lasers to be taken into remote areas for treatment of water weeds.

STRATCOM Establishes C-E Installation Agency

Formation of a new subordinate command of the U.S. Army Strategic Communications Command at Fort Huachuca, Ariz., to provide centralized control of STRATCOM's worldwide communications-electronics engineering and installation activities was announced July 9.

Creation of the U.S. Army Communications-Electronics Engineering Installation Agency (USACEEIA) was announced by Maj Gen W. B. Latta, CG of STRATCOM. It was formed provisionally, pending Department of Army approval.

General Latta named Col Harry E. Tabor, STRATCOM's deputy commander, to also command the USACEEIA. Col Tabor, who has been nominated for brigadier general by President Nixon, will be assisted by Col George E. Rippey as deputy commander.

"Grouping the essential communications-electronics implementing functions into a centralized organization," General Latta said, "enables firm placement of responsibility and authority, enhances responsiveness and reduces costs."

Automation of the worldwide STRATCOM communications system dictates central development, control and modification of systems hardware and software, it was explained. This approach is essential to insure mutual compatibility of hardware functional capabilities and unity of programing methods and modifications applied to the worldwide system.

Under the concept, four HQ STRATCOM elements have been transferred to USACEEIA. They are Office of the Army Communications Security Commodity Manager and the Directorates for Communications Engineering, Test and Evaluation, and Tele-Communications Automation. STRATCOM's Communications Engineering-Installation Agency (CEIA) has been transferred and renamed USACEEIA—Western Hemisphere. This unit has also been assigned new missions to support continental U.S. Army commands.

Among the missions assigned to STRATCOM is that of serving as the Army manager for strategic long-distance communications; engineering, installing, operating and maintaining the Army portion of the worldwide Defense Communications System. The command also provides communications support to such agencies as the White House, Pentagon, Joint Chiefs of Staff and the State Department.

French Succeeds Gershater as Fort Detrick Commander

Command of Fort Detrick, Md., passed from Col E. M. Gershater, CO for two years, to Lt Col Selvyn H. French on July 1 when Col Gershater was reassigned to a research and development unit with the U.S. Army in Vietnam.

Maj Gen F. J. Gerace, director, Requirements and Procurement, Army Materiel Command, presented Col Gershater with the first Oak Leaf Cluster to the Legion of Merit for his leadership and achievements at Fort Detrick. The colonel also was presented the Freedoms Foundation Award for 1969, in recognition of his essay titled "My Hopes for America's Future."

Lt Col Selvyn H. French

A Certificate of Merit also was presented to him by the Bureau of Medicine and Surgery, United States Navy, signed by Vice Adm G. M. Davis, MC, chief of the bureau and Surgeon General of the Navy. The certificate commends Col Gershater's contribution to naval technical progress in research and development through "direct support of specific programs," involving a naval unit at Fort Detrick.

Lt Col French, who has been head of the Installation and Services Directorate, will serve as Fort Detrick commander pending the arrival of Col Floyd B. Mitman Jr.

FAA-Army Engineers Design Aircraft Egress System

An emergency egress system considered promising also for commercial airlines, designed and built by the Army's Frankford Arsenal, is undergoing final tests at the National Aviation Facilities Experimental Center, Atlantic City, N.J.

The system is basically a linear shaped charge which cuts emergency exits in the aircraft fuselage in the event the regular emergency exits are blocked or jammed or instant egress is necessary.

The Federal Aviation Administration (FAA) originated concept of such an egress system and passed it on to Picatinny Arsenal to design and build a working model.

Picatinny engineers decided to use a mixture of two inert liquids (which become explosive only when they are mixed) and pump it through a small hollow tube to make a linear shape-charge. Their problem was getting the right formula for the explosives.

Experiments proved a mixture of Nitro-methane (94 percent by volume) and Benzylunine (6 percent) was the most effective. However, they were thwarted in their effort to mix correctly and pump the 75 ml of liquid explosive into the system.

Picatinny then turned to Lloyd Insetta, liaison engineer for the Propellant Activated Devices (PAD) Laboratory at Frankford Arsenal, for help and advice. Insetta studied the problem and in January 1967 passed it to Ray Sutter, a PAD engineer.

The objective was to design, fabricate, and test a system which would utilize a liquid linear shape-charge to cut explosively, and remove an emergency escape hatch in the aircraft structure.

Sutter, along with two other Frankford engineers, Robert Polaneczki and Joseph Di Phillipo, designed a system to contain, mix, expel, and detonate two fluids making up the explosive compound.

Initial work on the program started with the mixing pump. This device was designed to store both fluids in chambers so arranged that pumping could be accomplished by a 2-diameter piston to assure correct mixing ratio.

The pump has a 2"-diameter piston for the nitro-methane and a 12"-diameter piston for the sensitizer (Benzylunine). This produces a 15 to 1 pumping ratio—the necessary proportion for maximum effectiveness.

To activate the pump, a Frankford Arsenal initiator was used. The initiator has a 2-fold purpose: (1) to pressurize the mixing pump; and (2) simultaneously to produce sufficient pressure to fire two delay-action initiators. The mixing group initiator is a standard mechanically operated miniature initiator, now being used in aircraft ejection-seat systems.

One of the delay initiators activated by the mixing pump initiator is a 2-second delay device, which disconnects the mixing pump (saving it for possible future use) and at the same time seals the tube to insure a more efficient explosion. An M-15 initiator, a 3-second delay device, is then fired to detonate the shape-charge which cuts the desired opening.

The entire operation currently takes three seconds. However, it could be performed in less than a second, as it only takes a half second for the pump to mix the 75 ml of fluids and pump the liquid explosive into the system.

Two major problems which the Frankford Arsenal engineers had to overcome to provide a reliable working system were: to achieve the proper sequencing of the different stages of the operation and the correct time lapse between each, and to design a pump which would meter the explosive into the system quickly but not so fast as to trap air in the tubing, resulting in poor detonation. Driving all the air out of the system and getting reliable detonation were the keys in providing the FAA with the emergency system they desired.

Since January 1969, when Frankford Arsenal PAD Laboratory turned the device over to the FAA, the National Aviation Facilities Experimental Center has been conducting tests to establish the reliability and characteristics of the system.

Some of the things the FAA is looking into are the shapes, sizes, and types of explosives, blast pressures and shielding, vibration and crash effects, noise and temperature extremes.

Quadripartite Nations Study Effects of Large TNT Blasts

When a one-million-pound TNT blast was detonated July 23 at Medicine Hat, Alberta, Canada, scientific teams representative of 23 agencies in the United States, Canada, United Kingdom and Australia checked the results.

DIAL PACK was scheduled as a further investigation of fundamental air blast and ground shock, cratering and thermal pulse effects, and the response of structures and items of military and civilian equipment.

Similar tests, starting with a relatively small explosion in 1956, have been conducted annually to verify and improve protective equipment and techniques against shock and blast effects.

The test this year was conducted at the Defence Research Establishment, Suffield—Canada's Defence Research Board prairie laboratory about 26 miles west of Medicine Hat, where approximately 1,000 square miles of relatively flat terrain provides an ideal location for large-scale experiments.

25 STRATCOM Personnel Begin 10-Week Computer Systems Course

Twenty-five personnel from the U.S. Army Strategic Communications Command (STRATCOM) began a 10-week course in computer systems analysis and design in August at Fort Huachuca, Ariz.

The course will be taught by the IBM Corp., under special contract, to train telecommunications personnel so they can contribute to the STRATCOM effort in planning, installation and management of computer systems.

Participants will learn the five basic programing languages of computers and the dialects necessary to work at various levels of systems design.

Picatinny Research Chemist Studies in London

Dr. Christos Capellos, research chemist in the Feltman Research Laboratories of Picatinny Arsenal, Dover, N.J., departed in July to study at the Royal Institution in London.

Under advanced education funding provided by Picatinny Arsenal, he will spend about one year training in the use of the nanosecond flash photolysis technique. Investigations will include molecular reactions at an extended time range of a few billionths of a second; also, effecting electronic control over the sensitivity of chemical propagation and chain reaction of explosives. All of these studies will prove valuable in his work at Picatinny Arsenal.

Dr. Christos Capellos

Dr. Capellos will study under Prof. George Porter, Royal Institution director, who was awarded the Nobel Prize in 1967 for his invention of the flash photolysis technique and his contributions in the field of flash photolysis. Prof. Porter was an examiner for Dr. Capellos' PhD, received in 1965 at the Royal Institution in the area of radiation chemistry.

Dr. Capellos graduated from Athens University in 1959 with a degree in chemistry and earned his master's degree in 1962 at the Imperial College of Science and Technology in London.

Night-Vision Devices Assisting Civilian Ecological Research

Civilian scientific applications of night-vision devices developed by the U.S. Army to increase combat effectiveness under cover of darkness are yielding highly desirable information related to ecological problems.

Only one final report on several ongoing studies made possible by the Army's loan of its new N-V devices has been filed to date. It details results of nighttime observations of the coconut crab, important as a major item of food for natives returned to Eniwetok Atoll in the Pacific Ocean after years of absence following A-bomb tests. Findings are pertinent to considering the need for regulating the taking of the crabs to avoid their depletion.

Another research project planned originally as a 6-month study of the habits of vampire bats as carriers of rabies, responsible for loss of millions of dollars worth of cattle annually in Latin American nations, has twice been extended because of results possible only through use of night-vision aids. This effort is scheduled now to cover an 18-month period as part of a 4-year program.

Studies of vampire bats with a view to their selective destruction are being conducted by two teams of researchers. One effort, sponsored by the Food and Agricultural Organization of the United Nations, is seeking information on the possibility of their biological control in Mexico. There they are said to be responsible for the loss of at least 100,000 cattle annually due to rabies.

Another approach is selective extermination through chemical methods. This effort is sponsored by the U.S. Agency for International Development under contract with the U.S. Bureau of Sport Fisheries and Wildlife.

Estimates of total loss of cattle in Latin American countries due to rabies carried by vampire bats vary, but have been reported at $350 million annually.

Studies of the coconut crab, *Birgus latro*, were performed through the use of night-vision instruments loaned in support of a project funded by the U.S. Atomic Energy Commission. The researchers were Dr. Howard H. Vogel Jr. and James R. Kent of the Section of Radiation Biology, Department of Radiation, University of Tennessee College of Medicine.

"We found the night-vision devices a great aid in observing the coconut crab at night," their report states. "We were able to study their feeding habits, their interactions, behaviorly, among themselves and with other species. We were successful in photographing through the devices with Tri-X 35mm film. . . . Although we did not try taking motion pictures, it should be possible with a few modifications for attaching the camera to the eye piece.

"The night-vision devices enabled us to successfully watch these crustaceans in three separate study areas. We learned how to capture, hold and mark the animals—which can reach a size up to three feet across the shell . . . We captured and marked about 150 crabs . . . observed and photographed crabs opening coconuts with their chelae, as was reported by Darwin in 1859. . . ."

Use of bird bands on one walking leg of the crabs and insertion of a miniature Geiger-Mueller tube in burrows provided records of their dwelling time in their lairs. Range and territory studies were made by attaching small radio transmitters to the backs of some crabs.

"Occasionally, a crab would venture out distances of approximately 100 yards in search of a coconut," the report states, "but it would return to its den with the coconut carried under its body as rapidly as it could. . . .

"At the conclusion of our studies, we captured a male and female *Birgus latro* and sent these crabs to Dr. Donald Maynard at the University of Michigan for neurological studies. They arrived alive and in good condition.

"We feel that this research project proved to be worthwhile and interesting, and we thank the U.S. Atomic Energy Commission, the University of Hawaii and the Life Sciences Division of the Office of the Chief of Research and Development, Department of the Army, for their assistance."

The OCRD Life Sciences Division arranged for loan of the night-vision aids. Dr. Arthur J. Emery Jr. was the Army project officer in arranging for loan of the N-V devices through the Office of the Project Manager for Night Vision, U.S. Army Materiel Command. He recently transferred to the Office of Naval Research, where he is program director for microbiology, Biological Sciences Division.

Dr. Emery stated that other areas of study involving N-V viewers are pertinent to the concern of the Bureau of Sport Fisheries and Wildlife about possible extinction. Included are several species of owls, the Newell Shearwaters and the Dark-rumped Petrells.

AMC Director of Distribution, Transportation Promoted

Army Materiel Command Director of Distribution and Transportation Maj Gen Theodore Antonelli was promoted to that rank July 1, with General F. J. Chesarek, CG of the AMC, presiding at the ceremony.

When assigned to HQ AMC in January 1969, General Antonelli served for six months as special assistant for Post Hostilities Logistics Operations. His previous assignment was vice director, Defense Communications Planning Group, Washington, D.C.

Commissioned in the Regular Army in 1947, he has held numerous key Transportation Corps assignments, including chief of the Transportation Arctic Group, Thule, Greenland, a 3-year tour with the Office of the Deputy Chief of Staff for Logistics, HQ DA, and transportation officer for the 1st Cavalry Division, Korea.

Upon returning from Korea in 1960, he became chief of the Transportation Office, U.S. Army Missile Command at Huntsville, Ala., and later served three years with the Office of the Joint Chiefs of Staff.

General Antonelli graduated from the University of Connecticut in 1941 and in 1965 received a master's degree in international affairs from George Washington University. He is a graduate of the Command and General Staff College, Army War College, and Industrial College of the Armed Forces.

He has received the Silver Star, Legion of Merit, Bronze Star, Joint Service Commendation Medal and Army Commendation Medal with two Oak Leaf Clusters.

Gen Chesarek and Maj Gen Antonelli

Mrs. Agatha Wolman

David O. Cochran

Eugene S. Davidson

Eugene C. Smith

4 R&D Civilian Employes Chosen to Attend ICAF

Four Army R&D civilian employes are among the 180 military and nonmilitary personnel throughout the Department of Defense who will attend the 1970–71 course at the Industrial College of the Armed Forces (ICAF) beginning in August.

One of the Army selectees, Mrs. Agatha S. Wolman, is the only woman civilian ever chosen to attend ICAF. Other Army R&D employes attending will be David O. Cochran, a former employe of the U.S. Army Research Office, Eugene S. Davidson and Eugene C. Smith.

Operated as a joint educational institution for the Armed Forces under direction of the Joint Chiefs of Staff, the ICAF is located at Fort Leslie J. McNair, Washington, D.C. It is acclaimed as the capstone of the U.S. military education system in management of logistical resources for national security.

Studies prepare selected military officers and key civilian personnel for command, staff and policy-making positions in the national and international security structure.

Mrs. Wolman is technical chief of the Systems Analysis Branch, U.S. Army Strategy and Tactics Analysis Group (STAG), Bethesda, Md. Since joining STAG in 1962, she has served progressively as chief of the Systems Development Branch, Special Analysis Branch, Computer Games Branch and the Programing Branch.

With the Navy Department's Bureau of Yards and Docks in 1960–61, she was a consultant on mathematical and statistical methods. She was involved in quality control and reliability programs for construction, transportation, and weight-handling equipment; also, the construction and maintenance of Naval facilities.

At the Bureau of Naval Weapons (1954–59), Mrs. Wolman applied statistical methods to insure acceptable quality and reliability of ordnance items. Her work was concerned with special weapons, mines, torpedoes and fire control systems, and depot stocks in the Navy Surveillance Program.

She has a BA degree in mathematical statistics from the George Washington University, where she has also done graduate work, and has completed courses in Advanced Systems Technology for ADP Systems Analysis; Supervisory Scientists and Engineers; and Data Base Organization and Management.

DAVID O. COCHRAN served as a branch chief in the former Scientific and Technical Information Division, U.S. Army Research Office, OCRD, from April 1965 to November 1966. He is now chief of the Cost Research Division, Directorate of Cost Analysis, Office of the Comptroller of the Army, Washington, D.C.

He developed system concepts for logistics and weapon models to be used in the war gaming of various force structures, while employed at STAG from 1961–64.

Cochran earned a BS degree in mathematics and geophysics from Southern Methodist University (1950) and took postgraduate courses at the University of Washington (1953–56). From 1956 to 1960 he taught courses in geophysics and geology at Oregon State University.

EUGENE S. DAVIDSON has been serving as a program analysis officer with the Plans and Programs Division, Office of the Principal Deputy, Assistant Secretary of the Army (Installations and Logistics), since July 1967.

He was chief of the Program Coordination Branch, Office, Director of the Army Budget (1961–67). From 1950 to 1962, he was employed as an analyst in the Program Review and Analysis Division, Office, Comptroller of the Army and with the Fiscal Analysis Division, Office of the Director of the Army Budget.

Davidson holds a 1950 BS degree in business administration from American University, completed the Defense Systems Analysis Course at the Institute for Defense Analyses in 1966, and earned an MA degree in economics from the University of Maryland in 1967.

EUGENE C. SMITH was nominated to attend ICAF while serving as a supervisory general supply specialist with the International Logistics Directorate, HQ U.S. Army Materiel Command. He held key positions in the Mutual Security Office, Office of the Chief of Ordnance, prior to establishment of the Army Materiel Command.

He attended evening sessions at Strayers College (1948–50) and Southeastern University (1964–67), both located in Washington, D.C., to obtain an associate in science degree in business administration. He continued at Southeastern to earn a BS degree in business administration with a major in management (1969).

Col Stoner Succeeds Friar As Pine Bluff Arsenal CO

Pine Bluff (Ark.) Arsenal is now commanded by Col John K. Stoner Jr., who recently succeeded Col Clyde Friar when he was reassigned to Hawaii. Col Stoner formerly was special assistant to the Secretary of the Army for Manpower and Reserve Affairs.

Col Stoner is qualified for his new duties by a variety of key assignments during a 19-year Army career, including a tour of duty in Vietnam in 1968 and earlier in Korea. He also has served in the Panama Canal Zone.

Graduated in 1951 from Drexel University with a bachelor's degree in chemical engineering, he obtained a master's in business administration from Harvard University. He also has completed advanced study at Case Institute of Technology, Cleveland, Ohio, and the University of Pittsburgh.

Col Stoner's honors include the Legion of Merit with OLC, Bronze Star with "V" device for valor, Air Medal with four OLCs, and Army Commendation Medal.

AFIP Enzyme Study Offers Hope of Liver Disease Aid

Research on the enzyme urease which may prove significant in the treatment of liver diseases, especially hepatitis, is being conducted at the Armed Forces Institute of Pathology (AFIP) at Walter Reed Army Medical Center, Washington, D.C.

Dr. William N. Fishbein, chief of the Biochemistry Branch at AFIP, has found that simple compounds known as hydroxamic acids will inhibit the action of urease in the colon.

Urease is a bacterial and plant enzyme which is not found in mammalian tissues but is present in the gastrointestinal tract of mammals.

Working in the colon of mammals, urease splits urea into ammonia and carbon dioxide. Carbon dioxide is expelled from the body through the lungs. Ammonia is carried to the liver where it is converted back into urea, the chief nitrogenous constituent of urine, which is eliminated through the kidneys.

In a patient with a diseased liver, the process of converting the toxic ammonia to urea does not function at a maximal rate. The patient suffers from ammonia intoxication, which can be fatal.

Dr. Fishbein says inhibition of urease activity in the colon would prevent the formation of ammonia from urea and thus prevent ammonia intoxication.

The research is based on the hypothesis that bacterial urease activity is a significant contributing factor in the pathogenesis of hepatic coma, uremic colitis and other diseases. Inhibition of urease thus would offer a new approach to treatment of these conditions.,

Clinical trials of urease inhibition with acetohydroxamate have been conducted by Dr. W. H. J. Summerskill at the Mayo Clinic, Rochester, Minn., using urease produced in the AFIP biochemistry laboratory.

Dr. Fishbein also hypothesizes that using hydroxamates to control ureolysis in ruminant animals on urea feeding would increase efficiency of nonprotein nitrogen utilization and reduce ammonia intoxication.

In conjunction with the Beltsville Agricultural Station at College Park, Md., Dr. Fishbein and his associates have conducted a preliminary study of the effects of acetohydroxamate in rumen fistulated sheep on diets containing 50 per cent of the nitrogen in the form of urea.

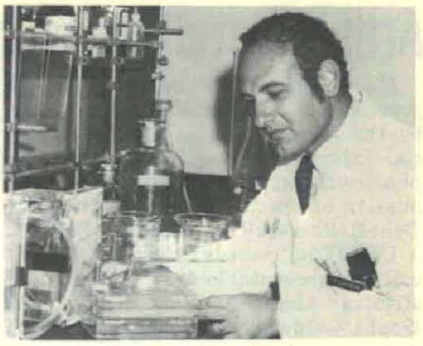
Oral doses of 10, 15 and 20 grams produced lower rumen ammonia levels, marked persistence of rumen urea levels, and no significant change in the bacterial flora, fatty acids or soluble fiber content in four test animals.

Only at the 20-gram dose, however, was the control over the ammonia and urea levels maintained throughout a 5-day trial. The 20-gram dose was used in a crossover study of nitrogen retention, and each animal more than doubled its nitrogen retention when acetohydroxamate was added to the feed.

The potential of urease inhibition as a therapeutic measure is especially significant for the Armed Forces because of the large number of personnel who suffer from hepatitis or cirrhosis of the liver.

Statistics show that there is a one-half percent incidence of transfer of serum hepatitis when blood is transfused. The high number of blood transfusions necessary under combat conditions makes transmission of hepatitis a serious problem for military personnel. Much of the urease research has been supported by Army R&D grants.

Dr. Fishbein cited another potential clinical use of urease inhibition: "The increasing use of organ transplantation indicates that even an interim recovery from hepatic or uremic coma might provide the necessary hiatus for surgical replacement of the diseased organ, with ultimate full recovery. The hydroxamic acids may also be useful in treatment of patients with septicemia and urinary tract infections due to urease-producing bacteria."



Dr. William N. Fishbein

AFIP research seeks to evaluate molecular forms of urease and its complexes with inhibitors and with substrates; also, the pharmacology, toxicology and metabolism of hydroxamic acids, and the physiological function of urease.

Nationally known for his research with the enzyme urease, Dr. Fishbein is the author or coauthor of 30 publications on urease and related subjects. He has BA and MD degrees from Johns Hopkins University and a PhD in biochemistry from the University of Maryland.

In 1968 he was awarded the A. Cressy Morrison Award by the New York Academy of Sciences for his scientific paper, "The Structural Basis for the Catalytic Complexity of Urease: Interacting and Interconvertible Molecular Species." The paper was cited for "embodying the results of the most original research in the natural sciences."

Dr. Weigle Appointed Director of Benet R&E Labs

Watervliet (N.Y.) Arsenal Chief Scientist Dr. Robert E. Weigle, who has served in that capacity since 1962, recently was given an additional title as director of the arsenal's Benet Research and Engineering Laboratories.

Dr. Weigle received BCE, MS and PhD degrees (1951–57–59) all from Rensselaer Polytechnic Institute (RPI), Troy, N.Y., and was an associate research scientist at RPI until he joined the arsenal staff as chief of research in 1959.

CONGRATULATIONS are extended to Dr. Robert E. Weigle on appointment as director, Watervliet Arsenal's Benet R&E Labs, by arsenal CO, Col William Mulheron Jr.

In 1963 he was one of two U.S. representatives who attended the NATO Arms Conference in Paris. Since 1963 he has served as a member of the Army Mathematics Steering Committee and in 1969 was appointed a member of The Army Research Council.

Dr. Weigle is a member of numerous professional associations and serves on the Department of Defense Committee for Research, DoD Forum on Physical Engineering and Sciences, and the Gun Tube Technology Committee of the National Materials Advisory Board, National Academy of Sciences.

His achievements in research have earned him a Presidential citation for distinguished service as a civilian employe and the Army's Meritorious Civilian Service Award.

Army Dental Research Supports National Interests in Oral Health

Manpower losses attributable to problems of oral health, compounded by the high percentage of maxillofacial injuries in modern warfare, emphasize the growing importance of the mission of the U.S. Army Institute of Dental Research in Washington, D.C.

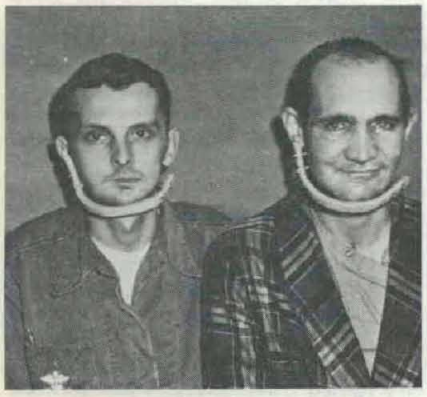
USAIDR records show that sick call for preventable oral diseases constitutes almost a "medical catastrophe"—10,000 to 15,000 personnel daily, on the average, who are involved as patients of dental staff members.

Studies during two large-scale field exercises showed a projected annual rate for emergency dental conditions of 184 for every 1,000 men. Statistics, however, did not fully illustrate the magnitude of the problem, because the exercises did not last long enough for cases of acute dental diseases or oral soft tissues to reach the maximum.

Modifications and applications of civilian practices of dentistry have resulted in improved military dental treatment. Still the urgency to attain and maintain levels of oral health that will keep soldiers combat-ready for necessary periods, and to give expeditious treatment to injuries, calls for new concepts.

Originating and developing such concepts is a prime function of the USAIDR—innovations that will do the job of restoring the oral health and well-being of the soldier faster and better, and thus reduce greatly the present manpower loss rate.

Established in January 1962 as a Class II activity of the U.S. Army Medical Research and Development Command, the USAIDR is located at Walter Reed Army Medical Center. Created as the Army's major agency for dental research, the USAIDR is organized into Divisions of Pathology, Oral Biology, Dental Materials, Preventive Dentistry, Surgery, Clinical R&D.



USAIDR is credited with an impressive array of achievements, including a Biphase Appliance for treatment of mandibular fractures. Shown above, the appliance has particular merit in avulsive type injuries in which fragments can be maintained in position until grafting of tissue is completed.

Col Surindar N. Bhaskar
USAIDR Director

The USAIDR role is to support national interests in the oral health of military forces who are prepared to live and fight in all environmental extremes of the earth.

Included on the staff, in addition to specialists in the clinical specialties of dentistry, are military and civilian scientists qualified in the areas of pathology, biochemistry, microbiology, pharmacology, radiation biology, epidemiology, physiology and nutrition.

While USAIDR is organized on divisional lines, research is approached functionally, resulting in fully integrated programs. This ensures that the total resources of the Institute are brought to bear on a recognized problem and its ultimate solution. The mission includes:

- Conducting research in the etiology, prevention, and control of oral diseases of military importance.
- Developing simplified techniques which will allow rapid and effective dental treatment to include maxillofacial injuries.
- Conducting investigations on the physical and chemical properties of dental materials, and the effect of manipulation and other variables on these properties.
- Conducting education and training programs in dentistry for the maintenance of high professional treatment standards.

PREVENTIVE DENTISTRY. The ravages of dental and other oral diseases need to be corrected and controlled during the period that inductees become battle-ready soldiers prepared for duty in any environment throughout the world.

This treatment requirement for the U.S. Army Dental Corps will continue to be heavy until nationwide civilian practice of preventive dentistry provides a greater conservation of oral and dental structures. Progress of science in civilian agencies and the National Institutes of Health will produce some of the answers the Armed Forces need for treatment of large numbers of patients.

An urgently demanding requirement exists for research and development in the Army because of the large disparity between the oral health of the soldiers and the means historically available to condition soldiers for combat.

This disparity is brought into sharper focus when one considers counterinsurgency campaigns and limited warfare, in which small groupments of men wage battles important to our nation in areas isolated from definitive, sophisticated treatment facilities.

Since World War II, and recently through the U.S. Army global programs of preventive dentistry practice and research, there has been a confluence of research rewards, bringing a realization that completely effective oral health for masses of men is a distinct probability within the foreseeable future.

USAIDR scientists estimate that, within our lifetime, preventive dentistry, improved patient and practice management techniques, and advances in the science of dental materials, will make losses from duty for routine dental treatments nearly negligible compared to present rates.

In its studies, the USAIDR uses the interdependent combination of the controlled population groups, definitive record systems of the U.S. Army, special field teams, its own exceptionally skilled staff of scientists, and consultation with specialists in other laboratories.

COMBAT CASUALTIES. The latest survey of injuries resulting from combat in Vietnam reports that approximately 15 percent of surgical admissions to hospitals were primary maxillofacial injuries. Primary admission for other type injuries but with concomitant maxillofacial injuries more than doubles the number of patients requiring treatment for maxillofacial wounds.

The Emergency War Surgery NATO Handbook states that maxillo-

facial injuries are an exception to the general rule and can be closed at the time of initial surgery. Improved methods for wound debridement and delayed primary closure of severely traumatized and contaminated facial wounds are being investigated due to the high percentage of wound breakdown occurring with this treatment technique.

The excellent esthetic and functional results from oral surgery observed in fixed installations are the product of complex, time-consuming, definitive procedures, requiring many professional personnel. When oral surgery is to be performed in field medical units serving highly mobile ground combat forces, the needs for simplified surgical procedures and for improved triage and evacuation methods become extremely important.

In USAIDR's searches for expeditious modes of treatment and control of oral injuries, it is emphasized that for the most effective care possible the basic life sciences that govern the physiology of the oral cavity must be understood.

Interdisciplinary approaches and collation of research resources with the professions of medicine and dentistry by USAIDR's staff seek early clinical and battlefield application of research results.

FIELD TECHNIQUES. Intensive investigations are being undertaken of the traditional methods of performing clinical dentistry, of the techniques used in laboratories, and the large-scale use of preventive dentistry measures.

U.S. Army-sponsored research in physical properties of dental materials began several decades ago. It has resulted in various items which have become standards of excellence for international dentistry.

Continuing studies by USAIDR are directed to modern battlefield requirements for the manipulation and uses of various materials in environmental extremes. As a result, several important applications have been made and accepted in clinical field practices.

Strides in improving dental laboratory processing techniques are being made, and have resulted in savings in materials and manpower. USAIDR leaders recognize the continuous need for new dental materials and laboratory techniques, oriented to combat service support, and for research to exploit new knowledge from biological and physical sciences.

Closely allied with these programs in dental materials and simplification of field dental techniques is a continuous cognizance by USAIDR of the blending of biological and physical research with the emerging new generations of instrumentation.

Lightweight, rugged, and dependenable instruments are necessary for the military dentist to support combat troops in scattered, remote and isolated battlefields of the future. To this end, USAIDR's capability in biomechanical engineering is in process of being expanded.

EDUCATIONAL PROGRAMS. Logical extensions of the functions of an organization devoted to mission-oriented research are educational programs—concepts of basic scientific principles and research-improved therapeutic technologies communicated to the clinicians. Researchers are thus exposed on a continuing basis to the operational problems and needs of the U.S. Army.

USAIDR efforts involve advanced graduate and postgraduate continuing education. A 1-year course, the Advanced Theory and Science of Dental Practice, is conducted each year in affiliation with the Georgetown University Graduate School.

This course is designed to provide for a further understanding of the basic sciences and the ability to evaluate objectively and correlate scientific principles which govern clinical procedures.

Advanced graduate level education in the basic sciences and allied biomedical disciplines, coordinated with clinical experiences and oriented to hospital protocol, prepares selected Dental Corps officers for advanced clinical or research training.

Postgraduate continuing education consists of eight week-long courses presented annually covering all fields of specialized dental practice to make the latest diagnostic, technological and therapeutic information available to both specialist and general practitioner Dental Corps officers.

Annual attendance at these courses has been averaging nearly 1,200 persons, with other military and many civilian dentists and physicians in attendance.

Live television coverage and videotaped productions of patient treatment demonstrations are included in these programs. In addition, excellent movie, audio-tape and video-tape libraries and a comprehensive collection of pathology slides are available for basic science and clinical specialty training in both the graduate and postgraduate programs.

Results of the educational program interactions between researcher and clinician are evidenced by the many significant contributions to the development of new treatment regimens leading to the improved health and capability of Army personnel.

ACHIEVEMENTS. Though the USAIDR is a young organization, it is credited with an impressive array of achievements, including

- New concepts of wound healing therapy, infection processes and radiation damage.
- Cortical pin technique for fixation of mandibular fractures applicable to fixed facilities and field use.
- The Biphase Appliance for treatment of mandibular fractures. This appliance has particular merit in avulsive type injuries in which fragments can be maintained in position until grafting procedures can be performed.
- New technique of delayed closure of heavily contaminated facial wounds.
- Evaluation and establishment of techniques for use of the Preventive Dentistry Paste.
- Development of a rapid polymeric splinting material.
- Evaluation of the fluid resin technique for fabrication of denture bases.
- Use of bone marrow grafts in maxillofacial deformities and wounds.
- Use of water jet devices in the management of maxillofacial wounds.
- Development of isobuytyl cyanoacrylate as a post extraction and surgical dressing.
- Improved cold sterilization procedures for field use.
- Improvement of patient education techniques through motivational studies.
- Development of new rapid and reliable technique for transplantation of oral soft tissues.
- Improved techniques for self-applied means of plaque removal.

(*Continued on page 32*)

PULSE HEIGHT Analyzer is used in neutron activation analysis to provide quantitative trace metal data on acceleration of wound healing at USAIDR.

Army Dental Research Supports National Interests

(*Continued from page 31*)

• Control of properties of chromium type base metal alloys.

• Use of ultrasonic devices in management of oral disease.

• Autogenous grafts for replacing temporomandibular joints and mandibular condyles.

• Development of a new method of pulp capping.

• Studies leading to the development of the Dental Combat Effectiveness Program, which has reduced the morbidity rates for oral disease in Vietnam to 84 per 1,000.

As an indicator of the scientific successes of CY 1969 activities at USAIDR, 27 papers were published by staff members, 108 lectures were delivered on an invitational basis outside of USAIDR to civilian and military scientific groups, and 13 abstracts were presented at the meeting of the International Association of Dental Research.

CHALLENGES. The nature of the operational requirements of the U.S. Army Dental Corps will continue to emphasize support of research and development activities. Present and planned projects include:

• Evaluation of anticariogenic agents for Army use.

• Development of improved and/or new combat restorative materials.

• Development of new biodegradable materials for use in the treatment of fractures and wound closures.

• Further investigations into the use of cyanoacrylates in the management of oral soft tissue diseases.

• New and improved techniques for grafts and bone regeneration.

• Studies on the identification and control of oral infections.

• Simplification and improvement of emergency surgical procedures.

• Further studies on wound healing therapy and prevention of radiation damage.

New Director Shows Pride In USAIDR Achievements

When Col Surindar N. Bhaskar became director, U.S. Army Institute of Dental Research (USAIDR), Washington, D.C., one of his first actions recently was to evidence pride in achievements of the institute.

In listing recent research advances, he mentioned the new water jet lavage technique for debridement of orofacial wounds (see page 33 feature) and a chemical antibiotic adhesive. Col Bhaskar called attention to the American Dental Association's evaluation of USAIDR investigations in three of the past four years as among the 10 most clinically significant dental studies in the nation.

The USAIDR staff, it was pointed out, includes expert pathologists, physiologists, biochemists, bacteriologists, mechanical engineers, public health dentists, metallurgists and electronic engineers—all of whom are also dentists. Their findings are published extensively in news media.

Col Bhaskar has published 145 original contributions to professional journals and seven books. He has a doctor of dental surgery degree from Northwestern University and a master's and a doctor of philosophy degree from the University of Illinois.

A Diplomate of the American Board of Oral Pathology and the American Board of Oral Medicine, he serves as an associate professor at Georgetown University Dental School and as a consultant in oral pathology to the Assistant Surgeon General and the chief of the Army Dental Corps.

STRATCOM to Install Improved Radio System in Iran

Fifty communications experts from the U.S. Army Strategic Communications Command's Engineering Installation Agency (CEIA) will install an improved radio system at more than 2,000 sites in Iran.

In charge of the project for CEIA is L. Red Bauhs, who said the agency team will equip the sites and install antennas on 100-foot towers on terrain ranging from mountains to desert, in temperatures varying from 125° F. to minus 18° F.

Col Daniel R. Walley, commander of the STRATCOM Field Office-Iran, said many of the sites can be reached only by burro, camel or man-pack. The Iran field office is responsible for total system implementation as well as advising and assisting the Gendarmerie and the U.S. military mission in Iran.

To insure continued operation of the system that will link district, regiment, battalion, company and post headquarters, a signal school was opened last year. Initial enrollment was 90 students and the goal is to train more than 3,000 Iranians.

Dr. Reilley Returns as ODDR&E Deputy (Research)

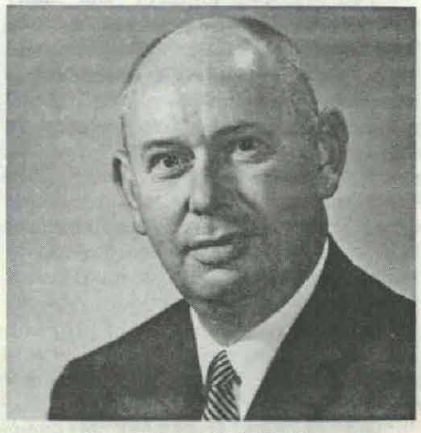
Dr. Edward M. Reilley returned in July to the position of Deputy Assistant Director (Research), Office of the Deputy Director of Research and Engineering, which he left in July 1967 to become the first director of Post Office Research and Development.

Dr. S. Benedict Levin, who had succeeded him as ODDR&E Deputy Assistant Director for Research, resigned in February 1970 to become executive vice president of the Earth Satellite Corp., Washington, D.C.

Dr. Reilley was founder and, until he transferred to ODDR&E in 1964, first director of the Institute of Exploratory Research, Army Electronics Command. Dr. Levin succeeded him there and served until he moved up to ODDR&E when Dr. Reilley went to the Post Office Department.

Lt Col Sylvester L. Wilhelmi left the position of executive officer to the Director of Army Research to become military assistant to Dr. Reilley. Lt Col John N. Albertson, formerly chief of the Medical and Biological Sciences Branch, Life Sciences Division, OCRD, succeeded Col Wilhelmi as executive to the Director of Army Research.

Cmdr Clell N. Ammerman, who was military assistant to Dr. Levin, has become military assistant to Dr. Donald M. MacArthur, Deputy Director (Research and Technology), ODDR&E.



Dr. Edward M. Reilley

ISF Winners Visit Army Labs

Seven of 10 high school science students selected by a panel of Army judges as Superior Award winners at the 21st International Science Fair in May at Baltimore, Md., have decided on one-week, all-expense paid visits to Army in-house labs, as follows:

Debbie Anne Meloy, Fairfax, Va., about July 19 to the Cold Regions Research and Engineering Laboratory, Hanover, N.H. *Beverly Ann Fordham*, Dallas, Tex., about Aug. 2 to U.S. Army Natick (Mass.) Laboratories. *Maynard M. Herron*, Manter, Kans., about July 12 to the Harry Diamond Laboratories, Washington, D.C. *Stephen E. Wade*, Moorefield, West Va., about Oct. 4 to U.S. Army Waterways Experiment Station, Vicksburg, Miss. *David H. McDaniel*, Clarksburg, W. Va., about Aug. 2 to the Pitman-Dunn Research Laboratories, Frankford Arsenal, Philadelphia, Pa. *Robert C. Benjamin*, Melbourne, Fla., about Aug. 16 to the Pitman-Dunn Research Laboratories. *Bruce C. Marusich*, Clinton, Md., about Aug. 12 to the U.S. Army Natick (Mass.) Laboratories.

Tests Show USAIDR Water Jet Device Effective for Cleaning Orofacial Wounds

U.S. Army Institute of Dental Research (USAIDR) investigators have developed a pulsating water jet technique which tests indicate is three times as effective for cleaning orofacial wounds as the conventional bulb syringe method. The USAIDR is an element of the Army Medical Research and Development Command.

The easily portable water jet device is relatively inexpensive and prototypes were recently sent to Vietnam for experimental use in cleaning orofacial wounds. Researchers at USAIDR, located at Walter Reed Army Medical Center, Washington, D.C., studied effects on debridement of combat wounds and found the pulsating jet to be preferable to a continuous water stream.

Studies which yielded the pulsed technique of water jet lavage, or wound cleansing, were begun at USAIDR in 1966. High-speed cinematography showed that a continuous water stream hit the soft tissues and kept the area of impact in a continuously compressed state.

The pulsating water jet, however, produced a compression phase and an interpulse phase during which impacted tissues were decompressed. Tissues pulse or "breathe" when a pulsed water jet is applied to the wound.

Experiments showed that the interpulse decompression permitted debris to escape from a wound, while the continuous compression phase caused by nonpulsed water jets interfered with debridement of the wound.

Col Surindar N. Bhaskar, DDS, Director of USAIDR, commented that the water jet device is especially useful in Vietnam where many missile wounds involve dirt imbedded in the flesh.

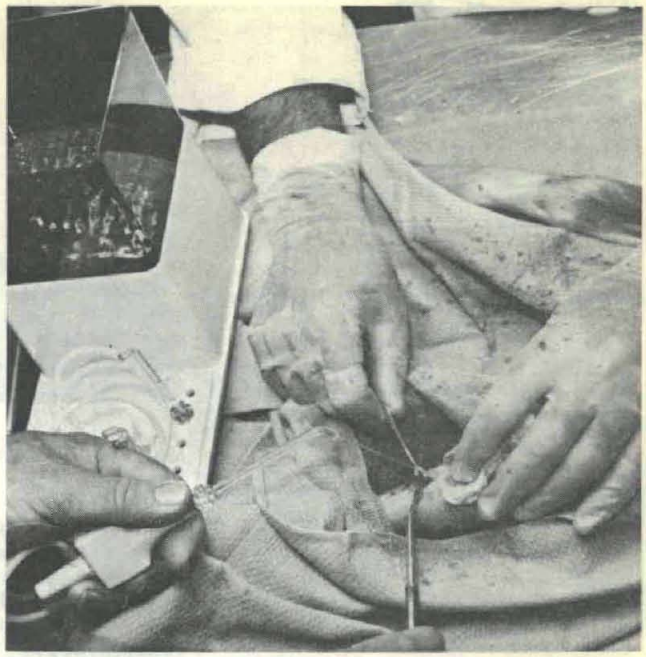
USAIDR water jet lavage researchers include Division of Pathology Chief Lt Col Duane E. Cutright, Lt Col Arthur Gross, Lt Col Bienvenido Perez and Maj Joe D. Beasley III. Dr. Joe Frisch of the Department of Periodontics, University of Southern California School of Dentistry, Los Angeles, also has worked on the technique.

Pulsed water lavage was also found to be more effective than the conventional bulb syringe in removing bacteria from infected wounds. Adding antibiotics to the water emitted from the pulsed water jet increases effectiveness of the lavage.

USAIDR studies indicate that a pulsating water jet is one-fourth less harsh on tissues than a continuous water jet stream of the same pressure. For undamaged gingival (gum) tissues, a pulsed water jet up to 90 pounds per square inch (psi) proved acceptable. In treating inflamed or ulcerated oral tissues, water pressures of between 50 and 70 psi are recommended.

The pulsed water jet is termed more effective because tissues can withstand a greater pressure if the jet stream is pulsed than if it is continuous in treating orofacial wounds.

Col Bhaskar believes it also will prove an effective method for general use in debridement of wounds.



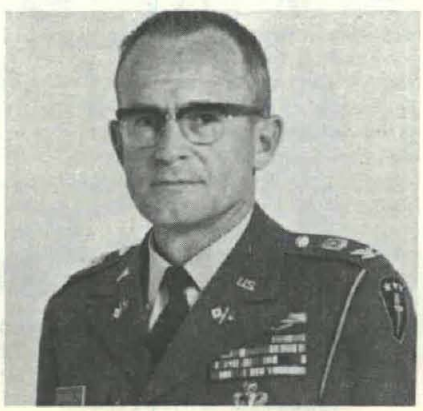
ORAL PATHOLOGY Division Chief Lt Col Duane E. Cutright uses a pulsating water jet device to debride wound on a rhesus monkey at the U.S. Army Institute of Dental Research. Tests indicate that it is three times as effective as the conventional bulb syringe method.

Col Swenson Becomes Commander of ACSA

Command of the U.S. Army Communications Systems Agency, a Strategic Communications Command element at Fort Monmouth, N.J., will be assumed in August by Col (Brig Gen designate) Richard W. Swenson, upon retirement of Col William D. Canfield.

Awaiting his turn on the order of promotion list to general rank, Col Swenson will serve concurrently as the Army Materiel Command project officer for Strategic Army Communications (STARCOM). He is director, Plans and Operations, Safeguard Communications Agency, Strategic Communications Command (STRATCOM) at Fort Huachuca, Ariz.

Managerial responsibilities of Col Swenson as ACSA commander include global communications systems acquired by the Army for joint Armed Forces operation under the Defense Communications Agency.



Col Richard W. Swenson

ACSA also is charged with meeting requirements of other U.S. Military Departments and nonmilitary government agencies, as well as cooperation with allied government and military organizations in establishing overseas communication networks.

ACSA procures a wide range of communications equipment and is managing some 400 contracts. Involved are more than 2,500 communications items such as power plants, computers, antennas, transmitters and receivers.

Among its major projects are the Integrated Communications System for Southeast Asia, Automated Digital Network, and the Automatic Secured Voice Communications System. Systems projects include microwave, cable and tropospheric scatter facilities worldwide. ACSA has liaison offices at Fort Huachuca, Philadelphia and Washington, D.C., with field offices in Europe, the Pacific and Southeast Asia.

Col Swenson has a degree from Cornell University and is a graduate from the Army War College, Command and General Staff College, and the Armed Forces Staff College.

Kudos

MERITORIOUS CIVILIAN SERVICE. *George M. Sokol,* deputy for Technical Management and chief scientist for the U.S. Army Computer Systems Command (USACSC), recently received the MCSA for "exceptional and exemplary service" from October 1967 to April 1970.

Brig Gen Wilson R. Reed, USACSC commander, presented the Army's second highest civilian employe award to Sokol for his "experience, zeal, insight and judgment which exerted an influence on the automation effort in the Army far beyond anything technical."

Sokol joined the Automatic Data Field Systems Command (predecessor to USACSC) in 1967. He earned a BS degree in electronics and physics from Harvard University and has completed graduate courses in digital computer design at University of California, Los Angeles, and math and physics at the University of Maryland.

He was employed by the U.S. Naval Ordnance Laboratory (1947–51) and then joined Sylvania Electronic Systems as manager of the Development Laboratory until 1967.

Maj Gen Edward L. Rowny, former Deputy Chief of Research and Development, presents Army Commendation Medal to his son, Lt Paul J. Rowny. Lt Rowny received the medal while serving as special assistant to the executive officer of the first Advanced Individual Training Brigade at Fort Leonard Wood, Mo. He is an ROTC graduate of Johns Hopkins Univ.

Thomas J. Mahler, chief, Special Items Division, Commodity Management Office at Picatinny Arsenal, Dover, N.J., was recently awarded the MCSA. Col W. A. Walker, Arsenal commander, cited him for superior performance as commodity manager of the Sheridan Weapon System ammunition from 1963 to date.

Mahler was acclaimed for "total dedication and competence in managing the development, production and deployment of a family of ammunition that significantly advanced the state-of-the-art and contributed to the effectiveness of the Armed Forces."

OUTSTANDING CIVILIAN SERVICE. Two civilian physicians, one who evaluated the nutrition of indigenous troops in Iran and Pakistan and another who is a former nutrition consultant to the President, recently received OCS Medals from Lt Gen Hal B. Jennings Jr., the Army Surgeon General.

Dr. Herbert Pollack and Dr. John B. Youmans were praised for contributions to military nutrition. They were cited especially for service to the Army's Medical Research and Nutrition Laboratory at Fitzsimons General Hospital in Denver, Colo., an element of the U.S. Army Medical Research and Development Command.

Dr. Pollack received his medical degree from Cornell Medical School in 1929 and later earned a doctoral degree in physiology. He entered the Army in 1942 and worked in the Office of the Surgeon General as a nutrition specialist. He ended his active Army career in 1946 as chief medical consultant in the European Theater of Operations.

As a civilian consultant to The Surgeon General for 18 years, Dr. Pollack has assisted in solving clinical nutrition problems. In 1952 he surveyed the nutrition of civilians and Army troops in Korea. He then evaluated the diet of Nationalist Chinese troops. Acting on his suggestions, the Chinese Government practically eliminated nutritional deficiencies among its troops.

Dr. Pollack has been a consultant to the President, the Secretary of War, Food and Drug Administration, Federal Aviation Agency, U.S. Public Health Service, National Research Council, the Department of Defense and other federal agencies.

Dr. Youmans received bachelor's and master's degrees from the University of Wisconsin and in 1919, earned a medical degree from Johns Hopkins Medical School. He has served most of his career as an instructor and professor of medicine at the Universities of Michigan, Vanderbilt and Illinois. In 1950 he became the dean, professor of medicine and director of medical affairs at Vanderbilt.

In 1916–17 he was an Army enlisted

AMMRC Scientist Wins SARS Fellowship

Scientist Robert M. Colton has been selected to spend a year at the University of Birmingham, England, on a Secretary of the Army Research and Study (SARS) Fellowship. Colton is chief, Materials Engineering Division, Army Materials and Mechanics Research Center (AMMRC) in Watertown, Mass.

During his fellowship year Colton will visit research institutes and universities in Germany, Norway, Ireland, Belgium and the Netherlands. The SARS program is designed to encourage development of civilian employes whose records indicate outstanding potential for future service to the Army.

Working with Dr. S. Tobias, an expert in the field of high-energy forging and plasticity studies, he will conduct an analysis of deformation processing of high-strength alloys.

During his 12 years with AMMRC and its predecessor agencies at Watertown, Colton has authored or coauthored 38 technical publications and reports on metallurgical research, specializing in high-energy forming and fabrication of missile components. The technical community uses his services as a consultant and his publications on titanium alloy development as reference sources.

Colton has been responsible for preparing the Five-Year Wrought Metals Plan for the Army Materiel Command and is a consultant in metallurgy to the Advanced Research Projects Agency of the Department of Defense.

SARS winner Robert M. Colton (right) receives notification of research and study grant from Dr. Alvin E. Gorum, director, Army Materials and Mechanics Research Center.

man assigned to a hospital train. During World War II, he was a colonel in the Army Medical Corps, assigned to the Office of the Surgeon General as director of the Nutrition Division.

He traveled to the Southwest Pacific to investigate the nutrition of U.S. troops and also evaluated nutritional problems of Chinese troops in the China-Burma-India Theater of Operations in 1944. The next year he was in Europe assisting in nutrition surveys of civilian populations.

Dr. Youmans helped persuade The Army Surgeon General to begin a separate unit concerned with nutrition training and research. When released from the Army in 1946, he became a consultant in nutrition to The Surgeon General.

While a consultant to the Interdepartmental Committee on Nutrition for National Defense, Dr. Youmans directed nutrition surveys in 1956 of the Armed Forces of Iran and Pakistan.

LEGION OF MERIT. *Col Norman R. Rosen,* slated to return to the Office, Chief of Research and Development, Sept. 1, as Assistant Director of Army Research and CO, Army Research Office, was awarded the LOM for service with Supreme HQ Allied Powers Europe (SHAPE) from July 1967 to July 1969.

As chief of the Land and Missiles Installations Section, Infrastructure Branch, Logistics Division, SHAPE, he was responsible for the staff supervision of the implementation of the infrasturcture required to support SACEUR's missile, special ammunition storage, war headquarters and land training installation programs.

The citation states his "mature judgment" guided the programing and construction in nine nations "during the difficult period when important aspects of the programs were disrupted. Another exceptional accomplishment was to obtain the construction of 1,600 sets of family quarters.

"He patiently and tenaciously carried out negotiations with the Belgian Government which resulted in the initiation of a program of construction of the required housing as well as the SHAPE International Hospital."

MERITORIOUS SERVICE MEDAL. Brig Gen George H. McBride, deputy CG of the U.S. Army Missile Command, recently presented the MSM to *Lt Col Marshall L. Byrd* during ceremonies at Redstone Arsenal, Ala.

Reassigned recently to Germany, Col Byrd was cited for ". . . distinguished service as chief of the Personnel and Training Office at the command and later as secretary of the General Staff."

SPECIAL ACT AWARD. The design and construction of a tornado simulator as a research project earned *Lonnie D. Antwiler,* a Weapons Command (WECOM) mechanical engineer, a $250 Department of Army special service award.

Capable of producing air velocities up to 138 miles per hour, the simulator enables engineers to study the effects of a miniature twister on structures built to scale.

In presenting the award, Col C. P. Alter, WECOM director of Research and Engineering, stated that projects like this provide a significant tool to aid in the understanding of tornadoes and the design of public and private structures to prevent the loss of life and property.

COMMENDATIONS. Office of the Chief of R&D, HQ DA. Certificates for Outstanding Performance Ratings (OPR) were awarded as follows:

Director of Missiles and Space. Mrs. Betty F. Kleindienst; Mrs. Mildred B. Pence, OPR with Quality Step Increase.

Technical and Industrial Liaison Office. L. VanLoan Naisawald.

Chief Scientist, DA, Dr. Marvin E. Lasser was awarded a Certificate of Achievement.

APG Employes Receive $1,000 Under Incentive Awards Program

Special Act or Service Awards of $1,000 each under the Army Incentive Awards Program at Aberdeen (Md.) Proving Ground, were presented recently to William P. Wright and John W. Kramer.

Dr. R. J. Eichelberger, director of the Ballistic Research Laboratories, presented the award to Wright. Dr. Joseph Sperrazza, acting director of the Aberdeen Research and Development Center, made the award to Kramer.

WRIGHT, a physicist with the Ballistic Research Laboratories, received the award for developing a data flow system that logically and visually relates all 13 technological areas required in the Army Materiel Command Nuclear Weapons Effects Research and Test Five-Year Plan.

For the first time, the system provides a means of relating the multitude of research tasks in the areas and identifying technological gaps and duplication. It also provides a definitive and objective basis for funding, managing and executing a large multidiscipline, multiagency scientific research program.

KRAMER, a physical scientist at the Aberdeen R&D Center, was credited with initiating a Department of Defense-sponsored study, the results of which led to a marked improvement in the effectiveness of some major weapons systems in Southeast Asia.

Further, as coordinator of a joint-service group on operational effectiveness of non-nuclear munitions, he was influential in establishing coherent joint-service programs which are leading to more efficient munitions.

Security Agency Appoints Hovey ADCS for R&D

Herbert S. Hovey Jr., a supervisory engineer, was recently appointed U.S. Army Security Agency Assistant Deputy Chief of Staff for Research and Development (ADCSR&D) at Arlington Hall Station, Arlington, Va.

The appointment converted the space formerly held by a colonel to a civilian position at GS–16 level.

As ADCSR&D, Hovey shares with his deputy, Col Jack Riggins, top management responsibility for the command's research, development, test and evaluation activities. He also is vice chairman of the USASA Technical Committee.

After receiving a degree in electrical engineering from the University of Florida in 1957, he entered the Army as an ROTC graduate and has been with USASA for 12 years. When the Office of the Deputy Chief of Staff for R&D at USASA was established in April 1960, Hovey was assigned as part of its original staff.

In 1964 he was among 23 winners of the prestigious annual Research and Development Achievement Awards presented by the U.S. Army Chief of Research and Development, in recognition of outstanding basic research by in-house laboratory personnel. He received the Department of the Army Meritorious Civilian Service Award in 1962.

Herbert S. Hovey Jr.

Packard Outlines Weapon Systems Acquisition Policy

(*Continued from page 2*)

made during the conceptual stage. If wrong decisions are made during this period the problems that are generated cannot easily be overcome later in the program.

Any new program will contain some risk that the technology involved cannot, within reasonable time and cost constraints, be converted into practical engineering design which meets the desired operating requirements. There are three ways in which this technical risk can be minimized:

1. *Risk Assessment.* The first is to make a careful assessment of the technical problems involved and a judgment as to how much effort is likely to be necessary in finding a solution that is practical. A careful look at the consequence of failure, even of "low risk" program elements, is also critical.

2. *System and Hardware Proofing.* The second and only sure way to minimize the technical risk is to do enough actual engineering design and component testing in the conceptual development stage to demonstrate that the technical risks have been eliminated or reduced to a reasonable level. Component or complete system prototyping, or backup development, are examples.

3. *Trade-offs (risk avoidance).* Since program risk and cost are dependent on practical trade-offs between stated operating requirements and engineering design, trade-offs must be considered not only at the beginning of the program but continually throughout the development stage.

Proposals for OSD approval of development programs shall include a description of how the Service or Agency intends to manage the program to include appropriate attention to (1) *Risk Assessment;* (2) *System and Hardware Proofing;* (3) *Trade-offs.* When a DCP (Development Concept Paper) is prepared, it shall reflect these in the management plan.

Small development projects which do not require specific OSD approval shall also be structured to reflect these considerations.

All new programs will be kept in the conceptual development stages until the responsible Service secretary and the OSD can be assured that the program is in the proper shape to proceed into full-scale development.

Full-Scale Development. Authorization to proceed into full-scale development will be given by OSD based upon a DCP and the recommendation of the DSARC (Defense Systems Acquisition Review Council). In making this recommendation, the DSARC shall consider in particular whether adequate risk reduction has been accomplished.

Even though risk has been adequately addressed during the conceptual development stages, full-scale development will uncover technical and engineering problems that need to be solved. Procedures shall be established in the development program by which these problems will be continually addressed in view of possible trade-offs with stated operating requirements, cost, and operational readiness date.

Furthermore, it is essential to have assurance that those problems encountered during the earlier development stages have in fact been solved. This requires that milestones be established to demonstrate achievement of objectives at appropriate points in the developing program. These milestones shall include such things as completion of appropriate stages in the over-all system design and testing of critical items of hardware, e.g., subsystems and components.

Consideration must be given in development to all matters necessary in a full operating system. This will include such things as maintenance, logistic support, training, etc. However, where these matters are dependent on the final production design, *as much of this work as possible should be delayed until the production stage.*

In general, RFPs (Request For Proposals) for the development stage should be carefully reviewed to eliminate demands for reports, documentation and work tasks which are not absolutely necessary for the efficient accomplishment of the actual development work. These considerations and demands must be limited to those which directly contribute to the design of the system itself.

Production. The most important consideration before moving into full-scale production on a new weapon system is to have assurance that the engineering design is completed, that all major problems have been resolved, and this has been demonstrated to the extent practical by actual performance testing.

At the DSARC review when the decision is made as to whether to proceed into full production, I want the responsible Service to certify that the following actions have been taken:

- All of the milestones which demonstrate the achievement of a practical engineering design have been met.
- All important engineering problems encountered during the development have been resolved with appropriate trade-offs, with stated operat-

Voltage Regulator Reduces Noise of Field Phones

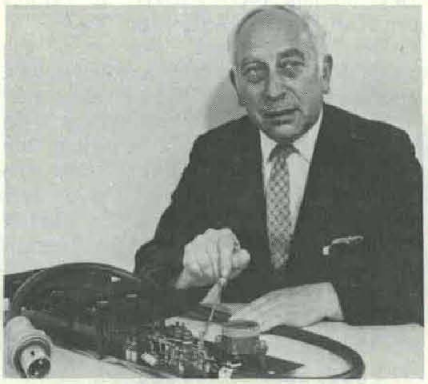
Complaints from Vietnam about excessive noise in field telephones have led to development of a transistorized voltage regulation system that reportedly reduces noise 99.97 percent.

The Army Electronics Command (ECOM), Fort Monmouth, N.J., designed the new solid-state voltage regulator, which has passed all electrical tests and is now undergoing environmental and mechanical testing for field service.

Engineers at ECOM's Communications-Automatic Data Processing (Comm-ADP) Laboratory found that the noise apparently came from accessory equipment, such as ringing generators and alternating current chargers linked to the batteries powering switchboards and telephones. They chose the voltage regulator, which was more economical and less bulky than filtering, as a solution to the noise problem.

The system clamps the voltage at 48 volts, although the battery power supply frequently goes to 55 volts and sometimes reaches 65 volts. The voltage control reduces power supply noise on tactical telephones by 35 decibels, a reduction of 3,000 to one. A beneficial side effect is that the incidence of burn-outs in switchboard lamps is reduced by protecting them from power surges.

The system was designed by Nathan W. Feldman, an electronic engineer in the Comm-ADP lab, and Mrs. Marylynne Jacobs of the Research and Development Technical Support Activity.



ECOM electronic engineer Nathan Feldman points to a component in the new transistorized voltage control designed to reduce noise in tactical telephones 99.97 percent. The regulator is under test for field service in Vietnam.

ing requirements so that the production, maintenance and operating costs are optimized.

The start-up of production must be scheduled to minimize financial commitments until it has been demonstrated that all major development problems have been resolved. In most cases production engineering and production tooling are necessary to demonstrate that the engineering has been satisfactorily accomplished. It may also be necessary to develop and demonstrate new production processes, methods and procedures. Thus, some limited expenditure on production may have to overlap development.

Contracts. In all our contracting, the type of contract must be tailored to the risks involved. Cost-plus-incentive contracts are preferred for both advanced development and full-scale development contracts for major systems. When the assessment of technical risk permits, such contracts should include provisions for competitive fixed-price subcontracts for subsystems, components and materials.

In many cases this will enable a major portion of the program to benefit from competition. When risks have been reduced to the extent that realistic pricing can take place, fixed-price type contracts should be used. But the contracting officer should have the flexibility to consider the technical capability of the contractor and other factors in selection of contract type.

When fixed-price contracts are used for development programs, the contractor's financial ability to absorb losses that might be incurred *must* be a factor in making the award.

It is, of course, desirable to award a fixed-price contract in a competitive environment. It has been proven to be difficult or impossible to achieve effective competition in a fixed-price contract for production for a major weapon system before full-scale development has been undertaken.

Consideration should therefore be given to the use of a negotiated fixed-price contract after the development has progressed to the point that the production design can be realistically specified. To the extent possible, a contract negotiated under these circumstances should encourage competition for subsystems, components and materials. In this way a substantial part of the cost can be established in a competitive environment.

The use of letter contracts should be minimized. Change orders should not be authorized until they have been contractually priced, or until contractual ceilings have been established.

This guidance is provided to the Services with the understanding that it is to be implemented within the established DCP and DSARC policies. Other reports and reviews are to be kept to a minimum, but the lines of communication between OSD offices and Service components must be kept open to insure actual programs are being implemented under this guidance.

To the extent that the above guidance conflicts with existing DoD Directives and Instructions, the policies stated herein will govern. Since these policies should be applied immediately, I would appreciate your distributing this memorandum to key personnel, including all program managers, involved in the acquisition of major weapon systems.

I want the appropriate regulations of OSD and the Services and Agencies to be changed or cancelled to reflect these policies. I have asked the DDR&E to take the leadership in accomplishing this and have suggested Sept. 1 1970 as the date for recommending changes to me.

Computer Group Moves From Germany to Fort Hood

Movement of the U.S. Army Computer Systems Command's Tactical Operations System Development Group from Heidelberg, Germany, to Fort Hood, Tex., was "95 percent completed" when the *Army R&D Newsmagazine* went to press.

Effective July 31, the group will become the TOS Element of the U.S. Army Computer Systems Command Support Group at Fort Hood. TOS is an on-line, near real-time automatic data processing system designed to increase tactical effectiveness of the field Army, by coordinating intelligence, operations and fire support information for decisions.

In a letter of appreciation to Brig Gen Wilson R. Reed, CG of the USACSC, General James H. Polk, U.S. Army Europe Commander-in-Chief, commended the group of 75 military and 13 civilian personnel in the TOSD Group for "professionalism, dedication and technical knowledge. . . ."

Col David E. Wright Jr. heads the TOS Element following an assignment as chief, Command and Control Division, Office, Deputy Chief of Staff of Operations, U.S. Army Europe.

Col Wright and his staff will be assisted by contractor personnel from Bunker-Ramo Corp. and Control Data Corp. in providing tactical ADP support to the Army's Project MASSTER (Mobile Army Sensor Systems Test, Evaluation and Review) organization. They will continue development of a fully militarized, fieldable version of the Tactical Operations System.

The present Tactical Operations System is composed of three basic types of data processing equipment. User Input/Output Devices (UIOD) enable a number of remotely located military users to communicate with the system and to interchange information with each other.

Other components are the Remote Station Data Terminals (RSDT), which are intermediate message processor/transmitters between the UIODs and a central computing facility, and the Central Computing Center (CCC). The CCC stores the command's data base, processes all incoming messages transmitted by RSDTs in subordinate commands, performs computations and transmits output messages.

ECOM Employe Earns PhD 'With Distinction' at UCLA

Under the U.S. Army Graduate Study Program, a 20-year employe of the Army Electronics Command, Dr. Frank Brand, 46, recently received his doctoral degree "with distinction" from the University of California (L.A.).

Dr. Brand was released from his duties as chief of the Integrated Electronics Division, Electronic Components Laboratory at Fort Monmouth, N.J., to attend UCLA for nine months while working toward his PhD degree. He has a BS degree (1950) and MS degree (1958), both in physics, from Polytechnic Institute of Brooklyn.

Dr. Frank A. Brand

During his 20 years with ECOM and its predecessor organizations, Dr. Brand has found time to pursue his advanced education interests, publish more than 50 professional papers, serve as a lecturer at Monmouth College, gain patents on three inventions, win election as a Fellow of the Institute of Electrical and Electronics Engineers (1966), receive an ECOM R&D Leadership Achievement Award (1965), and rear six children.

Dr. Brand also serves on the editorial staff of *Microwave Journal*, serves on the Advisory Group on Electron Devices, and is active as a member of the Armed Forces Communications and Electronics Association.

TACOM Tests Concept to Improve Wheeled Vehicle Mobility

By James K. Miatech

Innovative engineering to bridge partially the capability gap between wheeled and tracked vehicles in meeting U.S. Army requirements for soft-soil and cross-country mobility is incorporated in a new test model.

The Advanced Systems Laboratory at the U.S. Army Tank-Automotive Command (USATACOM), Warren, Mich., has conceived and developed a unique Wheeled Mobility Test Rig embodying a new propulsion method.

In response to ever-increasing emphasis on improved mobility requirements in recent years, USATACOM has originated and developed many novel concepts. Experimental models of special-purpose vehicles have incorporated articulated bodies, large wheels and various multiple-wheel suspension systems.

The Wheeled Mobility Test Rig (WMTR) combines the almost indispensable advantages of high road speed inherent in a wheeled vehicle with a capability of moving through off-road soft terrain where tracked vehicles have long demonstrated superiority.

The WMTR is envisioned to operate as a normal wheeled vehicle on roads and off-road where terrain will permit. When propulsion is no longer possible by conventional means due to adverse terrain, a shift is made to the new propulsion method.

This latter mode of mobility is not dependent upon the usual interaction between rolling wheels and the ground; it is a form of "walking" or "shuffling" made possible by a controlled suspension system which provides forward, rear and vertical wheel travel.

The suspension system allows each wheel to be moved forward individually while the other wheels remain stationary to provide the reactive force. After all the wheels have been advanced, the vehicle body is then brought forward with respect to the wheels.

Figure 1 shows the general configuration of the Wheeled Mobility Test Rig. This 4 x 4 articulated aluminum rig provides two degrees of freedom (roll and yaw) between the two bodies.

Fig. 1. Wheeled Mobility Test Rig

JAMES K. MIATECH is a project engineer with the Advanced Systems Laboratory, U.S. Army Tank-Automotive Command, Warren, Mich. In previous assignments at TACOM, he served as development engineer on special projects and conducted laboratory evaluation of vehicle components. Miatech is a 1964 graduate of Michigan Technological University with a BS degree in mechanical engineering.

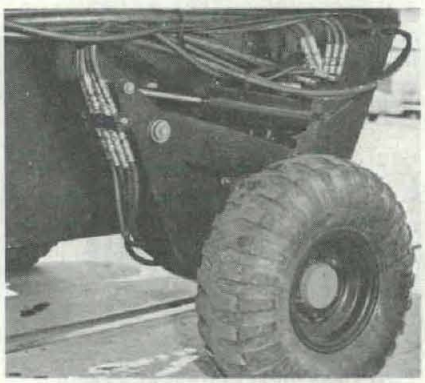


Fig. 2. WMTR SUSPENSION SYSTEM (closeup view) showing upper and lower leg members, lower member actuating cylinder, and hydrostatic motor inside the wheel. Upper member actuating cylinder is inside the hull.

The propulsion system of the rig consists of a 20-horsepower, air-cooled engine driving three hydraulic pumps through a 1.4:1 step-up gearbox.

Two main pumps drive a hydrostatic motor in each wheel, and the third pump supplies hydraulic power for the walking and control systems. Steering and controlled leg movements are accomplished by means of hydraulic cylinders.

The nature of the drive train in this rig requires individually powered wheels, rather than conventional mechanical means, and is well suited for application of either hydrostatic or electric systems.

Readily available, reasonably priced hydrostatic pumps and motors, combined with the requirement of several leg actuators, led to the utilization of an all-hydraulic system.

Individual wheel drive units combine a small .41-cubic-inch displacement motor with a 12.5:1 planetary gearbox. The main drive pumps have a displacement of .82 cubic inch per revolution and operate at pressures up to 5,000 psi. The auxiliary pump also has a capacity of .82 cubic inch per revolution and delivers fluid to the leg-actuating cylinders at a maximum pressure of 2,000 psi.

The suspension system (Figure 2) consists of hinged, structural members at each corner of the vehicle. The upper member is mounted through a rotary joint to the vehicle hull. A powered wheel is mounted to the lower member. The position of the upper member with respect to the hull and the relative position of the two members about their common hinge point are controlled by separate actuators.

The position of each of the wheels with respect to the vehicle body therefore can be selected by controlled actuation of the structural members about their pivot points.

The control system on the test rig is completely manual at this time. Operation of the vehicle in the normal riding mode is quite simple. A forward-neutral-reverse valve controls the direction; an accelerator pedal actuates the pump stroke pistons to

control speed; and a steering wheel actuates articulated-steer cylinders.

Dynamic braking from the motors is adequate to slow and stop the vehicle. However, floating disc brakes have been built into the wheel drive units to serve both as a back-up system and parking brakes.

Engine speed is adjustable from idle to a maximum of 3,600 rpm, but is maintained at a selected constant speed for vehicle operation.

Smooth operation of the rig in the walking mode requires dexterity on the operator's part. Control of the eight hydraulic cylinders ("hip" and "knee" joint for each wheel) is achieved by means of four joy sticks.

Each stick operates through an X pattern to control two valves, with each valve controlling a double-acting cylinder. Plumbing is such that each stick operates the hip and knee cylinders on one corner of the vehicle. Automatic cycling would be desirable and will be investigated.

When the vehicle becomes immobilized in mud because wheel sinkage resistance has become greater than the available tractive effort, the shuffling mode of propulsion is initiated. One wheel is moved forward through the mud while the other three provide the reactive force to prevent the vehicle from moving backward. The other three wheels are then pushed forward.

After all wheels have been advanced, the hydraulic cylinders are retracted simultaneously to bring the vehicle body back to its original position over the wheels. By repeating this cycle, a slow progressive movement through the mud can be achieved. Theoretically, as long as the vehicle is not bellied out, walking is possible.

The concept is that the walking action, when combined with vertical wheel control, will enhance negotiation of many obstacles. As the vehicle approaches an obstacle, the ground clearance could be increased by changing the vertical position of the wheels. With the wheels powered, and by proper manipulation of the leg cylinders, each wheel could be pushed up separately over the obstacle.

In some cases, just the increased ground clearance would be sufficient to overcome obstacles. Individual positioning of the wheels will also provide leveling of the vehicle for operation on either forward or side slopes.

Initial tests of the rig in mud have demonstrated the feasibility of the walking principle. Further testing is scheduled to determine its practicality for adaptation to standard wheeled vehicles, as well as its soft-soil performance characteristics in comparison with other military wheeled and tracked vehicles.

Army Dedicates $3.5 Million Academic Building at ALMC

Dedication of Bunker Hall, a $3.5 million academic building at the Army Logistics Management Center, Fort Lee, Va., gave General Frank S. Besson Jr. an opportunity July 21 to extoll Lt Gen William B. Bunker's contributions to improved logistics management.

General Bunker was deputy CG of the Army Materiel Command for five years prior to his death June 5, 1969, and in 1962–64 was AMC Comptroller and Director of Programs. From 1956 to 1962 he was CG of the U.S. Army Transporatation Materiel Command and its forerunner, the Transportation Supply and Maintenance Command.

General Besson was CG of the AMC from its inception in 1962 until he departed in February 1969 to become chairman of a Joint Services Logistics Review Board. When the board completed its work in June 1970, General Besson was assigned as Special Assistant for Logistics, Office of the Assistant Secretary of Defense (I&L).

In his glowing tribute to General Bunker's exceptional capabilities as one of the U.S. Army's most distinguished logisticians, General Besson was thus able to speak with the authority of long association with him during the organizational period of the AMC in 1962 and the tremendous logistics burden imposed by the Vietnam buildup.

General Bunker's memorial at the Army Logistics Management Center, where he was a frequent speaker and a guiding force in shaping its curriculum, is a 4-story structure containing 126,500 square feet of floor space.

The building has 16 classrooms with a capacity for 40 students each, four classrooms each accommodating 25 students, and 140 administrative offices. Features include a 30,000-volume library, 400-seat auditorium, cafeteria for 500, and a computer center and complex for instructional use.

Among those participating in the dedicatory ceremonies, during which a large portrait of General Bunker was unveiled, were his widow, Mrs. Crystle Carr Bunker, and a large gathering of military, local, state and federal government leaders.

Study Report Wins CDC Creative Thinking Award

Authorship of a study report on how to adapt an inexpensive gauge for predicting fatigue failure in helicopter rotor blades has won Army Maj Frederick F. Mayer a U.S. Army Combat Developments Command's (CDC) Creative Thinking Award.

Maj Mayer spent the last year as a student at the Army's Command and General Staff College, Fort Leavenworth, Kans., where his report was prepared as a treatise for graduation, based upon an exhaustive literature search of U.S. Government and private industry documents.

His study concludes: ". . . Many rotors fail in fatigue prior to calculated service life primarily because of overloading. The inexpensive S/N Gauge can be adapted to predict blade failure and update life, thereby preventing accidents or unnecessary early blade replacement. . . ." (S/N means cyclic stress versus number of cycles.)

Maj Mayer has a BS degree in military art and engineering from the U.S. Military Academy, West Point, and a master of science degree from Arizona State University where he studied for two years. He also gained first-hand experience on helicopters in his last assignment as a company commander and assistant operations officer with the 1st Air Cavalry Division in Vietnam.

His next assignment is to the CDC Infantry Agency, Fort Benning, Ga.

Lt Col Oddi Assigned as Chief CD&A Officer at Aberdeen PG

Chief of the Combat Development and Analysis Office, U.S. Army Small Arms Systems Agency, Aberdeen (Md.) Proving Ground, recently became Lt Col Vincent J. Oddi's title.

Col Oddi recently completed a tour in the Republic of Vietnam as commanding officer of the 2d Battalion, 27th Infantry (Wolfhounds), 25th Infantry Division. Prior to that assignment he was operations officer of the U.S. Army Limited War Laboratory.

Col Oddi has attended Infantry Officers Candidate School, Infantry Career Course, and Command and General Staff College, graduating in 1963. He attended Ohio State University and the University of Omaha.

Among the awards and decorations he is authorized to wear are the Silver Star with OLC, the Legion of Merit with two OLCs, the Distinguished Flying Cross, Bronze Star Medal, the Army Commendation Medal with two OLCs, the Purple Heart, Combat Infantryman Badge, and the Vietnamese Cross of Gallantry with Gold Star.

$1,000, Dr. Siple Award Technical Paper

TITLE: Structure and Lattice Dynamics of Metal Azides and Their Relationship to Stability

AUTHORS: TREVINO, CHOI, IQBAL, MICAL, PRASK and RAO
Picatinny Arsenal

ABSTRACT: The inorganic azides form a family of compounds exhibiting a broad range of properties of immediate military interest. For example, α-lead azide and $Ba(N_3)_2$ both of which possess similar complex structural properties differ markedly in explosive behavior; in contrast, several of the stable alkali azides possess, very nearly, the same relatively simple crystal structure as AgN_3, a sensitive primary explosive. A knowledge of the lattice dynamics (i.e. atomic vibrations and atomic forces) is essential for the understanding of macroscopic behavior but has up to now been attempted without employing all necessary experimental techniques. This work details the structure of BaN_6, in which the existence of more than one type of azide ion has been found and confirmed, and the lattice-dynamical properties of K, Rb, Cs and Ba azides. Each of these azides has been studied by infrared and Raman spectroscopy. In addition neutron scattering has been used to measure dispersion curves in KN_3([001] and [110] directions) for the first time for any azide; a full lattice -dynamical calculation has been completed and interatomic forces inferred. An explanation of the relative stabilities of alkali azides and AgN_3, $Ba(N_3)_2$, α-$Pb(N_3)_2$ and $Cu(N_3)_2$ based on their observed lattice-dynamical properties is proposed.

$500 Award Technical Papers

TITLE: The Role of Fracture Toughness and Residual Stresses in the Fatigue and Fracture Behavior of Large Thick-Walled Pressure Vessels

AUTHORS: DAVIDSON, THROOP and REINER
Benet R&E Laboratories, Watervliet Arsenal

ABSTRACT: In thick-walled cylinders such as cannon tubes exposed to repeated internal pressure, the fatigue life and the fracture mode are of concern. In large caliber cannon tubes, crack initiation occurs very rapidly due primarily to thermal effects at the bore surface. Thus, of concern in this case is how rapidly the fatigue crack propagates and the size to which it can grow prior to fracture.

In this investigation the fatigue and fracture behavior of large thick-walled cylinders, identical in size and configuration to the 175mm M113 cannon tube, were examined as a function of yield strength and fracture toughness level and with respect to the presence of residual stresses induced by autofrettage. An increase in fatigue life associated with the presence of autofrettage residual stresses was observed. Also, fatigue life increased with increased fracture toughness level, with the fracture mode changing from brittle to ductile. These results are interpreted and discussed in terms of recent fracture mechanics concepts. Analytical fracture mechanics relationships relating residual stress and fracture toughness level to cyclic crack propagation rate and relating fracture toughness to critical crack depth are presented and compared to the experimental results.

The results of the investigation are used to interpret the cause of premature fatigue failures encountered in the 175mm M113 gun tube and formulate the basis for a redesigned tube having a significant improvement in fatigue life over the original version.

TITLE: Temporary Cavity Effects in Blood Vessel Injury by High Velocity Missiles

AUTHORS: AMATO, RICH, LAWSON, GRUBER & BILLY
Biomedical Department, Edgewood Arsenal

ABSTRACT: Mechanical disruption of the blood vessels by high velocity

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Picatinny Team Wins Six Siple Medallions

(Continued from page 1)

Awards Program, which furnished a total of $3,600 for authors of nine prize-winning papers out of the 100 presented at five concurrent sessions each day of the conference. Award winners and titles of their papers are:

- "The Role of Fracture Toughness and Residual Stresses in the Fracture Behavior of Large Thick-Walled Pressure Vessels," which won $500 shared by Dr. Thomas Davidson, Joseph F. Throop and Albert N. Reiner. All are with the Benet Research and Engineering Laboratories, Watervliet (N.Y.) Arsenal.
- "Temporary Cavity Effects in Blood Vessel Injury by High-Velocity Missiles," a $500 winner for a 5-man Army Medical Corps team. Maj Joseph J. Amato, Lt Col Norman M. Rich, Maj Noel S. Lawson, Capt Ronald P. Gruber and Capt Lawrence J. Billy are assigned to the Biomedical Department, Biophysics Laboratory of the Research Laboratories, Edgewood (Md.) Arsenal.
- "The Generation and Penetration Characteristics of High-Density Shaped-Charge Jets," a $350 winner for Joseph M. Regan and George H. Jonas of the U.S. Army Ballistic Research Laboratories, Aberdeen (Md.) Proving Ground.
- "Analysis and Application of Gallium Arsenide Avalanche Transit

$500 AWARDS were accepted by Maj Joseph J. Amato for Edgewood Arsenal Biomedical Department team of Amato, Lt Col N. M. Rich, Maj N. S. Lawson, Capt R. P. Gruber and Capt L. J. Billy; Dr. Thomas E. Davidson acceped for Watervliet Arsenal Benet R&E Laboratories team of Davidson, J. F. Throop and A. N. Reiner.

Time Devices," a $250 winner for Joseph J. Baranowski and Vincent J. Higgins, Electronic Components Laboratory, U.S. Army Electronics Command, Fort Monmouth, N.J.

• "Modern Counter-Surveillance in Combat Clothing," a $250 winner for A. O. Ramsley, U.S. Army Natick (Mass.) Laboratories.

• "On the Propagation of High-Intensity Relativistic Electron Beams," a $250 winner for Dr. Thomas G. Roberts, Army Missile Command, Redstone Arsenal.

• "Direct Solution of Complex Crystal Structures by Electron Microscopy," a $250 winner for Jack A. Kohn, Charles F. Cook Jr. and Donald W. Eckart, Institute for Exploratory Research, Army Electronics Command.

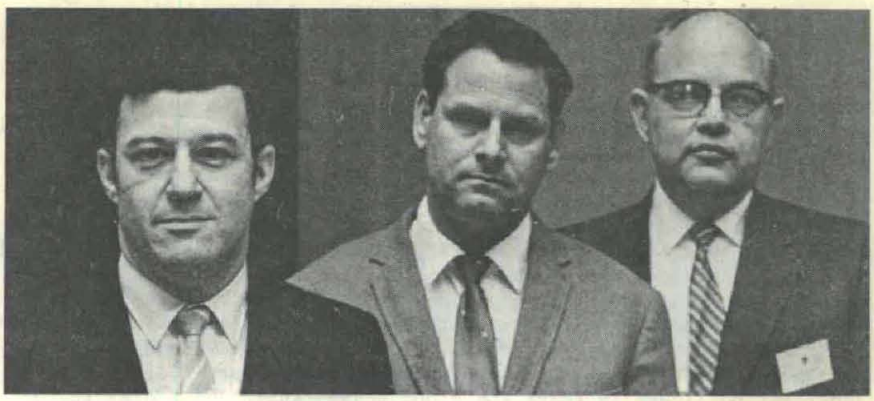
• "The Effect of Diet on Jejunal Enzymes," which earned $250 for Col Robert H. Herman, MC, Norton S. Rosensweig, Capt Fred B. Stifel, MSC, and Yaye F. Herman, Army Medical Research and Nutrition Laboratory, Denver, Colo.

In addition to the innovation of the Siple Medallion, cast in silver as a similarity of him portrayed on the cover of *Time Magazine* when he was scientific leader at the South Pole Station during the International Geophysical Year, the 1970 Army Science Conference introduced a new 3-inch bronze medallion. This is scupltured with the crest of the U.S. Army Research Office.

Twenty-one authors or coauthors of the eight technical papers chosen for cash honorariums (other than the 6 Siple Medallion winners) were presented bronze medallions in recognition of outstanding achievements in basic research. The honorariums will be presented later at installations where they are employed.

Two special certificate awards also were made. Gerhard K. Gaulé and Donald L. Foiani, Electronic Components Laboratory, Electronics Command, Fort Monmouth, N.J., were cited for their work in collecting data "under very difficult conditions in Vietnam." Their research was reported in a paper titled "A New Approach to Detection of Enemy Arms Caches."

Efforts of a large team were recognized by the second special award, presented to Col R. Blair, deputy for Medical Sciences, Research Laboratories, Edgewood (Md.) Arsenal, and Dr. Joseph Sperrazza, new director of the Army Materiel Systems Analysis Agency, Aberdeen (Md.) Proving Ground. Their paper is titled "Wound Data and Munitions Effectiveness as Based Upon Battlefield Surveys in Vietnam."



$250 AWARD was accepted by Jack A. Kohn (left) for the research team of Kohn, C. F. Cook Jr., and D. W. Eckart, from the U.S. Army Electronics Command (ECOM) Institute for Exploratory Research, Fort Monmouth, N.J. J. J. Barankowski and V. J. Higgins, also from ECOM, coauthored a $250 award-winning paper. Dr. Thomas G. Roberts (center) authored and presented a $250 award paper on research at Army Missile Command. A. O. Ramsley (right), Army Natick (Mass.) Laboratories, also was a $250 award winner.

Six papers listing 16 authors or coauthors were recognized by the presentation of Certificates of Meritorious Achievement. The only individual author in this category was I. E. Figge Sr. of the U.S. Army Aviation Materiel Laboratories, Fort Eustis, Va. His paper is titled "Tetra-Core: A Three-Dimensional Space Structure."

Titles of other Meritorious Certificate papers and the authors are:

• "Application of Sensing Arrays to Photogrammetry and Metrology," Dr. Desmond C. O'Connor and Pi-Fuay Chen, U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Va.

• "Investigation of a New Disease of Military Dogs," Col Robert N. Nims, Maj David L. Huxsoll, Maj Paul K. Hildebrandt and Maj Jerry S. Walker, all with the Veterinary Corps at Walter Reed Army Institute of Research (WRAIR), Washington, D.C.

• "Obstacles in Oxygen Transport During Aeromedical Evacuation," Maj John N. Henry, Lt Col Teruo

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AVLABS Seek to Arrest Aircraft Bullet Damage

Arresting the spread of cracks in aircraft aluminum alloy stress skin panels caused by bullets or other sharp impact, thereby avoiding numerous catastrophic accidents, is the hope of two researchers at the Army Aviation Materiel Laboratories, Fort Eustis, Va.

Experimental use of thin fiberglass strips on the critically stressed sections of the aircraft has indicated they are effective in confining to the immediate area the damage caused by bullets or other flying objects.

Charles D. Roach, former AVLABS director of research, and Irving E. Figge Sr., project engineer in the Structures Division, report that results of research and testing to date show encouraging promise of overcoming the structural failure problem.

In their research the fiberglass strips (straps) were applied in several ways, including bonding to either one or both sides of 12-inch wide aluminum alloy specimens similar to aircraft wing and fuselage sections.

The specimens were preloaded in a 100,000-pound capacity hydraulic test machine and a steel rod driven through them to simulate the shattering impact of a .30-caliber bullet producing a running crack. The action was camera recorded at 10,000 frames a second.

Figge reports that significant increases in the crack arrest behavior (up to 48 percent) were obtained with two 0.75-inch by 0.010-inch strips spaced 2.75 inches apart on the front and back sides of the specimens.

Residual static strength values (for a specimen with a 2-inch-long crack) approaching the ultimate strength of the material were obtained by this method. Figge said the metal thus reinforced retained nearly its full strength despite the bullet hole.

Additional research must be performed, he stressed, to develop a method that does not require extensive surface application before strip bonding, and permits a cure without pressure or heat; also, to evaluate reaction of the straps after being subjected to service loadings and environmental conditions.

$500 Award Technical Papers

(*Continued from page 40*)

missiles has presented a problem in vascular repair. Knowledge of mechanism of injury and specific microscopic damage to the vessel wall is necessary to formulate rules of adequate resection. Previous experiments had led to the conclusion that larger blood vessels, because of their elastic nature, appeared grossly relatively unharmed if not directly struck by the missile. The present study demonstrates that the blood vessel when struck by a missile is neatly sheared and that the temporary cavity imparts the majority of damage to the blood vessel. The formation and decay which occurs within 5 to 10 milliseconds produces marked stretching and tearing of the arterial tissue. More important, it is also noted and demonstrated that when the missile passes in close proximity to the blood vessel wall, although initially unmoved, the transfer of energy from the missile to the tissue particles with rapid acceleration literally tears the blood vessel apart and causes it to undergo violent distortion and compression. Histological sections demonstrate the microscopic changes which have occurred. These include loss of endothelial layer, microthrombus formation, small and large disruptions in the internal elastic lamina. Other changes are seen and will be discussed. This preliminary study documents the mechanism of injury with both high speed photography and angiography.

$350 Award Technical Paper

TITLE: The Generation and Penetration Characteristics of High Density Shaped Charge Jets

AUTHORS: REGAN and JONAS
Ballistic Research Laboratories, Aberdeen Proving Ground

ABSTRACT: A laminated shaped charge liner was successfully used to generate a jet from the material on the inner surface. The features of the jet and its ductility were observed by radiographs. The penetration characteristics of the jet into steel are analyzed. The increase in total depth of penetration (about 50 percent over copper) agrees excellently with theoretical predictions.

$250 Award Technical Papers

TITLE: Analysis and Application of Gallium Arsenide Avalanche Transit Time Devices

AUTHORS: BARANOWSKI and HIGGINS
Fort Monmouth

ABSTRACT: This paper reports on a unique theoretical design which has advanced the performance of avalanche transit time diodes for the direct generation of coherent microwave energy. A rigorous computer aided analysis is presented which solves the continuity equations and Poissons equation for an avalanching electron-hole plasma. The theoretical characterization of these devices with respect to AC impedance and noise performance is obtained and has let to internally designed and fabricated gallium arsenide avalanche transit time oscillators and amplifiers. The microwave performance characteristics of these devices has set the state-of-the-art in terms of DC to rf efficiency and amplifier noise figure and has resulted in component application for military systems.

Gallium arsenide devices are presently being tested and evaluated in several Army systems. These systems include: a Ku-band local oscillator for a portable battlefield radar; an X-band transmitter for a digital communication system; a Ku-band velocity sensor for air cushion vehicles; a pump for a traveling wave tube in a classified coherent doppler system. Details of the results of these tests are discussed along with several other proposed Army applications.

TITLE: Modern Counter-Surveillance in Combat Clothing

AUTHOR: RAMSLEY
Natick Laboratories

ABSTRACT: A method is described for protecting the combat soldier

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Picatinny Team Wins Six Siple Medallions

(*Continued from page 41*)

$350 AWARD was accepted by George H. Jonas for research with J. M. Regan at Ballistic Research Labs, Aberdeen (Md.) Proving Ground.

Matsumoto and Brig Gen George Hayes, all with the Medical Corps at WRAIR.

- "A Theoretical and Experimental Evaluation of a Biconical Antenna Nuclear Electromagnetic Pulse Simulator," Janis Klebers and Stanley H. Bukalski, U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va.
- "Internal Electromagnetic Pulses in Irradiated Enclosures," John A. Rosado, Raine M. Gilbert, William L. Vault and John E. Tompkins, Harry Diamond Laboratories, Washington, D.C.

Individual authorship of award-winning papers dropped to three, an all-time low, with a total of 44 authors for the remaining 14 papers selected by the panel of judges from the 100 that were presented. Considered also were 20 papers held in the supplemental category.

Clearly indicating the shift to team effort in research activities was the fact that 80 of the 120 papers carried multiple authors.

Dr. Marvin E. Lasser, Army Chief Scientist who presided as chairman at general sessions of the conference, acclaimed the superior quality of papers that were presented. Notable also was the fact that 17 prize-winning authors were military personnel; also, that 42 of the total of 209 authors were officers and one was an enlisted specialist. This attests to the steadily increasing ratio of scientists and engineers in uniform as compared to civilian researchers.

A large number of the attendees at the sessions and those listed as authors or coauthors of research papers were in the 30 to 35-year age group,

substantiating their increasing contribution to the Army research and development program.

Abstracts of the 100 papers that were presented are carried on pages 40 to 77, reflecting the range of scientific disciplines of interest to investigators in areas of basic research.

Many of the results of these investigations have foreseeable potential applications to military materiel, equipment, medical service or other immediate or long-range requirements.

Regarded as particularly important, for example, are the discoveries of the Siple Medallion team as related to advances in explosives technology, involving compounds of immediate military interest. Their research has produced a new understanding of factors in atomic vibrations and forces.

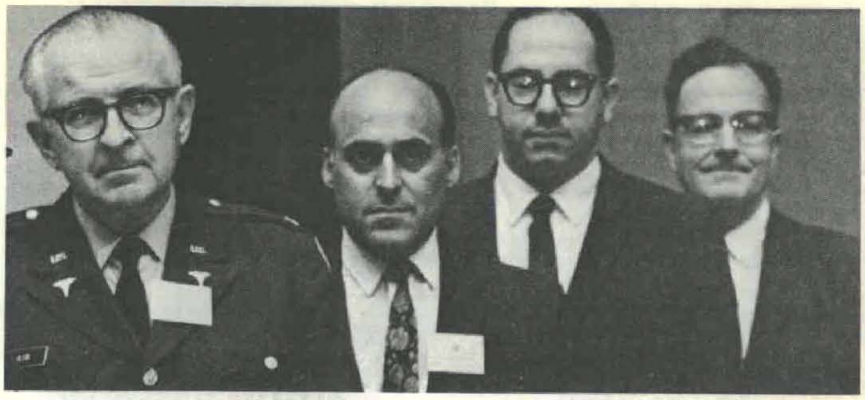
Similarly, the $500-award paper coauthored by Davidson, Throop and Reiner reports on investigations that have led to improved interpretation of the cause of premature fatigue failures in the 175mm M113 gun tube. Applications of this knowledge are anticipated for other weapon systems.

Improved understanding of how to cope more effectively with disruption of blood vessels by high-velocity missiles, long a problem for Army medics in vascular repair, is the result of research which earned a $500 award for a 5-man team headed by Maj Joseph J. Amato. Their "preliminary study" documents the mechanism of injury with high-speed photography and angiography.

KEYNOTE ADDRESS. Much of the information presented by Lt Gen George I. Forsythe, CG of the U.S. Army Combat Developments Command, in his keynote address was restricted. Applause frequently attested responsiveness to his hard-hitting message on "The Modern Soldier in His Current and Future Environment."

The modern American soldier, he said, is "very inquisitive, somewhat demanding and yet a terribly wonderful man. . . . He questions his leadership. . . . He is the most innovative sort of person in the world. . . . He accomplishes the impossible. . . . If the leader knows what he wants and can articulate that to his outfit . . . his guys will break their backs producing it for him."

General Forsythe expressed the belief that "we are on the brink of probably some of our greatest opportunities. . . . We have learned something about a whole new kind of war. . . . We have innovated and adopted new tactics and techniques. Thank God for the scientific community that has presented us with some hardware to use in a very tough and demanding war in Vietnam.



SPECIAL RECOGNITION research papers were coauthored by (from left) Col Joseph R. Blair, MC, Edgewood (Md.) Arsenal Research Laboratories, and Dr. Joseph Sperrazza, Army Materiel Systems Analysis Agency, Aberdeen (Md.) Proving Ground; and by Donald L. Foiani and Gerhart K. Gaulé, Electronic Components Lab, U.S. Army Electronics Command, Fort Monmouth, N.J.

"As I look out into the 1970s, I see fewer resources, fewer men, fewer dollars, less time, a continuing threat and absolutely fantastic opportunities. . . . The process of formulating ideas is a process about which too little is known. We don't care where the ideas come from. . . . Any ideas from any source are welcome. . . .

"In a period of time when we have limited resources and we have so many opportunities to improve the combat capabilities of our forces, we are going to have to do the hard work of deciding what it is that will give us the greatest payoff, and put our resources on that. . . . Tough decisions must be made because there is very little margin for error. . . ."

General Forsythe discussed the need for improved combat capabilities for operations at night and for "real-time intelligence" about the enemy; also, for advances in command and control sysems and improved firepower, particularly the effectiveness of first-round hits.

One of his strong tributes for effective support of the soldier in the field was a commendation of the Army Natick Laboratories. He said they "do some tremendous work in looking out for the needs of the soldier. I would just like to commend Natick. They are very closely tied in. They do the teamwork. They understand the soldier. . . ."

One of his key points was that of devoting more consideration to the practicality of disposable items, rather than the frequently more expensive retrieval and reconditioning process.

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Surgeon General Announces General Reassignments

Reassignments of five general officers qualified as physicians in the U.S. Army Medical Corps and one brigadier general-designate were announced July 17 by the Office of the Surgeon General, HQ DA, Washington, D.C.

Maj Gen Frederic J. Hughes will leave Letterman General Hospital in San Francisco, Calif., to succeed Maj Gen James T. McGibony July 31 upon his retirement as commanding general, U.S. Army Medical Command, Europe.

Brig Gen William H. Moncrief assumes command of Letterman General Hospital after a tour of duty as CG of Brooke General Hospital, Brooke Army Medical Center, Fort Sam Houston, Tex. His successor had not been announced at *Army R&D Newsmagazine* press time.

Brig Gen Robert M. Hardaway III will command William Beaumont General Hospital, El Paso, Tex. He was promoted to that grade in June while commanding the 97th General Hospital in Frankfurt, Germany.

Brig Gen Richard R. Taylor will become CG of the U.S. Army Medical Research and Development Command in Washington, D.C., after serving as surgeon of the Military Assistance Command, Vietnam.

Brig Gen Louis J. Hackett Jr., MC, former CG of the Office of Civilian Health and Medical Programs of the Uniformed Services, is newly assigned to the Office of the Surgeon General, Washington, D.C., as director of Plans, Supply and Operations.

Col (Brig Gen designate) Robert Bernstein left the duties assumed by Brig Gen Hackett to succeed Brig Gen Taylor as surgeon of MACV.

$250 Award Technical Papers

(*Continued from page 42*)

against detection by infrared photography, the image intensifier, and the sniperscope, while retaining visual camouflage. To provide ideal concealment, clothing must have specific reflectances in the visible and near-infrared regions of the spectrum, as described by a theoretical curve that has been derived empirically. The use of newly-found infrared fluorescent dyes on fabrics has resulted in actual spectral reflectance values that approximate the theoretical curve and that make it possible to cope with these sensitive detection devices.

TITLE: On the Propagation of High Intensity Relativistic Electron Beams

AUTHOR: ROBERTS
Redstone Arsenal

ABSTRACT: The existing theories for the propagation of intense electron beams at relativistic energies are used to give a phenomenological description of beam propagation and an expression for the maximum current that a beam may possess is derived. This expression ($v/\gamma \cdot I_{\psi}^2/I^2 = 1$) is somewhat different from the Alfven limit ($v/\gamma = 1$) but reduces to this limit in a frame in which the beam is fully space-charged neutralized, and shows that beams with $v/\gamma > 1$ can be expected to propagate.

TITLE: The Effect of Diet on Jejunal Enzymes

AUTHORS: HERMAN, ROSENSWEIG, STIFEL and HERMAN
Medical Research and Nutrition Laboratory, Denver

ABSTRACT: In order to study the metabolic basis for acute and chronic gastrointestinal disease it is necessary to define the normal metabolism of the intestinal mucosa. We have biopsied the jejunal mucosa of normal volunteers, obese patients and selected patients with gastrointestinal disease. Controlled diets were fed on a metabolic ward and the effect of these diets on jejunal enzyme activities was determined. Parallel studies were carried out on rats on controlled diets. Our studies have shown that dietary sucrose and fructose as compared to dietary glucose increase jejunal sucrase and maltase but have no effect on lactase. Dietary maltose, lactose and galactose have no effect on jejunal disaccharidases. Dietary glucose increases jejunal glycolytic enzymes: hexokinase, glucokinase, fructose-1, 6-diphosphate aldolase and pyruvate kinase. Dietary sucrose and fructose increase jejunal fructokinase, fructose-1-phosphate aldolase, fructose-1,6-diphosphate aldolase and pyruvate kinase. Oral folic acid increases all of the glycolytic enzymes while postulated that the effect of folic acid is due to the generation of the cofactor N^{10}-formyl-tetrahydrofolic acid which is an initiator of protein synthesis. We have found that certain chronic gastrointestinal diseases are related to a failure of jejunal glycolytic enzymes to respond to dietary carbohydrate and/or folic acid.

TITLE: Direct Solution of Complex Crystal Structures by Electron Microscopy

AUTHORS: KOHN, COOK and ECKART
Fort Monmouth

ABSTRACT: As part of a comprehensive program aimed at tailor-made microwave materials for Army surveillance/communications, x-ray diffraction studies have been conducted on hexagonal-ferrite single crystals. Among the many complex, ferrimagnetic compounds discovered are structures larger than in any known inorganic materials. These approach "biological magnitude" and pose difficult problems for the necessary determination of atomic positions: classical x-ray diffraction gives unresolved intensity data, and the number of permissible structure models is untenable even for large, high-speed computers. A novel electron microscopic procedure allows such crystal structures to be "read" directly from fine surface

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Picatinny Team Wins Six Siple Medallions

(*Continued from page 43*)

PANEL DISCUSSION. Viewpoints on the long-standing and often spiritedly discussed question, "How Do You Determine Your Research and Development Needs?," were exchanged by a panel of eight distinguished leaders as one of the 1970 ASC features. Army Materiel Command Director of Laboratories Dr. Robert B. Dillaway was the moderator.

Dr. Arthur M. Bueche, vice president, Corporate R&D Division, General Electric Co., kept the audience laughing with his recitation of maxims of his own creation and others dating back 2,000 years to *Maxims* of *Pubilius Syrus*—"still useful" as applied to current situations and problems.

A list of 20 sub-questions pertaining to the main question for discussion had been sent to the panel in advance. These questions related generally to R&D planning, motivating technical people, and providing them freedom to pursue their interests; also, how much of the work should be basic versus applied, techniques of measuring results of R&D, and deciding how the R&D programs should be funded.

Dr. Bueche cited as his No. 1 maxim: "A technical manager is lucky his job is not as easy as it looks; if it were, he would not be so well paid." His second: "Planning, like water, seeks the lowest level."

With respect to the first maxim, Dr. Bueche listed such problems as hiring the best scientists and engineers available and then envisioning "the intersection between their best ideas and the needs and opportunities of the sponsor of the work . . . the probability of successful application, the cost of the program to total resources, impact of the program on other research programs, and so on—and on."

Commenting on his second maxim, Dr. Bueche said that "Too often, the best people—the responsible people—are 'too busy' to spend time planning. The job falls to people who don't have anything else to do at the time. And when we operate that way, we get the kind of plans we deserve."

Dr. Bueche emphasized that he did not mean to "imply that planning should be done *just* by the bosses, operating in a vacuum. *Especially* in the planning of technical work that is to be performed by highly trained and sophisticated people, I think there are really only two alternatives.

"You either *involve* the technical people in setting the goals they will

try to achieve, or you *do not involve* them in setting goals and you then resign yourself to the fact that the goals won't be achieved."

That led into his third maxim: "Goals are best met by those who helped to set them." Other Bueche maxims he cited in rapid succession: "Young researchers need all the freedom they really want." "A mythological scientist is one who doesn't care what happens to his work."

Enthusiasm of the inventor, he said, is often "the *only* thing that keeps a good idea on the track long enough to become a practical and profitable product." Then came Bueche maxim No. 6, "really Pubilius' No. 18": "Crime is honest in a good cause"—with reference to the staff member who can't get management to agree on a project and then "bootlegs" funds to do it anyway—"maybe a commendable practice, especially if the idea works out."

Other Bueche maxims included: "Geniuses make up one of the nation's least understood minority groups." "In performing research, 'basicness' is in the eyes of the beholder," or "One man's ivory tower is another man's workshop." "The value of new knowledge is neither diminished nor increased by the source of the supporting funds."

Also, "The voice of anti-technology is being heard more loudly through the land—thanks to solid-state P.A. systems." "Viewed objectively, all methods of measuring R&D are subjective." "Research work can't be judged by success alone; some successes are trivial and some failures invaluable."

Other panel members included Harold W. Duchek, vice president, Engineering and Research, Emerson Electric Co.; Wilmer A. Jenkins, director, Research, Explosives Department, E. I. du Pont de Nemours and Co.; Dr. Henry Lee, executive vice president, Epoxylite Corp.; Richard S. Schreiber, vice president for Corporate Research, Upjohn Co.; and Dr. Alvin Gorham, technical director, U.S. Army Materiel and Mechanics Research Center.

Dr. Duchek detailed, similarly to Dr. Bueche in many respects, the planning and R&D procedures followed by Emerson Electric Co. An average effective ratio, he said, appears to be about 25 percent for basic research and 75 percent for exploratory research and product development. The rule-of-thumb profit reward "should be something like three to four times R&D cost."

The critical question for decision-makers, in his opinion, is "What will a development provide to meet a future anticipated need? A good idea presented by a good man at the right time gets a project started."

MERITORIOUS technical papers were presented by (l. to r.) Janis Klebers, coauthored with S. H. Bukalski (not shown), both from the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.; John A. Rosado, Raine M. Gilbert, John E. Tompkins and W. L. Vault (not shown) of Harry Diamond Laboratories; I. E. Figge Sr., Army Aviation Materials Lab.

Jenkins explained that du Pont de Nemours and Co. has two types of research planning—improvement of established business (IEB), and exploratory research to create new products for continuing diversification of marketable items.

Careful evaluation of resources, particularly human resources, is the first consideration pertinent to new exploratory work, it was stressed. Discretion must "avoid scattering shots too broadly—seek an unsatisfied need and by R&D find a product to fill it. . . . If you can't calculate a cost benefit, beware of the program."

Dr. Lee explained how Epoxylite Corp. is organized for R&D activities and the established procedures for planning research with apparently good potential for application of new knowledge to product development. He also dwelt briefly on research growth in some foreign countries, notably Japan, and some factors and policies believed responsible for tremendous gains in new product development.

Schreiber's opening statement was: "Applying a broad interpretation to the theme question, I must say you cannot possibly meet your R&D needs for two very good reasons: 1) Any good, aggressive R&D unit *will always* have many more worthwhile needs than it can meet; 2) the corporate needs will and should determine the *majority* of R&D needs."

With that introduction, he launched into a briefing on Upjohn Co., its sales by product areas, basic concepts regarding R&D management problems, criteria for product evaluation, and

(*Continued on page 46*)

Paulick Retires as Test & Evaluation Command DCG

More than 35 years active military service ended July 31 for Brig Gen Michael Paulick when he retired as deputy commander and chief of staff, HQ U.S. Army Test and Evaluation Command, Aberdeen (Md.) Proving Ground.

Maj Gen Frank M. Izenour, CG, Test and Evaluation Command, served as reviewing officer at the parade that featured retirement ceremonies.

Brig Gen Michael Paulick

Born in 1915 in Tisdale, Pa., General Paulick joined the Army in 1935. He served as an enlisted man with the 36th Coast Artillery Regiment until July 1936 when he entered the U.S. Military Academy as a cadet. He was commissioned in the Infanty in 1940.

During World War II he served in North Africa, Italy, France and Germany, participating in nine campaigns with the 1st and 3d Infantry Divisions. He was awarded the Distinguished Service Cross, Silver Star with 2 OLCs, Bronze Star Medal with OLC, Purple Heart with OLC, Combat Infantryman Badge, French Fourragere with colors of the Croix de Guerre with palm, and the Croix de Guerre with Gold Star.

$250 Award Technical Papers

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step features revealed by careful etching. The smallest etch contours, 11.6 and 14.5 Å high, are edges of discrete building blocks that stack to form hexagonal ferrite structures. Knowing the "code" of the etch structure, one need only count the etch contour sequence in the surface motif to determine stacking element arrangement and thereby establish atomic positions in three dimensions. For a specific structure with a c dimension of 1,455 Å, the method immediately pinpointed the unique stacking sequence from among some 400,000 possibilities; even with an adequate set of observed diffraction intensities, a modern computer would take approximately two months to arrive at a solution whose uniqueness would still be in question.

Special Recognition Technical Paper

TITLE: Wound Data and Munitions Effectiveness as Based Upon Battlefield Surveys in Vietnam

AUTHOR: BLAIR and SPERRAZZA
Research Laboratories, Edgewood Arsenal

ABSTRACT: Under the auspices of the Army, the Navy, the Marine Corps, and the Joint Technical Coordination Group for Munition Effectiveness, two wound data and munition effectiveness survey teams were fielded in Vietnam. One was an Army team, in theater from June 1967 through June 1969, with headquarters at Tan Son Nhut and data collection teams at An Khe (1st Air Cav), Pleiku (4th Inf Div), Lai Khe (1st Inf Div), and Cu Chi (25th Inf Div). The other was a Marine Corps/Navy team, operational in I Corps from May 1968 to May 1969, and attached to the 1st Marine Division of the 3rd MAF.

The effort was divided into three phases: (1) data collection, (2) data analysis, and (3) data evaluation. The first phase was conducted in Vietnam and the last two by the Research Laboratories (Edgewood Arsenal), the Ballistic Research Laboratories and the Army Materiel Systems Analysis Agency (Aberdeen Proving Ground). This paper presents a resume' of the results and, in particular, on how well the following five objectives were met: (1) Enhance lethality of present/future weapons; (2) Confirm/modify criteria for estimating weapons requirements; (3) Confirm/modify wound ballistic criteria; (4) Evaluate/improve protective gear such as body armor, helmets, boots; (5) Confirm/modify criteria for estimating medical requirements.

Special Award Technical Paper

TITLE: A New Approach to Detection of Enemy Arms Caches

AUTHORS: GAULE' and FOIANI
Fort Monmouth

ABSTRACT: In the spring of 1969 the authors, assigned in liaison capacity to US Army Headquarters in Vietnam, were posed the problem of detecting enemy arms caches, most of these hidden in oil drums. In the absence of any directly usable equipment, a number of magnetometers--on hand in Vietnam for a different purpose--were tested and found to show considerable sensitivity in detecting large ferrous objects at a distance when used with accessory instrumentation. For field use, however, this detection method was too slow and too complex. To meet the tactical requirements, the authors improvised novel search devices by combining two sensor heads into a magnetic gradiometer, and developing electronic circuitry for the interpretation of the difference signals. The system provided an unambiguous audible signal which could intuitively guide a non-technical operator to the cache. The training time for locating typical hidden targets is short. In troop use since the spring of 1969, the improvised gradiometers successfully located ferrous aggregates (hidden enemy items) including small objects. In modern warfare, unpredictable and frequently shifting enemy tactics pose technical problems which must be met by improvisation. Refinements for the present improvised system, and general preparations for similar improvisations of electronic, and/or sensor systems in the future are suggested.

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Picatinny Team Wins Six Siple Medallions

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organization for R&D. He stressed the operational principle of maintaining a backlog of ideas, projects and products-to-be as a background against which to measure active projects and to "continually force the selection of the best of alternatives."

Research should be the leading edge in any organization, he said, as the cornerstone of all growth companies —"well-conducted R&D is the best investment any growing organization can make." Growth companies should have the "maximum number of really good independent investigators and the minimum number of supervisors or managers. . . ." Other key points: Make certain the discovery is worthwhile before investing in development; focus on people control, not financial control."

Dr. Gorham reported on R&D planning and procedures for some current and future weapons systems. He contributed to the success of the question and answer session with observations reflecting his depth of experience as an associate research engineer at the University of California at Berkeley (1956–59) and as an instructor in physics and metallurgy at the University of Arizona; also, as a staff member with the Los Alamos Scientific Laboratory and later with Stanford Research Institute, and as a director of materials research in industry. He became director of the Army Materials and Mechanics Research Center in January 1970.

CLASSIFIED PRESENTATION. Chief of R&D Lt Gen Austin W. Betts, in addition to presiding as toastmaster at the banquet, introducing keynote speaker Lt Gen Forsythe, and participating in the awards ceremonies, provided one of the conference highlights with a classified briefing on R&D programs and problem areas.

His presentation ranged back to 1939 in listing some Army R&D results that have impacted profoundly on the civilian economy. Too stringent adherence to the current requirement that all Army basic research be related directly to military requirements, General Betts said, could cut off many of such byproduct benefits to the national economy.

Army Chief Scientist Dr. Marvin E. Lasser presided as conference chairman and also headed the panel of judges that selected the award-winning technical papers. Judges were Dean Ralph E. Fadum, School of En-

gineering, N.C. State University; Dr. John L. Schwab, vice president and director, Research Operations, Squib Institute for Medical Research, and Dr. Paul M. Gross, Department of Chemistry, Duke University; Dr. Vincent S. Haneman Jr., director, Engineering Research, Oklahoma State University; and Dr. A. R. Curreri, chairman, Department of Surgery, and director, Division of Clinical Oncology, University of Wisconsin Medical Center.

Director of Army Research Brig Gen George M. Snead Jr. gave the address of welcome on behalf of General Betts as sponsor of the conference. Brig Gen John R. Jannarone, dean of the Academic Board, spoke on behalf of U.S. Military Academy Superintendent Maj Gen William A. Knowlton, who was unable to attend as host to the meeting. Deputy and Scientific Director of Army Research Dr. Richard A. Weiss called the assembly to order.

Much of the credit for success of the conference was accorded to Dr. John C. Hayes, project officer and executive secretary of the Advisory Council headed by Dr. Weiss, in Dr. Lasser's remarks at the banquet.

The acknowledgement included others who contributed importantly to the arrangements: Col Albert L. Romaneski, who assisted Dr. Hayes, and Lt Col Jack Jeter and Maj William Sexton, who served for the Academy.

Special Exhibits. Much favorable comment was overheard regarding the quality of the exhibits arranged near the entrance to Thayer Hall, where they were readily accessible to conferees during the coffee breaks.

One of the displays was arranged by the U.S. Army Institute of Environmental Medicine at Natick, Mass., to depict USARIEM's mission of determining how heat, cold, high terrestrial altitude and work environment affect the soldier's life processes, his performance and his health.

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MERITORIOUS technical papers were presented by Col Robert M. Nims (left) (coauthored with D. L. Huxsoll and Maj J. S. Walker, not shown, and Maj Paul K. Hildebrandt, right), all with the Walter Reed Army Institute of Research (WRAIR), Washington, D.C.; Maj John N. Henry (second from left), USAR (paper coauthored with Lt Col T. Matsumoto and Brig Gen G. Hayes, both not shown), all with WRAIR; and Dr. Desmond C. O'Connor (center) and Dr. Pi-Fuay Chen (second from right) of the Engineer Topographic Labs.

Dr. Harris Becomes Edgewood Arsenal Tech Director

Edgewood (Md.) Arsenal's new technical director, Dr. Benjamin L. Harris, has served about 20 years at the installation as an officer in the Chemical Warfare Service and a civilian employe.

In 1967 he terminated 15 years as a civilian scientist at the arsenal to accept an appointment as deputy assistant director of chemical technology, Office of the Director of Defense Research and Engineering, Washington, D.C. He served until he returned to Edgewood to fill the PL-313 position of technical director.

Starting his career at the arsenal as a second lieutenant, he served five years and currently holds the rank of colonel in the Army Reserves. He left to accept an assistant professorship in chemical engineering at Johns Hopkins University in Baltimore, remaining until he returned to the arsenal in 1952.

During the next 15 years, he held positions of progressive responsibility, including deputy assistant to the commanding officer for chemical warfare, technical assistant to the deputy commander for scientific activities (1959–60), deputy director of development for the Chemical R&D Laboratories (1960–62), director of developmental support (1962–66), and chief, Systems Analysis Division (1966–67).

Meanwhile, over a 17-year span, he served as a consulting engineer and as president of the Engineering Research Co. in Glenarm, Md.

Dr. Harris has been active in community affairs and has been identified with Boy Scout activities for about 40 years. He is a member of Alpha Phi Omega, the American Chemical Society, American Association for the Advancement of Science, Scientific Research Society of America, American Institute of Chemical Engineers (in which he has been elected to several offices), Armed Forces Chemical Association, American Ordnance Society, and the Army Reserve Officers Association.

Dr. Benjamin L. Harris

Listed in *American Men of Science, Chemical Who's Who, Who's Who in Commerce and Industry* and *Leaders of American Science*, he is the author of 82 classified technical reports and 28 other professional publications.

Medical R&D Command Grant Aids Dental Computer System

A computer system for reading dental X-rays and pinpointing diseases in stages too early for diagnosis by the human eye is being developed under a grant from the U.S. Army Medical Research and Development Command.

Researchers at the State University of New York at Stony Brook expect to have a working model of the system by the end of the year.

The computer system would provide Army dentists information on how many hours of treatment and how many dentists will be needed at particular times to treat specific groups of patients.

The system also would enable planners to determine how much dental disease to expect from a group of basic trainees by referring to past computer statistics. Since trainees needing immediate treatment would be identified by the system, the number of dental emergencies among troops just out of basic training should be reduced.

Meritorious Technical Papers

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TITLE: "Tetra-Core": A Three-Dimensional Space Structure
AUTHOR: FIGGE
Aviation Materiel Laboratories, Fort Eustis

ABSTRACT: A new structural element, "Tetra-Core", which uses unidirectional filamentary composites in a specially orientated space frame structure, has been developed at the U.S. Army Aviation Materiel Laboratories. The "Tetra-Core" element consists of a series of tetrahedrons which are alternately inverted and positioned such that they form continuous planes. Various structural configurations have been fabricated, including flat elements, torque tubes with potential application as supercritical shafting, and airfoil sections. It is believed that the concept has excellent potential for structural application because it uses the composite material in its most optimum form and in a configuration which approaches the efficiency of a Michell structure. Due to the inherent redundancy of the structure, it offers potential application in areas where failsafe requirements are high.

TITLE: Internal Electromagnetic Pulses in Irradiated Enclosures
AUTHORS: ROSADO, GILBERT, VAULT and TOMPKINS
Harry Diamond Laboratories

ABSTRACT: This paper presents results of calculations and measurements of the electromagnetic pulse produced within an enclosure irradiated by transient high-energy photons. The pulse results from the injection into the cavity of space charge and currents composed of photo- and Compton electrons. It can be propagated and coupled to circuitry within the enclosure so that the energy produced by the irradiation of a large area of the enclosure wall may be collected and deposited locally with intensified results. Unlike direct radiation on circuit elements, the deposition of energy is highly dependent, through electromagnetic boundary conditions, on the enclosure geometry. Three significant phenomena discussed are pulses due to Compton electrons resulting from gamma irradiation, the effects of space-charge limiting on photoelectron currents, and the effects of return currents caused by air ionization. Systems implications and some techniques for reducing the pulse effects are also presented.

TITLE: A Theoretical and Experimental Evaluation of a Biconical Antenna Nuclear Electromagnetic Pulse Simulator
AUTHORS: KLEBERS and BUKALSKI
Fort Belvoir

ABSTRACT: A biconical antenna electromagnetic pulse (EMP) simulator used at the U. S. Army Mobility Equipment Research and Development Center to test Army systems against the nuclear EMP threat is described. Design and operating characteristics are presented on the high voltage, fast rise time biconic section of the simulator which radiates an intense EMP environment. The measurement techniques and results from the experimental field mapping are included, showing measured electric and magnetic field pulse shapes and intensities within the test area. The presence of the ground produces significant differences in pulse shape and amplitude of the environment as compared to a corresponding free space output of the simulator. A method based on the theory of plane wave reflection at an earth interface is derived, and is used to unfold the effects of the ground from the experimental data. The resulting computations provide an equivalent free space output of the antenna, and establish a basis for correlation between the simulated and nuclear threat related environments.

TITLE: Obstacles in Oxygen Transport During Aeromedical Evacuation
AUTHORS: HENRY, MATSUMOTO and HAYES
Walter Reed Army Institute of Research

ABSTRACT: Respiratory insufficiency following trauma has been documented

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Picatinny Team Wins Six Siple Medallions

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USARIEM seeks to understand the complex effects of climatic stresses, the body's defenses, and the techniques, equipment and procedures best calculated to make the soldier operationally effective to a maximum degree by providing him with optimal environmental protection.

One of the attractions was "The Copper Man," described as "the first soldier to wear a new uniform." Inside his "skin" are three electrical components: wires to deliver heat, to measure the temperature at 19 representative sites on his skin, and a thermostat to control the power delivered to the heaters.

If a cotton "skin" is used to cover the manikin and wetted, the extent to which a uniform interferes with evaporative cooling (sweating) can be measured (impermeability index i_m).

Clothing and equipment designers can thus learn how good or bad a sleeping bag, uniform or body armor is with regard to its effects on the body temperature of the wearer. The clothing and i_m values are used to predict tolerance time for troops during

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Math Research Center Sets Advanced Seminar Oct. 12-14

U.S. Army military and civilian employe mathematicians will participate in an Advanced Seminar on Nonlinear Functional Analysis and Applications at the Mathematics Research Center, University of Wisconsin, Madison, Oct. 12–14.

Speakers from leading U.S. and foreign universities are scheduled to discuss applications of functional analysis to nonlinear equations, optimization, control theory and mathematical physics.

Officials stress that the seminar will not include presentation of research papers, and that the lectures will be published in book form.

Attendance is by invitation only. Preference will be given to Army personnel, but representatives of other U.S. Government agencies and others who can contribute to seminar objectives can request invitations.

Army personnel interested in attending should write to Secretary, Advanced Seminar, Mathematics Research Center, University of Wisconsin, Madison, Wis. 53706, including a statement of their position and scientific or engineering qualifications.

military operations in severe hot and cold environments.

Other displays showed the latest prototypes of field dental equipment, a new concept for a field medical laboratory including equipment for physiological tests, and "Missile Wounds: Their Challenge to Medical Research." The latter exhibit showed problems under study, such as wound sepsis, stress ulcers, coagulopathics after injury and various other medical problem areas.

An exhibit that appeared to receive considerable attention was arranged by Walter Reed Army Institute of Research to depict investigative areas of the U.S. Army Aeromedical Research Laboratory. It included internal medicine, experimental psychology, environmental medicine, biochemistry, biomechanics, bioengineering, auditory biophysics, physiological optics, and activities of the Army Laser Safety Team.

Walter Reed Army Medical Center was responsible for an attractive display on advances in medical treatment attributed to the U.S. Army Biomedical Research Laboratory.

Solid Mechanics Symposium Set for AMMRC, Oct. 13-14

"Lightweight Structures" will be the theme of the 1970 Army Symposium on Solid Mechanics at the Army Materials and Mechanics Research Center, Watertown, Mass., Oct. 13–14.

Sponsoring the symposium is the Technical Working Group for Mechanics of Materials of the Army Materiel Command Materials Advisory Group. Jerome Persh, Materials Division chief, Office of the Director of Defense Research and Engineering, Department of Defense, will give the keynote address at the unclassified conference.

Commodity-oriented position papers on current and future problems requiring mechanics research will be presented by the U.S. Army Advanced Ballistic Missile Defense Agency, U.S. Army Aviation Systems Command, U.S. Army Munitions Command and the U.S. Army Weapons Command. Also to be presented are 18 current research or application papers by Army in-house or contract researchers reflecting research in structural behavior, optimization and material response.

Those interested in attending the symposium, which is open to U.S. citizens, may contact Joseph I. Bluhm; Chairman, Army Symposium on Solid Mechanics, 1970; Army Materials and Mechanics Research Center; AMXMR-T; Watertown, Mass. 02172; or phone (617) 926–1900, ext. 418 or Autovon 684–8418, by Sept. 30.

Meritorious Technical Papers

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in a variety of combat injuries in Viet Nam. Often these patients are evacuated to hospitals in Japan as early as the 3rd post injury day. Evaluation of the respiratory tolerance of these wounded men acutely exposed to reduced oxygen tensions at aircraft cabin altitudes between 3000-7500 ft. was indicated. Arterial gases, pH, hematocrit, serum and urinary osmolality, specific gravity and volume were measured in 102 U.S. Army combat casualties before, during and after aeromedical evacuation from R.V.N. to Japan aboard the U.S.A.F. C-141 aircraft. Severe hypoxemia coinciding with hypocarbia and alkalosis was documented in 22% of 330 evacuees. The depth of hypoxemia was greatest in those with fractured femurs, multiple lower extremity fractures and in the very seriously injured, irrespective of injury type. Accommodation was observed in most patients with tenure of flight; accomplished by increasing the pulse & respiratory rates. Exceptions were chest injuries. Pre-flight PO_2 levels were usually approximated in Japan. Notable exceptions were the very seriously injured, chest injuries, burns & septic patients. The most significant determinants of the hypoxemic were cabin altitude and pre-flight insufficiency. Amenia, low serum osmolality, type, seriousness and complications of injury were of lesser significance. Broader knowledge of injury types affected by aeromedical evacuation has been gained by this study. The usefulness of pre-flight PO_2, PCO_2 & pH determinations to guide ones decision to evacuate a patient by air is established.

TITLE: Investigation of a New Disease of Military Dogs

AUTHORS: NIMS, HUXSOLL, HILDEBRANDT and WALKER
Walter Reed Army Institute of Research

ABSTRACT: Beginning in July 1968, an epizootic of a fatal hemorrhagic disease, characterized by unilateral or bilateral epistaxis, occurred among U. S. military dogs in Southeast Asia. This disease, named Tropical Canine Pancytopenia (TCP), has been responsible for the death of 179 military dogs during the initial 16 months of the epizootic. A chronologic summary of the results of a coordinated investigation of this disease is presented, including the clinical course, pathologic findings and laboratory studies.

TITLE: Applications of Sensing Arrays to Photogrammetry and and Metrology

AUTHORS: O'CONNOR and CHEN
Engineer Topographic Laboratories, Fort Belvoir

ABSTRACT: The performance and function of the human eye are reviewed from the point of view of the dynamic theory of vision. The theory offers a basis for explaining how a comparatively gross network of retinal receptors can be used for discriminating tasks many times finer than the individual receptors. The involuntary eye movements of tremor, flick, and drift, combined with complex neural interactions, appear to be largely responsible for this.

A sensing array system which makes use of these concepts is devised. In this electronic system, "perturbation" corresponds to the involuntary eye movements. A zero sensing error is obtained by the introduction of an optimal perturbation signal into the system.

The sensing array system is capable of detecting area, position, velocity and shape of a moving object-image either in a two-dimensional or a three-dimensional form. Possible applications of the array sensing techniques to photogrammetry and metrology are considered. Advantages of the techniques over the conventional array methods are given. Extensions of the idea in the future are suggested. Finally, the relationship between the suggested techniques and the state-of-the-art of electronics is discussed.

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TITLE: Field Test of a Steam Condenser Heat Sink Concept
AUTHORS: QUINN, AAMOT and GREENBERG
Cold Regions R&E Laboratory

ABSTRACT: In the design of deeply buried strategic installations, consideration must be given to provision for a heat rejection scheme which operates during and after attack conditions on a closed-cycle system. Thus all of the waste head must be stored underground for some specified period of time. A concept to reject heat generated by an underground power plant by disposal of turbine exhaust steam to rock tunnels was evaluated by means of a field test. The tunnel walls would thus be used to condense the steam and store the heat under a transient heating load. The test was conducted 2250 feet below the ground surface in an unlined tunnel in a granitic gneiss. Heat transfer to the rock was initially predicted using a well-known Carslaw and Jaeger analytical model. The design of the experiment provided for a comparison between the measured results and predicted values. A primary concern in the design of such a heat sink is the prediction of the time required for the rock surface temperature to reach the saturated dew point temperature corresponding to an essentially pure steam atmosphere for the design pressure condition. Establishing a correlation between measured and predicted temperatures was complicated by the problem of rock fall which developed and retarded the rate of temperature rise. It is felt that meaningful comparisons are valid during the first few days of the test prior to substantial rock fall.

TITLE: Testing for an Organic Superconductor
AUTHORS: AGEE and SPANGLER
Mobility Equipment Research and Development Center
Fort Belvoir

ABSTRACT: The suggestion [(1)] that an analogy to the electronphonon interaction responsible for superconductivity in the BCS theory might exist in polymers having a certain structure has sparked international dialogues concerning the theory and efforts to make such a polymer. The additional prediction that such molecules would be superconducting at room temperatures has given additional impetus to the search. This paper briefly reviews the problem and deals with a research effort to devise a suitable test for superconductivity in polymeric materials and the results of tests on samples produced in an effort to synthesize an organic superconductor.

The method developed and used involves an a.c. magnetic susceptibility measurement highly sensitive to diamagnetism characteristic of known superconductors. A more sensitive d.c. apparatus is described which employs a magnetometer which measures the magnetization of the sample as it is withdrawn from a superconducting transformer coupled to a superconducting quantum interference detector. The latter measurement has been found to be sensitive to fluctuation-induced Cooper pairing in an almost superconducting system. At the time of the writing of this paper, none of the organic samples tested have been found to be superconducting. More samples will be tested in the near future.

TITLE: Rapid Assessment of Aircraft Landing Sites
AUTHORS: AHLVIN and HAMMITT
Engineer Waterways Experiment Station

ABSTRACT: A complex of information based on many years of research in aircraft landing-area requirements has led to means of relating unpaved area response to aircraft characteristics. A similar complex of information in ground-vehicle mobility has led to means of relating the response of ground surfaces of various strengths to vehicle characteristics.

This background of information in the two disciplines makes

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Volume 3 Released on R&D In Computer, Info. Sciences

Volume 3, *Research and Development in the Computer and Information Sciences*, was released in July as SD Catalog No. 20402 by the U.S. Department of Commerce/National Bureau of Standards.

Dealing with *Overall System Design Considerations*, it is authored like the two earlier editions by Mary Elizabeth Stevens. Volume 3 is a selective literature review as related to information systems and networks.

Key words are listed as data recording; holography; information control; input-output; integrated circuits; lasers; memory systems; multiprocessing; networks; on-line systems; programing; simulation and storage.

Sections are: Requirements and Resources Analysis; Problems of System Networking; Input-Ouput, Terminal Design, and Character Sets; Programing Problems and Languages and Processor Design Considerations; Advanced Hardware Developments; Debugging, On-Line Diagnosis, Instrumentation, and Problems of Simulation; and Conclusions.

Volume 1, *Information Acquisition, Sensing and Input*, sells for $1.50 and is listed as SD Catalog No. C13.44:113. Volume 2 is *Processing, Storage and Output Requirements in Information Processing Systems.* Listed as SD Catalog No. C13.44:113/Vol. 2, it sells for $1.25. Vol 3., 147 pages, also can be obtained for $1.25.

Col Ross Succeeds Pope As P&T Director at OTSG

Assignment of Col Richard H. Ross, MC, as director, Personnel and Training, to succeed Col James K. Pope, MC, reassigned to Korea as surgeon of the Eighth U.S. Army, was announced recently by the Office of the Army Surgeon General.

Col Ross had served since August 1969 as vice chairman of WORSAMS (Worldwide Organizational Structure for Army Medical Support) Study Group, which will determine the best organizational structure for the Army Medical Department.

A 25-year Army veteran, he was stationed at Fort Lawton, Wash., when the Korean War began. He went to the Far East as surgeon, 25th Infantry Division, and later served two tours of duty in Europe.

Col Ross has a BS degree from the University of Washington and an MD degree from Jefferson Medical College, Philadelphia, Pa. He served his internship at Providence Hospital.

Proposed Law Offers Plan For Annual Pay Revision

An improved, permanent system for adjusting salaries of U.S. Government white-color employes was submitted to Congress late in July by the Civil Service Commission as an administrative proposal. The proposal would:

- Afford an appropriate role to the President, the Congress, and federal employe organizations in the setting of pay.
- Extend the comparability concept embodied in the 1962 and 1967 pay laws and thereby keep federal workers' pay comparable with salaries paid by employers outside of government.
- Reduce to a maximum of six months the time lag between a pay survey and the effective date of a federal salary adjustment.
- Create an Advisory Committee on Federal Salaries, an impartial body of three non-government members appointed by the President to serve 6-year terms.

Responsibilities. The Office of Management and Budget and the Civil Service Commission would continue to serve jointly as the President's agent. They would consult fully with employe organizations on Bureau of Labor Statistics salary survey coverage, comparability methods, and results, and would recommend salary adjustments to the President.

The Advisory Committee would review annual recommendations of the Civil Service Commission and the Office of Management and Budget, consider the views of employe organizations, federal officials, and other experts on the analysis and pay proposals in the CSC/OMB report, and recommend to the President the action he should take on the schedules.

The President would adjust schedules and report his action to the Congress before Oct. 1 each year. He would furnish to Congress reports and recommendations of CSC/OMB and the Advisory Committee.

Congress would monitor the policies and practices embodied in the proposed law, and would enact changes in the law as members deem necessary. If in any year the President determines that the adjustment required by the law is not appropriate because of a national emergency or economic conditions affecting the general welfare, he must notify Congress of the alternative action he proposes to take.

Congress would then have the opportunity to approve or disapprove his proposed action. Should the Congress disapprove, the President would have to make the adjustment called for under the permanent law.

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it possible to use the response of an area to ground vehicles to forecast the aircraft-supporting capability of the area.

This paper delineates the study, office and field necessary to bring together the correlations of these two disciplines and presents directly usable criteria for assessing aircraft landing site capability from behavior of the site to one pass of ground vehicles. This method developed will permit a direct and very rapid determination of the capability of an area to support any aircraft without the need for soil-strength measuring equipment or specially trained personnel. Specifically, the process is one of selecting a standard vehicle, such as a 2½-ton cargo truck, traversing a potential landing area, and noting the rutting. From this degree of rutting, a direct projection of allowable operations of any aircraft can be made.

TITLE: An Investigation of the Dynamic Pressure Response of Flueric Transmission Lines

AUTHOR: ATHA
Advanced Ballistic Missile Defense Agency

ABSTRACT: This paper describes an analytical and experimental investigation which was conducted to determine the dynamic pressure response of flueric transmission lines to sinusoidal and square wave input pressure signals. An electrical-pneumatic analogy was used to develop a distributed parameter mathematical flueric transmission line model. The model was then used to predict analytically the dynamic pressure response of flueric transmission lines to sinusoidal input pressures over a wide frequency range. Fourier series techniques were used with the model to determine the dynamic pressure response of flueric transmission lines to square wave input pressures over a wide frequency range. Experiments were conducted using 2-, 4-, 6-, and 8-foot lengths of 0.125-inch inside diameter lines. Experimental input and output data was obtained for sinusoidal input pressures ranging in frequency from 0 to 300 hertz and for square wave input pressures ranging in frequency from 0 to 110 hertz. The correlation between the experimental and analytical data was very good. The study showed clearly some of the pronounced dynamic effects that occur in the high frequency operation of flueric transmission lines. The mathematical model is presented as a validated engineering design tool for analyzing the dynamic pressure effects that occur in flueric transmission lines.

TITLE: Prediction of High Velocity Solid Propellant Gun Performance by Gas Dynamic Computer Program

AUTHOR: BAER
Ballistic Research Laboratories, Aberdeen Proving Grounds

ABSTRACT: A key link in the development of an overall ballistic model for weapon research is the solid propellant gun gas dynamics computer program. This program is a one-dimensional Lagrangian code based on the Richtmyer Von Neuman "q" method; but unlike the basic method which considered the flow of gas only, the present method considers the flow of a fluid consisting of hot gas with burning propellant grains entrained in the gas. The equations describing the time dependent flow of gas and propellant in a gun with a variable cross sectional area is described. Integration of these equations by the program gives a detailed picture of the interior ballistic processes occurring in a gun such as pressure gradients or heat transfer profiles.

Comparison between the detailed interior ballistic predictions of the gas dynamics program and the experimental data from the firings of an heavily instrumented high velocity (4500-7600 f/s) 37mm smooth bore gun is given. This comparison indicates that the percentage error between prediction and experiment for both velocity and pressure is less than 25%. Conclusions are given to the comparison and plans for future theoretical and experimental work are indicated.

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TITLE: Determination of Latitude and Longitude of Unknown Stations from Photographs of a Satellite Against Stellar Background Independent of any Distance

AUTHOR: BALDINI
Engineer Topographic Laboratories, Fort Belvoir

ABSTRACT: In this issue, a method for determining the geocentric coordinates latitude and longitude of unknown stations based on photographs of a satellite relative to the star background is described.

A minimum of two photographs is required in order to obtain the solution. The elapsed period of time between these two photographs can be as small as a second or as large as many hours or days.

The satellite geocentric right ascension and declination for a given time must be known. These coordinates can be obtained from known orbital elements, or from simultaneous or quasisimultaneous observations taken against a stellar background, or from the sequential collation of ranges.

A topo-geocentric instantaneous orbit is considered for deriving the formulation.

TITLE: Alteration of Taste Qualities Through Natural Products

AUTHOR: BARTOSHUK
Natick Laboratories

ABSTRACT: Palatability is a strong inducement to man to eat and thereby maintain his performance capacity. Because of the need for a high degree of acceptance for operational rations, and for processed foods generally, the palatability factor in foods has become a subject of increasing research. This paper suggests a new method of altering taste that works by changing the tongue rather than flavoring the food, thereby eliminating some potentially dangerous food additives. Two taste altering substances originating from plants (Gymnema sylvestre and Synsepalum dulcificum) are considered from the standpoints of their history, chemical composition and taste effects. Potential uses in flavor research and in the improvement of foods are briefly discussed. The leaves of Gymnema sylvestre suppress sweetness. Synsepalum dulcificum berries (miracle fruit) cause sour foods to taste sweetened. The active principle in Gymnema sylvestre leaves resides in a moiety of triterpenoid glucuronides. The active principle in miracle fruit appears to be a glycoprotein partially composed of arabinose and xylose. The anecdotal descriptions of the taste effects of Gymnema and of miracle fruit in the literature have not been entirely consistent. Investigations at the U.S. Army Natick Laboratories were designed to acquire precise information on the taste effects in order to utilize these materials to study the mechanisms of taste and to suggest possible applications of the materials to improve the palatability of food used in rations.

TITLE: Night Vision Viewers Using Thermal Techniques

AUTHORS: DALY, SIMS and BEAN
Night Vision Laboratory, Fort Belvoir

ABSTRACT: Advances in multielement infrared detector arrays and coolers have made possible a family of lightweight viewers for ground-to-ground applications. Concepts and scanning techniques are reviewed and the detector noise bandwidth is discussed. Two of these viewers, a tripod mounted thermal night observation device, and a handheld thermal viewer, are described. Data is given on range and other performance characteristics.

TITLE: Retinal Damage by Q-switched Ruby Laser

AUTHORS: BEATRICE, POWELL, LANDERS and BRESNICK
Joint AMRDC-AMC Laser Safety Team, Frankford Arsenal

ABSTRACT: Threshold energies for retinal damage by Q-switched Ruby

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Col Tobey is New Director Of ARMTE at White Sands

Duties of director of the Army Missile Test and Evaluation Directorate (ARMTE) at White Sands (N. Mex.) Missile Range were assumed late in July by Col Nelson W. Tobey, a veteran of 29 years of Army service.

Col Tobey, who succeeded Col Robert T. Townsend, was until recently the director for Missiles and Space, Office of the Chief of Research and Development.

He obtained a BS degree in chemistry from Virginia Military Institute (VMI) in 1939 and at that time he received a Reserve commission as a Field Artillery officer. He has a 1950 master's degree in mechanical engineering from the University of Southern California, and is also a graduate from the Command and General Staff College and the Army War College.

Following World War II, in which he participated with the 7th Field Artillery in campaigns in North Africa, Sicily, Normandy, Aachen, Remagen and Central Europe, he taught chemistry and physics at VMI for one year until he received his Regular Army commission.

Col Tobey has served at Fort Bragg, N.C.; Fort Richardson, Alaska; Fort Bliss, Tex.; Riyadh, Saudi Arabia; and two separate tours in the Office of the Chief of Research and Development, HQ, DA. At Fort Sill, Okla., from July 1965 to May 1967, he served first as commanding officer of the 9th Field Artillery Missile Group, then as deputy commander of the III Corps Artillery.

Assigned in May 1967 as chief, Air Defense and Missiles Division, Office of the Chief of R&D, he became deputy director for Missiles and Space in August 1967 and director in January 1969.

Army Awards $3.8 Million For CDC 6400 Computer

Award of a $3,891,938.95 fixed-price contract was announced July 31 by the U.S. Army's Safeguard System Command to purchase a 6400 computer which is being utilized in the Safeguard Management Information System (SMIS).

The modification of the contract with Control Data Corp. is for the purchase of the CDC 6400 computer which has been operating at the command's headquarters under a computer services agreement.

The computer will function as the central data storage and retrieval ele-

ment of the Management Information System. This will serve the Safeguard System manager in Washington, the command headquarters in Huntsville, and other Army organizations involved in the ballistic missile defense program.

SMIS is one of the first programs of its kind designed to use a centralized data processing system to provide integrated management information for a major defense project.

The SMIS data processing equipment and computer programs will enable Safeguard managers in a variety of areas to feed large quantities of data into the system where it can be stored and later retrieved almost instantaneously in whatever form or combination that is required.

The retrieved information can be displayed on desk-set cathode ray tube viewers similar to a small television set or printed copies can be made.

The CDC 6400 computer, which will be the heart of the SMIS, is capable of storing 2-billion characters of information in its disk file and extended core storage systems. It will be able to receive from or provide information to as many as 12 terminals simultaneously.

Development of the SMIS is under the cognizance of the Management Data Systems Office of the Safeguard System Command.

MICOM Key Civilian Employe Takes ECOM Comptroller Post

Robert C. Lowery ended 14 years service July 9 as a key civilian employe of the Army Missile Command and its predecessor agencies at Redstone (Ala.) Arsenal to become comptroller at HQ U.S. Army Electronics Command Fort Monmouth, N.J.

He had served for several years as director of programs at the Missile Command after moving to Redstone Arsenal in 1956 from the Pittsburgh Ordnance District.

Lowery is a past president of the local chapter of the Federal Government Accountants Association, and was active in the local activities of the Association of the U.S. Army and American Ordnance Association.

A colonel in the Army Reserve, he was an instructor in the Industrial College of the Armed Forces (ICAF) group study course in the U.S. Army Reserve School at Redstone Arsenal. He graduated from the ICAF in 1968, has a master's degree in business administration from Ohio State and a BS degree in BA from the College of Wooster.

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Laser operating in the TEM_{oo} mode were determined in the Rhesus monkey. Threshold values were established for both a 3mm and 8mm diameter beam which produced estimated retinal spot sizes of 40-50μ. These levels were compared to threshold values obtained using a divergent beam designed to produce estimated retinal spot sizes of 500μ, 750μ and 1mm. Several different methods were utilized to determine the threshold end-point for retinal damage, and the comparative sensitivity of each technique was analyzed. These included:

1. Ophthalmoscopy

2. Fundus photography and fluorescein angiography

3. Histopathology using serial sections, whole-mount flat preparations of the retina and pigment epithelium; retinal vascular injections and electron microscopy. The study included a comparison of threshold levels obtained for Q-switched Ruby Laser at 6943Å with threshold data collected in a similar fashion for Q-switched Neodymium Laser at 1.06μ.

TITLE: Exploitation of Contoured Double Cantilever Beam Specimens in Crack Growth and Arrest Studies

AUTHORS: BLUHM, GORDON and MORRISSEY
Materials and Mechanics Research Center

ABSTRACT: Fail-safe design of critically loaded structural elements envisions the control and eventual arrest of prevalent cracks. Implicit in the concept is an acute awareness of the characteristics of crack dynamics upon which a sound criteria for crack arrest can be based.

The present study is based principally upon the precept that not only energy release rate, but also its spatial gradient, plays a significant role in arrest criteria. To further examine the effects of this latter parameter, the authors here considered a specially contoured double cantilever beam specimen in which this gradient is controlled.

Materials considered in the present study included 7075-T651 aluminum, graphite and glass. Crack growth data from tests covering the range from stable to unstable growth was obtained using optical or compliance measurements or X-ray photographs. The crack growth data showed, particularly in the aluminum specimens, a very marked effect of the energy release rate gradient on the relative crack stability. The graphite specimens, nominally very brittle, were completely stable over the range of gradients investigated. The glass on the other hand was completely unstable over the limited gradient range investigated.

TITLE: Threshold Effects of Chemical Mixtures in the HCN Laser

AUTHORS: MORRIS, JACOBS, BRAND and MOONEY
Electronic Components Laboratory, Fort Monmouth

ABSTRACT: The discovery of the HCN laser has given scientists, for the first time, an inexpensive coherent source in the sub-millimeter region of the spectrum. This laser has two strong oscillation lines, one at 337 μm and another at 311 μm wave-length, with powers ranging between 1 and 10 mW cw for 1 to 2 meter lengths.

Experiments are described where various chemicals were added to the basic laser fuel, CH_3CN (acetonitrile), in the HCN laser. Laser output power at 337 μm wavelength and current threshold, (minimum current necessary for oscillation) were monitored. Results include increased power and efficiency with the addition of CO_2 or O_2 to the discharge. Experiments also include the characterization of the HCN laser output over a wide range of pumping speeds. Increased pump speed resulted in increased power; however, power saturation occurred at higher pumping speeds.

From these results one can obtain insight into the basic mechanism of the HCN laser and develop possible means for improvement.

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TITLE: Conformational Studies on the Active Site of Acetylcholinesterase by Electron Paramagnetic Resonance

AUTHORS: MORRISETT, BROOMFIELD and HACKLEY
Medical Research Laboratory, Edgewood Arsenal

ABSTRACT: Membrane-bound and membrane-free acetylcholinesterase have been spin-labeled with a nitroxylorganophosphonate at the active site seryl residue. The electron paramagnetic resonance spectrum of the spin-labeled membrane-bound enzyme indicates that the active site region is quite large and/or located on the enzyme's surface. The spectrum of spin-labeled, membrane-free acetylcholinesterase is similar to that of the membrane-bound enzyme, indicating that the conformation at the active site region is not greatly affected by removing the enzyme from the membrane. The paramagnetic radical is quenched when the spin-labeled membranes are held at 25° for 24 hours. The resonance signal is regained by the addition of nonionic detergent. This effect has been tentatively explained in terms of the reducing capacity of a nearby sulfhydryl group. This quenching effect is not observed with the spin-labeled, membrane-free enzyme. The spectrum of the membrane-free material exhibits two components, suggesting the presence of two different types of active sites.

TITLE: Response of Selected Materials to High-Speed Fragment Impact

AUTHOR: BROWN
Engineer Waterways Experiment Station

ABSTRACT: In order to design effective protective schemes for personnel and material, it is necessary to understand the behavior of various materials under fragment impact. This knowledge allows one to make optimum use of time, personnel, and available materials. A study has been made to gain an understanding of the basic physical laws governing the defeat of fragments using textiles, wood, and earth materials.

Mathematical analysis of the physical characteristics of the various materials and experiments using a fragment-simulating projectile have yielded insight into the basic mechanics of fragment defeat. Of particular interest are the concepts of (1) the various failure modes of textiles; (2) the critical velocity limit for textiles and its importance in engineering design; (3) the physical characteristics desirable in textiles used to defeat fragments; (4) the nonlinear relation between thickness and effectiveness for textiles; (5) the linear relation for effectiveness of wood; and (6) the tendency of some earth materials to show a maximum depth of penetration for the fragment-simulating projectile at approximately 3500 fps. These concepts are analyzed using basic physical laws and mathematical models.

TITLE: Use of Activation Analysis for Determining Weight of Pellet in M34 Primers

AUTHORS: PRIEST, BURNS and PRIEST
Materials and Mechanics Research Center

ABSTRACT: 14 MeV neutron activation analysis for oxygen has been used to nondestructively determine the pellet weight in the M34 primer. The pellet contains 26.53% of compositional oxygen, and the special nuclear characteristics of the ^{16}N produced by bombarding the oxygen with 14 MeV neutrons are ideal for use in production quality assurance inspection systems.

Based on the results of these analyses, design specifications for a production quality assurance inspection system for 100% inspection of M34 primers for low pellet weight have been developed.

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Kopeikin Gives Lectures On CAMS, Missile Choice

Selection of a preferred missile system and the Coastal Anti-Missile System (CAMS) were discussed in two lectures presented in July by Leonard I. Kopeikin, assistant director and chief, Advanced Systems Studies Division, U.S. Army Advanced Ballistic Missile Defense Agency, OCRD.

CAMS is a systems concept designed to supplement the SAFEGUARD System capability in coping with sea-launched ballistic missile threats. The lecture on selection of a preferred missile system using concepts of systems analysis in evaluating complex problems and possible trade-offs.

Kopeikin presented the lectures to students in a course on systems analysis offered at the Center for Naval Analyses, Arlington, Va. The military-sponsored course consists of 12 months of instruction in mathematics and economics at the University of Rochester (N.Y.) followed by three months of defense application at the Center for Naval Analyses.

Thirty-four are participants in the course, including officers from the various military services and civilians. Upon successful completion of the program, participants are awarded master's degrees in administration.

Kopeikin served 10 years with General Electric, TEMPO, as supervisor of advanced weapons systems studies before joining the staff of ABMDA, Office of the Chief of Research and Development. An engineering graduate of the City College of New York, he has done graduate work at the University of New Mexico, the University of California at Los Angeles and in a General Electric program.

CS3 Passes First Field Test By V Corps Support Command

Initial field testing of the U.S. Army mobile Combat Service Support System (CS3) was successful recently at Rhein Main Air Force Base, Frankfurt, West Germany.

The CS3 is a van-mounted system using an IBM 360/40 computer, to provide on-site logistics, personnel and administrative information to commanders of Army division-size or larger units in the field.

CS3 has been developed by the U.S. Army Computer Systems Command headquartered at Fort Belvoir, Va. The field test in Germany was conducted by the V Corps Support Command, Seventh Army, with the guid-

ance of the Computer Systems Command Support Group, Europe.

The test showed that the entire CS3 system can be shut down, dismantled at one site, reassembled at another and be operational within six hours, not including travel time. Thus the test proved that a unit required to deploy quickly can move with its computer support.

At the beginning of the field test, the CS3 was processing actual V Corps Support Command data at a semipermanent site inside the city of Frankfurt. The test was recorded as successful when processing was resumed at the field site and when the move was completed without damage to the equipment.

Maj Gen Ralph L. Foster, CG, Support Command, wrote after the test that the CS3 system, as demonstrated, "is capable of operating effectively in a field environment."

Formal testing of the system is being carried out by the commanding general, III Corps, Fort Hood, Tex.

Connell Takes Command Of Edgewood Arsenal

Twenty-six years after he served the first of three previous tours at Edgewood (Md.) Arsenal, Col George W. Connell Jr. became commanding officer, succeeding Col Paul R. Cerar who had been CO since 1967.

Col Connell was previously deputy director, Chemical and Nuclear Operations Directorate, HQ DA, an assignment that followed two years as commander of the Chemical, Biological, Radiological (CBR) Agency, Combat Developments Command, Fort McClellan, Ala.

Following graduation from the Industrial College of the Armed Forces, Washington, D.C., he was assigned to Edgewood in 1965 as special consultant to the commander. Reorganization of the arsenal in 1966 made him the first director, Weapons Development and Engineering Laboratories.

Col Connell served in 1963–64 as a staff officer, Office of the Assistant Chief of Staff for Force Development, Washington, D.C. Following a one-year tour of duty in Korea as chemical officer, 1st Cavalry Division, he went to Washington, D.C., as a staff officer in the Office of the Deputy Chief of Staff for Operations.

After studying three years at Texas A&M University, he attended the University of Georgia to receive a bachelor's degree in business administration in 1955. His decorations include the Legion of Merit with OLC, Bronze Star with "V" device and Army Commendation Medal with 3 OLCs.

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TITLE: A Fleuric Oscillator for Military Timer Applications
AUTHORS: CAMPAGNUOLO and GEHMAN
Harry Diamond Laboratories

ABSTRACT: Military timer applications require an oscillator whose frequency is not affected by severe environmental conditions. The output frequency of flueric oscillators, although typically insensitive to vibration and other mechanical stresses, depends on the supply air stagnation temperature and pressure. This paper describes the theory and development of a flueric RC oscillator whose frequency is insensitive to changes of these stagnation conditions.

Three geometrically similar oscillators were tested to determine the network parameters required to produce this insensitivity. A modification of one of these oscillators had a frequency variation of less than ± 1 percent for pressures from 6 to 30 psig and temperatures from -58° to 175° F.

TITLE: Radar Polarization Diversity Effects on Target Reradiated Phase Front
AUTHORS: HATCHER and CASH
Redstone Arsenal

ABSTRACT: Angle fluctuation or target glint have always been a source of error in tracking radars. Angular errors in the reradiated phase front can, at short ranges, result in large errors in apparent target position and consequently large miss distances in the case of radar guided missiles. An effort at MICOM to alleviate this problem has led to the investigation of polarization diversities as a glint reduction technique. The evaluation of polarization diversity techniques has made use of target model analysis as well as an experimental program using actual targets. Accurate quantitative evaluation was not accomplished; rather, performance trends determined from the program indicate polarization diversity is possibly an effective glint reduction technique.

TITLE: Computer Operated Automatic Fuze Testing Systems
AUTHOR: CHASE
Harry Diamond Laboratories

ABSTRACT: Computer controlled fuze testing systems are discussed and illustrated with the MX596 Automatic Testing System. Advantages of such a system are high speed and great flexibility with a significant decrease in per-fuze testing costs. Real-time generation and printout of production line statistics makes possible the efficient control of high volume production. In-line testing provides early reject data with inherent cost savings. Usefulness of the testing system as an engineering tool is discussed.

TITLE: Echo Amplification in Magnetic Materials with Application to Pulse Compression Radar
AUTHORS: DANIEL, GUENTHER, and CHRISTENSEN
Redstone Arsenal

ABSTRACT: Although the spin-echo technique was originally observed in nuclear magnetic resonance, it has subsequently been shown that the echoes can be observed in a large number of physical systems and is not necessarily restricted to magnetic spin systems. Simply speaking, if two rf pulses are applied to a suitable material, the echo is an rf signal generated from within the material and is produced at a later time equal to the pulse separation. If the first pulse is the radar target return and the second pulse is a locally applied signal, then this technique can be utilized to compress the transmitter pulse

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and obtain greater range and resolution. It has recently been found that the spin-echo technique has an amplification characteristic that should be observable in a more limited but a still large class of materials. Ferrimagnetic YIG has been reported to yield a gain in echo amplitude over that of the first pulse by a factor of 10^5 at room-temperature. In this laboratory the spin echo has been studied in several nuclear spin systems and amplified nuclear spin echoes have been observed in antiferromagnetic MnO. Although this material is not suitable for a system application, the mechanisms are essentially those basic to device considerations. The observation appears to have sufficient merit to warrant further device considerations.

TITLE: Observations on Early Detection and Therapy of the Defibrination Syndrome in Meningococcemia

AUTHORS: LUTCHER, LINDESMITH, PETTYJOHN, STEUDEL, DUNKEL, IONNO and COOPER
Madigan General Hospital

ABSTRACT: During a recent outbreak of meningococcal disease at our institution, forty-seven culture proven cases of meningococcemia and or meningitis due to Neisseria meningitidis were diagnosed and treated. Particular attention was given to early detection of the defibrination syndrome (DIC) with the protamine test. Thirteen patients had positive protamine tests on admission to our intensive care unit. Five of these had gross evidence of DIC as manifested by routine coagulation studies. All patients admitted to the intensive care unit with a presumptive diagnosis of meningococcemia were immediately heparinized. When the initial screening studies were within normal limits, heparin was discontinued after one or two doses at four hour intervals. No morbidity was noted from the early and prophylactic use of heparin in our patients. Five patients in our series expired. The cause of death was attributed to diffuse intravascular clotting in two cases, both of which had gross evidence of defibrination on admission. A third patient with severe defibrination on admission was treated with heparin and convalescent plasma and recovered. This patient is believed to represent recovery from a more severe illness with DIC than has previously been described in the literature. A double blind cooperative study of the early use of heparin in patients with acute meningococcemia is strongly recommended.

TITLE: An Experimental Investigation of a Flueric Explosive Initiator

AUTHOR: CORRADO
Picatinny Arsenal

ABSTRACT: Resonance tube heating phenomena has been observed for several years but never seriously considered for its heat producing capabilities. In FY 69, Picatinny Arsenal undertook the task of investigating the feasibility of utilizing this device as a fluidic to explosive transducer. The primary objective was to develop an initiator, which when used with proposed fluidic safing, arming, and fuzing systems, would not compromise the increased nuclear hardness offered by the fluidic components.

The initiator, termed a "pneumatic match," consists of two nonmoving parts: A sonic nozzle and a resonance tube. The device operates when gas is introduced into the nozzle plenum and exits sonically from the nozzle initiating a resonating flow in the receiving tube. The resulting temperature rise is instantaneous.

The objective of the experimental investigation was to determine and optimize the geometry and operating parameters effecting the performance of a resonance tube for application as a flueric ignition device. Upon achieving an optimum configuration, the device was to be utilized for determining the feasibility of igniting various pyrotechnic compounds with the heat produced by the resonance tube.

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User Services Branch Set Up As USAMRDC Clearinghouse

Scientific investigators in the U.S. Army Medical Research and Development Command (USAMRDC) can call upon a single source, the User Services Branch, for rapid response to varied and complex medical research information requirements.

As an element of the Scientific and Technical Information (S&TI) Division of USAMRDC, the User Services Branch functions as a life sciences information clearinghouse, using modern literature searching techniques and data banks to answer queries.

The scientist in charge of the User Services Branch determines information sources which can best aid the researcher and provides selective dissemination of information tailored to requirements.

The S&TI Division serves USAMRDC users by providing a continuous exchange and availability of scientific and technical information. Stated goals are to avoid unnecessary expenditure of resources, make optimum use of existing resources, reduce medical R&D lead time, minimize duplication of federally funded research and make more effective use of advanced technology.

OCRD LS Division Sponsors Pollution Control Conference

Army research and development related to environmental pollution control will be discussed at a conference being arranged by the Office of the Chief of R&D for a date in October still to be decided.

The conference, in the Washington, D.C., area, will be attended by representatives of interested General Staff elements, Army Materiel Command, Office of the Surgeon General, Corps of Engineers, in-house laboratories and other agencies concerned with prevention or abatement of pollutants involved in Army operations.

Topics to be considered include programs and policies of Army agencies and other national agencies concerned with control of environmental pollution. Problems of establishment and identification of standards will be discussed, along with the form Army pollution control research should take.

The Life Sciences Division of the Office of the Chief of Research and Development will be host to the conference. Further information may be obtained by telephoning OXford 4-3346.

Deputy Secretary of Defense Announces WMCCS Cutback

Sharp cutbacks in a program announced Nov. 12, 1969 to standardize hardware and software in a Worldwide Military Command and Control System (WMCCS) and the part of the Intelligence Data Handling System (IDHS) tied to the WMCCS were announced recently.

Deputy Secretary of Defense David Packard said the revision of acquisition plans is based on a 5-month review. DoD will procure a minimum of 15 new standardized computing systems with an option for 20 additional computers. Under the original program, a minimum of 34 new computers was to be procured with an option for up to 53 additional computers.

Planned is the use of a third-generation IBM/360 as a "second standard" within the WMCCS and IDHS. Currently 16 centers covered by the new standardization effort lease medium or large IBM/360 machines.

Depending on an economic analysis of each installation, the currently operated IBM equipment may be purchased, continue to be leased, or replaced with the standard established by the new procurement. All new computers will be provided by the standard established by the competition.

Some software will be provided from a central office for existing third-generation IBM/360 equipment as well as for the new standard to be established as a result of the WMCCS competition. This new office, the Joint Technical Support Activity, will be established within the Defense Communications Agency.

Planned computer procurement has been reduced to minimize the cost risks of a large-scale hardware and software conversion during a period of increasingly tight DoD budgets. Software conversion costs will be programed within existing fiscal constraints. Another consideration is the desire to reduce commitment to a large amount of new automatic data processing equipment before the recommendations of the Blue Ribbon Defense Panel are received.

The Air Force Electronic Systems Division will be responsible for the ADPE selection and the Joint Chiefs of Staff will be responsible for establishing a schedule for delivery of machines to users. In order to meet urgent needs for improved ADP capabilities at several essential headquarters, including the Strategic Air Command, the Air Force will soon announce the release date for the Request for Proposal (REP).

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TITLE: New Techniques for Entry Into Explosive Warheads
AUTHORS: STEWARD and CORRIE
Frankford Arsenal
ABSTRACT: The work described in this paper is concerned with the application of materials degradation concepts to facilitate entry into explosive ordnance items for render safe purposes.

Applied research studies leading to the development of materials and devices which could provide controlled fracture of the aluminum alloys commonly used in the outer casings of selected ordnance items are discussed. Techniques are described which reduce the time and effort required to gain entry into these items. These reductions in time and effort should significantly lessen the hazards associated with many render safe procedures.

In connection with these studies, a DA Approved Small Development Requirement for an Explosive Ordnance Disposal Entry Kit has been generated.

TITLE: Effect of Environment on Crack Propagation in High Strength Steel
AUTHORS: RINNOVATORE and CORRIE
Frankford Arsenal
ABSTRACT: The studies described in this paper are part of a program to investigate methods of intentionally degrading metals and alloys of military importance. They were performed under DA Project 1T062105A333, Controlled Degradation of Materials.

The mechanism of failure of high strength steel in the presence of selected degradation agents was studied by means of fracture mechanics. Tests were performed on pre-notched, fatigue-cracked 4130 steel bend specimens. The plane strain fracture toughness, K_{IC}, was determined in air and in the presence of the degrading environments. The initiation and propagation phases of the fracture process are discussed in relation to the values of K_{IC} obtained in these environments.

TITLE: Optimization Analysis of a Compact Lightweight Laser Rangefinder
AUTHORS: COSTANTINO, PONTELANDOLFO and READO
Frankford Arsenal
ABSTRACT: This paper describes the analytical optimization that was used to achieve the design approach for a compact, lightweight laser rangefinder suitable for use within the general constraints of the mortar weapon system. Optimization, in this case, means minimizing weight, size and cost while maximizing performance, reliability and consideration of human factors.

The rangefinder design represents a significant engineering step and was realized only as the result of optimizing every aspect of laser rangefinder operation. The power supply efficiency had to be improved to allow the use of smaller, lighter batteries. High transmitter output had to be maintained while drastically shrinking the volume of this unit. The receiving optics serve a dual role of sight and collector of reflected energy; efficient optical design was critical. Selection of a suitable detector required extensive investigation and testing. The most challenging part of the effort was the design of a low noise, wide bandwidth video amplifier. The latest available integrated circuits were employed in the design of the counter and control circuits. Finally, all of these elements had to be combined through proper mechanical design to yield a working package which would represent to its user a piece of military gear that would be easy to use, perform reliably, and require a minimum of care and maintenance.

TITLE: Biological Effects of Staphylococcal Enterotoxin B
AUTHORS: DANGERFIELD and CROZIER
Medical Research Institute of Infectious Diseases
Fort Detrick
ABSTRACT: The results of a research program to determine the biological

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effects of staphylococcal enterotoxin B are presented. A single lot of highly purified staphylococcal enterotoxin B was prepared and characterized. It was found to be a simple protein having a molecular weight of 35,300 and to be a single unbranched chain of amino acids. A portion of this material was utilized in preparation of toxoid and to produce hyperimmune serum. Both were shown in experimental animals to be effective in prophylaxis and the hyperimmune serum was shown to be effective therapeutically. Pathophysiological studies have indicated that the kidney removes toxin from the circulation and that vascular collapse plays an important role in intoxication; however the exact mechanism of toxicity has not been established. A variety of experimental animals were employed for the purpose of bio-assay. Primates were found to be the most susceptible and responses were shown to be directly related to the quantity of toxin administered.

TITLE: The Internal and External Flow Field Associated with Parachutes During Inflation

AUTHOR: DE SANTIS
Natick Laboratories

ABSTRACT: It is recognized by researchers in the area of parachute aerodynamics that the flow field surrounding an inflating parachute is strictly a matter of conjecture. What makes knowledge of the flow field so important is that it is the dominant factor which controls the parachute filling time, parachute geometry and free-flight trajectory. This paper addresses itself to filling this gap in flow field knowledge by presenting the results of a comprehensive study to determine the flow field associated with a parachute during inflation. Seven models representing stages of parachute inflation were installed in a wind tunnel and studied over a range of flow velocities. The novel application of a hot-wire anemometer system to obtain the flow field characteristics is the prime reason that the study produced its remarkable results. The use of conventional pitot tubes or survey rakes would never have resulted in the discovery of the magnitude of the low velocity flow passing through the parachute fabric as discussed in the paper. Seven models simulating various stages of inflation of the C-9 parachute were fabricated and tested in a specially constructed wind tunnel test section where the temperature could be held uniform. Using this method, it was possible to accurately measure the internal and external flow surrounding the canopy. Some possible applications of the data to full-scale parachute systems are presented.

TITLE: Predictions of Shaped Charge Warhead Lethality Effectiveness

AUTHORS: SIMON and DIPERSIO
Ballistic Research Laboratories, Aberdeen Proving Ground

ABSTRACT: A modified theory of shaped charge jet penetration has been proposed which recognizes a "cutoff velocity" in a jet. No jet material traveling with a lower velocity than the cutoff velocity of a penetrating jet is a function of both target density and its hardness.

The mathematical formulation of jet penetration capability of precision charges, using jet and target parameters and the cutoff concept, are now extended to determine the lethality effectiveness of warheads against tanks.

The Ballistic Research Laboratories have developed a computer program which determines vehicle vulnerability to warhead attack. The output of this program is the probability of kill (expressed as M, F, M or F, or K kill).

The warhead effectiveness for thirteen warheads against two foreign tanks has been theoretically assessed and rated. By similar techniques, seven of these warheads have been evaluated based on

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Banquet Speaker Outlines Academic-Army R&D Roles

Participants in five of the six previous Army Science Conferences at which Dr. Ralph G. H. Siu had presided as toastmaster were accustomed to having his robust humor take precedence over significance of any message regarding a problem area.

A complete turn-about was evident in his performance as banquet speaker at the 1970 conference. Except for two short jokes, one of which deprecated the laudatory introduction he received from Chief of R&D Lt Gen Austin W. Betts as toastmaster, he was obviously deeply influenced by the turbulence of the times.

Dr. Siu had a message to convey, and he conveyed it with great seriousness. He referred briefly to his experiences and observations while he was a Presidential appointee. He was charged with responsibility as associate administrator of the new Law Enforcement Assistance Agency and the organizer and director of the National Institute of Law Enforcement and Criminal Justice. Then he proceeded as follows:

* * *

Growth in crime and delinquency is only one of the many changes that are taking place in our country. I would like to discuss another which is of direct interest to us here tonight. This is the major transformation in the attitude of the academic community toward defense research.

While the rhetoric from the campuses is loud and clear, I sense a semi-paralysis among many scientists and executives in the Defense Department as to what ought to be done about it. The general reaction seems to be one of lying low, hoping that the nasty ordeal will go away in a few years, after which the pre-Berkeley associations can be resumed.

But the issues will not just go away that simply. They are too deeply imbedded in the cultural turmoil that is sweeping the country. The universities will never be the same again. I would like to open up the dialogue on this critical matter, so that we can do the right thing by our country at this time.

My talk will be divided into three parts. The first part outlines the assumptions underlying our past relationships with universities. The second part discusses two illustrative social trends that reached significant stages during the past decade. The third part suggests adaptations to these changes on the part of the Army.

University Relationships. Let us begin with the Army's relations with outside organizations.

Following World War II, there was a gradual maturing of Army policies in research and development. The series of adjustments began at the engineering end. Industrial representatives made quite cogent and successful arguments to the effect that the Army should get out of the competitive arsenal business and leave production of materiel to private industry.

By successive increments, the spectrum of in-house activities was narrowed. Before long, the development of materiel became practically a completely contractual effort. At the other end of the spectrum, the Army seemed more than happy to let the universities preempt basic research.

Both industrial and academic institutions were well supported by Army funds and they grew impressively in strength. By the early fifties, the concept of a 3-way collaboration took hold—a government, university and industry team. This was and is still a good basis of operation.

Some unforeseen and undesirable side-effects on the esprit and quality of the in-house scientific staff did develop during the late fifties. As the academic community expanded from basic research into applied research and as the industrial concerns expanded from development into applied research, many of the in-house personnel were whipsawed into the untenable position of having to justify duplication of effort with Army contractors and grantees.

The challenging development projects had already gone to industry. The challenging basic research projects had already gone to universities. Then it appeared that most of the challenging applied research projects might also go outside. Many of the in-house personnel became contract and grant administrators, supervisors of contract and grant administrators, and supernumeraries in headquarters.

Sensing the unsatisfactory erosion of the initimate feel of scientific substance and research competence, the Army initiated strong corrective steps toward strengthening the in-house laboratories. The Army Science Conference was one of the things that came out of these moves. The Secretary of the Army Research and Study Fellowship Program was another.

In the meantime, the continuing relationship with universities was based upon four assumptions: First, the

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strictly experimental data acquisition.

It will be shown that the probability of kills determined from shaped charge theory and experiment are in agreement. Furthermore, precision shaped charge warhead designs can be rated without expensive and time consuming firing programs.

TITLE: Far Field Characteristics of Ground Shock Induced by Explosions

AUTHORS: DRAKE and SAKURAI
Engineer Waterways Experiment Station

ABSTRACT: Computer code simulation of the ground shock effects caused by explosions is designed to predict the history of the ground motion from the initial moment of the explosion, and requires elaborate description of the characteristics of the earth material. Because of their complexity, the extension of a code calculation to the range beyond the close-in field is costly and often yields unreliable results due to the accumulating errors; thus, empirically determined formulae are generally relied upon for quantitative descriptions of weapons effects.

This paper describes an attempt to improve the situation by utilizing a simple model which is good enough to describe the salient features of ground motion history outside the close-in range. It is essential to recognize that the elastic solution cannot account for the behavior near the explosion source and the "close-in" effects should be taken into account by an appropriate fit of the singularity of the solution. This is justified when those effects are confined to a small region in space and thus provides the key to the analysis. The seemingly unrealistic nature of the elastic solution often results from the improper input condition and not from the model itself.

This approach is applied first to the case of the contained burst by using a simple analytic solution; the result compares favorably with test data. Approximate solutions are also derived to be utilized for the analysis of the surface burst. The latter solutions also compare satisfactorily with results.

TITLE: An Electro-Magnetic Technique for Wire Location

AUTHOR: DUNN
Fort Monmouth

ABSTRACT: The command detonated land mine has been used by the enemy in Vietnam. The casualties inflicted by these mines makes the location of the mines or the wires used to detonate them a necessity. This paper describes a technique which shows some promise of solving this urgent problem. This technique uses the polarization rotation of the electromagnetic vector of an RF wire to enhance the detection capability . The experimental system was built using a frequency of 250 MHz and the vector rotated 15 revolutions per second. The system could detect a pair of field telephone wires buried 4 inches in relatively moist soil. During the experimentation it was observed that the trench used to bury the wire also gave returns similar to the wire returns. The search rate, determined by calculation, would be quite slow and would not meet field requirements.

TITLE: Pathogenesis, Prophylaxis, and Therapy of an Incapacitating Disease

AUTHORS: EIGELSBACH, HORNICK, SCHRICKER, HANKINS and GRIFFITH
Biological Laboratories, Fort Detrick

ABSTRACT: Our continuing investigations on the effectiveness of tularemia vaccine prophylaxis in man and a previous broad base of experience in treating tularemia made it possible to evaluate in volunteers a strain of

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Pasteurella tularensis more virulent and therefore potentially more virulent and therefore potentially more immunogenic than the innocuous live vaccine strain LVS. This more virulent strain had been previously studied extensively but exclusively in laboratory animals. The nature of the infection in man and immunity resulting from inhalation and dermal inoculation with this particular strain of organism are now known. The incubation period and severity of the respiratory infection were dose related. Though immunogenic, the strain studies was too virulent for man to be useful for the preparation of live vaccine. Respiratory doses ranging from about 12,000 to 86,000 cells routinely produced an acute, mild to moderate, febrile illness in volunteers 4 to 5 days after exposure. Complete recovery occurred within 7 days after onset, usually without specific therapy. Administration of streptomycin in a few (about 8%) of the cases resulted in the usual dramatic recovery seen in severe tularemia. Volunteers inoculated with 10,000 organisms via the intradermal route also developed an acute, febrile, but self-limiting illness. Volunteers administered live tularemia vaccine (strain LVS) exhibited high-grade protection against respiratory challenge with the strain of P. tularensis studies.

TITLE: Experimental Superconducting Alternators with Iron-Core and Iron-Free Armatures

AUTHORS: FERRICK and HEISE
Mobility Equipment Research and Development Center
Fort Belvoir

ABSTRACT: Iron-core and iron-free alternators employing superconducting field windings have been designed and constructed. The design equations have been verified experimentally. The machines have been performance tested and their terminal characteristics obtained. Results indicate a need to carefully consider eddy current losses in copper conductors for designs in which the windings are exposed to peak magnetic flux changes. The advantages of using ferromagnetic materials in designs in which saturation flux densities are not encountered are illustrated.

TITLE: A Research Concept for the Interpretation of Human Missile Wounds by the Pathologist

AUTHOR: FINCK
Armed Forces Institute of Pathology

ABSTRACT: The pathologist can make a contribution to the understanding of the wounding power of projectiles (missiles).

The concept of "high velocity" varies with the kinds of cases studies or the type of research: For some investigators, it is over 2,500 ft/sec (750 m/sec), for others, between 5,000 and 10,000 ft/sec (1,500 to 3,000 m/sec).

Metallic FRAGMENTS weighing less than 15 grains (1 gram), at a velocity of 3,800 ft/sec (1,158 m/sec) or even as high as 5,000 ft/sec (1,500 m/sec), are often retained in the body, producing PENETRATING but not PERFORATING (through-and-through) wounds.

It is RECOMMENDED that the following data be correlated: (a) manner of death: died of wounds (DOW); killed in action (KIA); accident; homicide; suicide; (b) distance from weapon or point of detonation; (c) interval between injury and death; (d) distribution of penetrating and perforating wounds and fractures; (e) radiologic, photographic, macroscopic, and microscopic aspects of wounds and wound tracks; (f) composition, shape, weight, and striking velocity of missiles recovered from the body and identified by ordnance experts.

A GUIDE for a 3 X 5-inch summary card is suggested.

TITLE: Investigation of Radar Anomalies

AUTHORS: FISHBEIN, FROST and VANDER MEER
Fort Monmouth

ABSTRACT: Many radar observers have reported detections of anomalous targets. Often the target density has been high enough to seriously

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proper place for basic research of interest to the Army is the universities. Second, the optimal way for fostering effective basic research is academic freedom to the university grantees. Third, the university laboratories can be counted upon to maintain a close contact with the Army and keep the Army informed of advances in science which may be of military importance. And fourth, the university laboratories can be counted upon to provide the necessary transition of basic theory into materiel and procedural concepts when needed.

Such was the state of affairs about 10 years ago. Let us now consider two typical social changes that have taken place since then.

Secularization. One of the most significant trends is secularization. Practically nothing is sacred anymore. Nothing is immune from attack. The dignity of the judge is being sorely tested by defendants in court. Even the name of God is being dragged down by theologians and ministers in the so-called "death-of-God" movement. Science, too, is engulfed in this wave of disrespect. This latter was a predictable result of the doings of the scientists and engineers themselves.

In the first place, research and development has grown tremendously. It has doubled in this country in the 1960s from $13 billion to $26 billion. It is expected to double again by 1980 to $50 billion. There are 570,000 scientists and engineers in the United States today. By 1980, we expect 750,000.

What does this impressive size mean? It means science and engineering is no longer a specialized activity. It can no longer claim exemption from the general rules, politics, and social conflicts—just because it is so big.

The second thing scientists and engineers have done in the recent past is the education of the public on the nature, contributions and promise of science and engineering. Before the forties, the public was rarely in on the earlier stages of the innovative process. But today, scientists and engineers are everywhere, explaining their work to politicans, bankers, housewives, and others.

Many of the major findings are announced through the mass media, such as the Salk polio vaccine, the Lee-Yang nonconversation of parity, and the Harvard team's isolation of the

gene. And we should not forget the real-time, worldwide TV spectacular of Apollo 11's landing on the moon. The public sector is becoming quite knowledgeable of the ways of science and engineering. With this came a better appreciation. At the same time, however, this familiarity dissipated the semiprotective, quasimystical halo heretofore enjoyed by creative persons.

The third thing scientists and engineers have done is to enter the arena of politics. The nuclear physicists started it with their publications and meetings on political issues. Scientists and engineers began to assemble in such groups as the Pugwash Conferences and issue communiques and manifestoes on domestic and international affairs.

Hundreds of thousands of scientists and engineers jumped bodily into the swirl of politics. There were the "Scientists and Engineers for LBJ," for Goldwater, for Nixon, and for Humphrey. Scientific meetings pass resolutions on war and peace.

But many people feel that turnabout is fair play. If scientists feel competent to tell politicans what to do in politics, then politicans should feel equally competent to tell scientists what to do in science.

The net effect of these and other activities is the gradual loss of the preferred status of scientists, which they acquired during former decades. The leadership in Army research will face its greatest challenge from the public and Congress during the next five years. Research will have to be justified to doubting Thomases, not only in being possibly related to Army purposes, but also in being clearly relevant to them.

Disillusionment and Reaction. Another important social trend is that of disillusionment and reaction among the young and the intellectuals.

Among the many things that happened several decades ago, the educational system began to emphasize current events instead of the traditional three R's of reading, writing, and 'rithmetic and the classics.

This resulted in the newspaper, radio, and television becoming the primary textbooks of modern education. Because of the pressure of their own circumstances for being, the public media of current events preferentially stress the sensationalism of the bad, rather than the serenity of the good. This has been the historical tendency. Satan has always enjoyed a much more extensive press than all of the good angels in heaven put together.

The opening up of the flood gates of the terribly efficient mass media has

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degrade radar performance. An investigation was undertaken to determine the nature and characteristics of these targets. Detailed doppler frequency data were taken. The data show that the targets are primarily birds and possibly insects. Doppler frequency discrimination techniques, which effectively rejected the unwanted signals, were developed and evacuated.

TITLE: Development of a Mathematical Model for Designing Functional Controls of a Soft-Recoil Mechanism

AUTHORS: NERDAHL and FRANTZ
Rock Island Arsenal

ABSTRACT: The soft-recoil cycle for an artillery weapon is defined. Differences between this unique cycle and conventional recoil are presented along with a brief discussion of inherent advantages and problem areas. A description of the XM46 Recoil Mechanism and the mathematical models used in designing the functional controls is provided. This mechanism is a major component of the Howitzer, Light, Towed: 105mm, Soft Recoil, XM204 which has been built for Military Potential Testing. Steps in the design procedure are outlined and significant design parameters are identified.

These mathematical models can be used to predict recoil forces and system motion for a given set of design parameters. They provide the weapons designer with a valuable tool for establishing and evaluating future designs of larger caliber artillery.

TITLE: Advanced Computational Algorithms for Large Scale, Three Dimensional Artillery Survey Applications

AUTHOR: GAMBINO
Engineer Topographic Laboratories, Fort Belvoir

ABSTRACT: Advanced computational algorithms are developed for the solution of a large scale, three-dimensional survey network for artillery and/or engineering purposes. The data is assumed to be gathered by a future, electronic, surveying system which consists of a transceiver and transmitter placed in an Army aircraft and transceivers located at numerous ground sites. The electronic surveying system is called the Long Range Position Determining System (LRPDS), which is in the R&D stages at the US Army Engineer Topographic Laboratories, Fort Belvoir, Virginia.

The problem lies in the solution of a normal equation system which involves thousands of parameters. The parameters are the three dimensional, rectangular coordinates of all the aircraft and ground sites, and the error model parameters of the ground trackers. The application of newly derived computational algorithms is the key to a practical solution.

TITLE: Holographic Inspection of Laminate Bonds

AUTHORS: IVERSEN, MCGARVEY and GARDNER
Weapons Command, Rock Island

ABSTRACT: Applications of conventional interferometry to the measurement of small displacements are well known. The gas laser, with its excellent coherence and high brightness, has extended interferometric analysis to irregular three-dimensional objects by the development of holographic interferometry. This new technique has already been successfully applied to the inspection of vehicle tires and sonar transducers. The application of holographic interferometry to the problem of void detection in laminate bonds is dealt with in this paper.

Double-exposure holography is the principal method used to detect the voids. One exposure is made with the laminated component at equilibrium followed by a second exposure with the component at a slightly elevated temperature. The minute differences in the thermal expansion of

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the material above the voids is remarkably apparent in the reconstructed hologram. The results of tests made on rubber-to-aluminum laminates with programmed voids are presented. Some possible modifications of the technique, including the use of pulsed lasers and real-time recording materials, are discussed and some other areas of holographic interferometry with potential inspection applications are examined.

The reported technique has significant application to the design and inspection of laminated components used in modern weapon systems. In addition, the technique is potentially applicable to production situations since it eliminates the necessity for destructive inspection.

TITLE: Denver Earthquakes
AUTHOR: GARONO
Edgewood Arsenal

ABSTRACT: Since 1962 a large number of earthquakes with an intensity as high as 5.5 on the Richter scale have been felt in the Denver area which Denverites previously had considered seismatically stable. Waste disposal practices at Rocky Mountain Arsenal are reviewed. In 1961 the Army Corps of Engineers constructed a deep well at Rocky Mountain Arsenal for the disposal of wastes from chemical operations. Deep well injection was begun in 1962 and continued until 1966 with a total of 150,000,000 gallons of waste being injected. Many geologists and the Denver public consider that the deep well is responsible for triggering the earthquakes due to waste disposed of in the 12,000 foot strata in the Denver Basin. The relation of earthquakes to waste disposal, rainfall, and the general seismic conditions of the area is evaluated. All the available data is presented.

TITLE: The Effects of Muscular Leg Exercise on Neuro-Endocrine Blood Levels
AUTHORS: JONES, HARTLEY, MASON, HOGAN, GERBEN and KRUSE
Research Institute of Environmental Medicine, Natick

ABSTRACT: The purpose of the present study was to determine the neuro-endocrine-metabolic response to muscular leg exercise on the bicycle ergometer. This study included short, steady state submaximal exercise and exhaustive exercise at submaximal and maximal work intensities. Each work load was quantitated by the measurement of oxygen uptake, heart rate and blood lactic acid. The hormones measured included plasma cortisol, growth hormone, norepinephrine and epinephrine. While there was a great amount of scatter in absolute values, a clear trend toward a pattern of change with each work load occurred. These changes were related to the relative (per cent of maximum oxygen uptake) rather than to the absolute work load. During exhaustive exercise a similar endocrine profile was observed at moderate compared to severe work loads. This profile at exhaustion included high levels of norepinephrine and levels of growth hormone which were little higher than control levels. These findings are of importance in understanding the neuroendocrine-metabolic aspects of the physiological response to exercise. This neuroendocrine profile may also provide a basis for developing an index to the appearance of fatigue.

TITLE: The Application of A Solid State Helium-Neon Gas Laser to Missile Guidance
AUTHOR: GIBSON
Advanced Ballistic Missile Defense Agency

ABSTRACT: This paper describes the development of laser gyro systems and compares them with conventional gyro systems. The uses of the laser gyro system are given and the advantages of the system for future applications are outlined.

TITLE: Open Cycle Hydrocarbon-Air Fuel Cell Power Plant
AUTHORS: GILLIS, KEZER and TASCHEK
Mobility Equipment Research & Development Center
Fort Belvoir

ABSTRACT: A fuel cell power plant that operates on logistic fuels offers

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swamped an entire generation with naked truths, half-truths, and untruths about human frailties.

Every time the young man picks up a magazine or a newspaper, he feels disillusioned with what he had been led to believe about his leaders and elders. He finds that they are not as trustworthy, or as wise, or as compassionate as they had been portrayed. He finds that power and venality are often the roads to success. He finds that the meek and the humble—the Sermon of the Mount notwithstanding—frequently get ground under.

All previous generations had to go through comparable experience of disillusionment. But it came in smaller doses and at later periods of their lives, when they were fortified with greater wisdom and resiliency to understand and absorb disappointments.

Under the present circumstances of rapid urbanization, the only thing that many of the despairing youths seem able to do is to thrash about in all directions in their attempts to eliminate what in their minds are evils.

Attempting to eliminate evil is no guarantee of doing good or being right, of course. But it is action and Americans are a doing people. So the young militants do their thing by turning against the establishment.

One of the most vulnerable parts of the establishment and most handy to attack is the university. Thus the university became the vent of their frustrations. They were joined by many professors and the coalition began to remake the university according to their own ideas of relevance. One of their strongest demands is that DOD-sponsored research must go off the campus.

Reassessment. How the respective universities will respond to the demand is not clear at this time. Many of them will weather the storm and continue to cooperate with the DOD in a mutually healthy manner. Others, including some of the best institutions, will terminate DOD grants and contracts as soon as they find alternate sources of funds.

In the meantime, they will press for even more liberal terms for their grants than they are accorded at the present time in order to prove to the students that Army-sponsored work is not only *not relevant* to military purposes but only *remotely related*, that there is no influence from the Pentagon whatsoever, and that therefore

the students should not object to the continued receipt of much needed funds from the Army.

In some cases, students will be offered membership on watchdog committees to insure a nonmilitary purity. For various reasons, there will be considerable pressure upon all parties concerned to approve such an accommodation of free subsidies.

It seems clear that the prevailing conditions do not fit basic assumptions upon which the Army had fashioned its relationships with the universities in the past. The Army can no longer rely on the universities as a group to be as enthusiastic as before in serving its research needs in peace time.

Coupled with the increasing insistence from the public and Congress for clear relevance in the Army's research program and the reduction of over-all funds, as the President has reaffirmed in today's speech, the turn of events on the campuses calls for a reassessment of the Army's relationships with academic institutions and the place of basic research within the Army's own laboratories.

While I cannot say what a thorough study will reveal, I do feel that, at the least, there ought to be a revision of those practices which actually result in a preferential strengthening of outside laboratories and assure more conducive conditions for scientific excellence to the grantees than to the in-house scientists.

I am not referring particularly to the fact, that man for man, responsibility for responsibility, and competence for competence, most of the in-house personnel are paid far less than contractor personnel. Nor am I referring to the disparity in fringe benefits.

I am not referring particularly to well within the control of defense management. It is well within its powers to provide in-house investigators the same freedom from intellectual kibitzing as is being provided thousands of academicians under Army grants. It is well within Defense powers to offer a young in-house scientist a chance to make a reputation for himself equal to that in hundreds of places which have been built and kept up by Army funds. It is well within Defense powers to let a man within an Army laboratory work on as challenging a research problem as a man on an Army grant. And so on.

In closing, I do not feel we should pass judgment on the decision of a university to discontinue military-sponsored research. Whether the reasons appear sound or not, we should sympathize with universities in the struggle in which they are engaged.

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to the military user many potential advantages over existing engine-driven generator equipment. A few of the important advantages are silence, high efficiency and potential high reliability because of the small number of rotating parts required by the fuel cell system.

At USAMERDC, a system approach based on a regenerative thermal cracking hydrogen generator and cathode air cooled phosphoric acid fuel cell stack was conceived, developed and feasibility tested. The outstanding features of this approach are that logistic fuels can be used directly without pre-treatment and the process requires no water. This system approach is termed "Open Cycle" because unlike other candidate fuel cell approaches, essentially all process streams are one pass and independent of each other.

The "Open Cycle" Fuel Cell system has been operated as a laboratory apparatus for over 200 hours to date. Experimental devices have demonstrated multi-fuel capability by running routinely on combat gasoline or JP-4. Prototype systems are presently being developed in-house to further advance this attractive fuel cell system.

TITLE: Mathematical Model for Projectile Body
AUTHORS: GOLD and SHINALY
Frankford Arsenal

ABSTRACT: A model for a small arms projectile is presented by treating the projectile as a shell of revolution subjected to axisymmetric loading. The equations are given in a general format allowing a variation of curvature and of shell thickness along the meridional curve. A comparison is given between the present and proposed analysis techniques indicating a better representation of actual projectile geometry in the proposed analysis. A general procedure is described for the solution of the governing differential equations and the superposition of responses to different loadings. The von Mises yield criterion is incorporated in the analysis to determine if yielding occurs. Comparisons are also given between experimental data and computer analysis of projectile model subjected to static loadings.

TITLE: Tactical Implications of the Physiological Stress Imposed by Chemical Protective Clothing Systems
AUTHOR: GOLDMAN
Research Institute of Environmental Medicine, Natick

ABSTRACT: Chemical protective uniforms have been assessed for their effects on soldiers wearing them in the heat. A multi-disciplinary, laboratory approach is used to measure material and uniform characteristics, to predict tolerance time for soldiers on operations in temperate or warmer environments and to validate these predictions in climatic chamber trials with volunteer subjects marching on treadmills. Subsequently, small scale field studies are conducted. Tactical military operations are studied by scientific collaboration with military units on maneuvers. The predictions based upon results of laboratory studies have been confirmed in the field. Even in a temperate environment, troops wearing chemical protective clothing have severely limited tolerance time for hard work. Conserving the soldier by transporting him (or at least as much of his load as possible) and providing extra men or rotating heavy loads or hard work tasks must receive far more attention when troops are encapsulated in chemical protective clothing than usual. Unusually long rest breaks in the shade must be provided. Even then, the effectiveness of encapsulated troops in operations requiring hard physical work (e.g. approach marches, assaults or sustained fire missions) may be limited to one hour or less at ambient environments above 75°F WBGT

TITLE: Linear Suspension System Parameter Identification
AUTHORS: JACKSON and GRANT
U.S. Army Tank-Automotive Command, Warren, Michigan

ABSTRACT: A method for measuring spring rate and damping coefficient is necessary for complete laboratory evaluation of a suspension component.

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This report outlines a technique by which a linear model is adjusted by an analog computer so that its parameters match those of the test specimen. The accuracy of this linear model is good unless the test specimen parameters are very non-linear.

TITLE: Simulation of High Altitude Ionized Air with an Artificial Dielectric
AUTHORS: GRAY and MERKEL
Fort Belvoir

ABSTRACT: From a macroscopic electromagnetic point of view, an isotropic plasma can be described as an isotropic lossy dielectric with an index of refraction less than one. The simulation of a plasma with a solid medium is complicated by the fact that all real dielectric substances have an index of refraction greater than one. A number of authors have suggested that the macroscopic electromagnetic properties of a plasma can be simulated with an artificial dielectric whose basic structure consists of a cubic grid of wire conductors. In work oriented toward the simulation of the interaction of a nuclear EMP and a missile in ionized air, a group of artificial dielectrics have been constructed by embedding fine copper or nichrome wire grids in plastic matrices. Wave guide measurements of the index of refraction and other electromagnetic properties of these artificial dielectrics are presented, and the measurements are compared with theory. The boundary value relations between the artificial dielectrics and a metal surface have been investigated. Coupling of a nuclear electromagnetic pulse to a missile can be influenced by the presence of ionized air because the index of refraction of the ionized air determines the effective electrical length of the missile.

TITLE: M16 Rifle/Ammunition Malfunction Modeling
AUTHOR: GREVERIS
Frankford Arsenal

ABSTRACT: The M16 rifle system provides an appropriate basis for a discussion of the malfunction modeling procedure. A brief description of the rifle mechanism functioning process together with the governing equations is presented. The system characteristic signature curve is introduced and its relevance to malfunctions explained. The signature curve is unique for each system and relates the cyclic rate of the rifle in terms of ammunition ballistics. Malfunction criteria superimposed on this curve establishes the probability of system malfunctioning.

The key element in this procedure is embodied in equipment designed to measure certain system parameters nondestructively. These parameters provide feeder material for the mathematical model developed to produce the characteristic curve. Conclusion of the subject is in the form of use and potential to rifle and ammunition producers.

TITLE: Feasibility Study, RF Detonation of Command-Detonated and Pressure-Electric Mines (U)
AUTHORS: STIBER and HABER
Fort Monmouth

ABSTRACT: Theoretical and experimental studies and investigations were conducted to determine the technical feasibility of using RF energy to detonate command and pressure-electric mines under typical field conditions encountered in Southeast Asia.

The current induced into the lead wires connected to a blasting cap was measured when the paired lead wires connecting the blasting cap to the battery and switch were illuminated by a high-density electromagnetic field. The resulting increase in temperature of the blasting cap fuze wire was measured using a calibrated thermo-

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The Army may be able to realize a new and even more valuable kind of intellectual assistance from the transformed universities of the future. I, for one, feel this will happen. But I do not see it happening for another 10 to 15 years. We can only be patient and let the universities find their own meaning and style in their own way.

It is a matter of prudence on the part of the Army to maintain at top quality the one scientific group on which it can always depend, peace or war. We must remember that it is during peacetime that many of the most meaningful actions can be taken to bring basic research to bear on Army needs.

DCA, ECOM Establish Unit To Develop System Standards

Establishment of a Joint Steering Committee (JSC) to guide the development of Military Communications System Technical Standards common to both long-haul Defense Communications System (DCS) and tactical applications was announced July 10.

Lt Gen Richard P. Klocko, USAF, director of the DCA, and Maj Gen Walter E. Lotz Jr., CG of the Army Electronics Command, signed a Memorandum of Understanding aimed at improving interoperation of the DCS and Tactical Communications Systems of the Department of Defense (DoD).

Terms of Reference accompanying the agreement define the Joint Steering Committee's organization and functions; also, objectives and methods to be followed in preparation of a section of Military Standard 188 (MIL-STD-188), common to both long-haul (DCS) and tactical usage.

Communications Heads to Meet At DCA Conference, Sept. 1-3

The Defense Communications Agency (DCA) will sponsor the Sixth Operations and Maintenance Management Conference, Sept. 1-3, at HQ U.S. Army Strategic Command (STRATCOM), Fort Huachuca, Ariz.

Designed to assure a mutual awareness of the requirements for use of the worldwide Defense Communications System (DCS), the meeting will be attended by Lt Gen R. P. Klocko, DCA director; Maj Gen W. B. Latta, STRATCOM commander; RAdm F. J. Fitzpatrick, commander, Naval Communications Command; and Maj Gen P. R. Stoney, commander, Air Force Communications Service, Richards-Gebaur AFB, Mo.

Civilians Gaining Benefits Of Army Education Effort

Long-term Training and Education Program opportunities supported by the Office of the Chief of Research and Development, HQ DA, will enable more than 70 Army civilian employes to attend colleges, universities and technicial schools in FY 1971.

Under this program to help Army civilian employes keep abreast of scientific, technical and management advances within and outside the Federal Government, about $800,000 of research, development, test and engineering funds will be used in FY 1971 to upgrade their capabilities for future Army requirements.

Army scientists, engineers and supervisory personnel who will benefit from this expenditure of HQ DA RDT&E funds represent only a fraction of the total number of civilian employes of the Army who will participate in long-term training activities. The central funds supplement resources allocated by local commands to support educational programs.

Funds provided for an employe's training range from less than $1,000 to over $30,000. The higher amounts include salary for a replacement for the employe undertaking training.

To qualify for funds under this program, the employe must plan to undertake off-the-job training on a full-time basis for at least 120 consecutive days. A normal academic semester does not qualify under this definition. Most training is at the graduate or postgraduate level, although some undergraduate work is centrally supported.

The following is a list of employes who will undertake training under the program in FY 1971, sponsoring agency, their job titles and the institutions they will attend.

Waterways Experiment Station, Vicksburg, Miss.: Richard L. Berg, research civil engineer, U. of Alaska; Michael A. Bilello, research meteorologist, McGill U., Montreal, Canada; Jerry W. Brown, mathematician, Colorado School of Mines; Donald E. Garfield, research mechanical engineer, Arizona State U.; David P. Hammer, civil engineer, U. of Illinois; John N. Strange, supervisory research engineer, Vanderbilt U.; and Thomas D. White, civil engineer, Purdue U.

Army Chief of R&D: Directorate of Army Research, Washington, D.C., Valentine E. Zadnik, geologist, Princeton Mid-Career Program; Man-

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couple to determine the magnitude of the induced current at the detonator. A thermocouple measurement of temperature was made, rather than a measurement of current, to prevent the instrumentation from affecting the experimental data.

TITLE: A Deterministic View of Spectrum and Cross-Spectrum Analysis
AUTHOR: HARRIS
Coastal Engineering Research Center

ABSTRACT: The basic concepts of spectrum and cross-spectrum analysis are introduced without *a priori* assumptions about the statistical nature of the data to be analyzed. A function $y_1(n\Delta t)$, known at N points can be fully expressed as $y_1(n\Delta t) = \sum_{m=1}^{N/2} A_{1m} \cos(2\pi nm/N - \phi_{1m})$. This expansion, called a finite Fourier transform of $y_1(n\Delta t)$, serves to partition the variance of $y_1(n\Delta t)$ among N/2 discrete frequencies. The "energy-density functions", usually considered in spectrum analysis can be formed as the ratio of the sum of the A_{1m}^2, over a small range of m, to twice the associated frequency interval.

If $y_2(n\Delta t) = \sum A_{2m} \cos(2\pi mn/N - \phi_{2m})$, the covariance of y_1 and y_2 is given as $\sum A_{1m} A_{2m} \cos(\phi_{1m} - \phi_{2m})$, the cospectrum density function is formed from the partial sums of this series as for the "energy" spectrum. The quadspectrum density function is obtained by combining the terms $A_{1m} A_{2m} \sin(\phi_{1m} - \phi_{2m})$ in a similar manner.

TITLE: The Determination of Aluminum and Chlorine in Composite Propellants by Non-Destructive Activation Analysis Using a Mixture of 14.5 MeV and Slow Neutrons
AUTHORS: RICHARDSON and HARRISON
Fort Monmouth

ABSTRACT: The use of a mixture of 14.5 MeV and slow neutrons has made possible the simultaneous determination of aluminum and chlorine in solid composite propellants by non-destructive activation analysis with a precision of better than ±1%. The method was developed and evaluated by carrying out a series of determinations on samples of known composition and comparing the results with those obtained by X-ray fluorescence. The overall agreement between the results of the methods is quite good, and both appear to be sufficiently accurate for quality control purposes. Aluminum was activated by 14.5 MeV neutrons to give magnesium-27 which was counted by means of the 0.842 and 1.013 MeV gamma rays. Chlorine was activated by thermal neutrons to give chlorine-38 which was counted by means of the 1.60 MeV gamma NAI(Tl) scintillation crystal connected to a Technical Measurements Corporation 400-channel analyzer. The source of neutrons was a Texas-Nuclear Model 9505 150 kV neutron generator.

TITLE: Reentry Measurements Program
AUTHORS: RUSS and HAWIE
Advanced Ballistic Missile Defense Agency

ABSTRACT: This paper presents the results of the Army's Reentry Measurements Program. The purpose of the program is to gather data from ballistic missile flights to aid in the development of discrimination techniques for a Ballistic Missile Defense System. Presented

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are the results of both RMP-A and RMP-B in terms of what has been learned about the physics of reentry and the associated observables. The data presented has been obtained from flights of "sharp" conical vehicles, "blunt" vehicles and spheres of various sizes and materials representative of the various classes of heat shields. Expected results of the program are the development and proof of the oretical models for the boundary layer and wake flow fields and a better understanding of the chemistry involved. This allows the development of discrimination techniques with an understanding of the range of usefulness and limitations which must be applied. Discrimination techniques and schema can be developed which are essentially independent of the threat.

TITLE: The Nature and Formation of the Bond In the Explosive Bonding of Metals

AUTHORS: KOWALICK and HAY
Frankford Arsenal

ABSTRACT: Wave formation in explosive bonding is viewed as a special case of the transition from a laminar to a completely turbulent metal flow regime set up along the collision region between two metal workpieces. Reynolds numbers for this flow have been determined and correlated with conditions for obtaining wavy bonded interfaces between metals, the most desirable type of bonding from the standpoint of attaining superior mechanical properties. This Reynolds criterion, together with other criteria associated with flyer plate kinetics, may be used to establish appropriate process parameters in explosive bonding practice.

TITLE: Anisotropy of Fatigue Crack Propagation in Hot Rolled Banded Steel Plate

AUTHOR: HEISER
Watervliet Arsenal

ABSTRACT: The anisotropy of fatigue crack propagation in hot rolled mechanically fibered steel plate was studied for three orientations, viz., crack arrester, crack divider and short transverse. The dependence of crack growth rate on stress intensity factor was shown to be sensitive to the micro-constitutents present and their orientation relative to the fracture plane and direction, Generally, this dependence increased as the material toughness decreased and when the mechanical fibering was parallel to the fracture plane and direction.

The macroscopic growth rates were considered as the summation of several microscopic mechanisms, including stridation formation and inclusion-matrix fracture. The data show that striation spacing was independent of orientation and that the fracture of inclusions was primarily responsible for the observed crack growth anisotropy.

TITLE: Phase Behavior in Fluid Mixtures at High Pressures I: Experimental

AUTHORS: HILL and STREETT
Department of Chemistry, United States Military Academy

ABSTRACT: A liquid-vapor phase equilibrium apparatus, suitable for use at temperatures down to 13°K and a pressure up to 4000 atm is described. Features of this system include a vapor pressure controlled cryostat, a vapor recirculating equilibrium system with a totally enclosed magnetic pump for circulating the vapor, and a thermal conductivity gas analyzer which provides immediate analysis of samples as they are withdrawn.

Pressures up to 1360 atm are obtained by use of a manually operated diaphragm compressor. A hand operated pressure intensifier is used for pressures in the range 1360-4000 atm. Temperatures are measured by a platinum resistance thermometer used in conjunction with a Mueller Bridge and an electronic null detector.

Using this apparatus, original experimental phase equilibrium

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Civilians Gaining Benefits Of Army Education Effort

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power Resources Research and Development Center, Washington, D.C., Roger L. Williamson, research psychologist, U. of Maryland; Army Research Office, Durham, N.C., Jimmie R. Suttle, physical scientist, North Carolina State U.

Walter Reed Army Medical Center, Washington, D.C.: Robert J. Werrlein, biologist, U. of Maryland.

Aberdeen (Md.) Research and Development Center: Kenneth J. Breitbart, operations research analyst, Columbia U.; Herbert K. Fallin Jr., mathematician, Dominick J. Giordana, electronic engineer, Garry L. Holloway, general engineer, Lyle D. Kayser, aerospace engineer, James R. Moore, operations research analyst, and Anthony J. Proto, mathematician, all of whom will attend the U. of Delaware; Eugene Roecker, research physicist, U. of Maryland; and Nathan J. Winslow, operations research analyst, Johns Hopkins U.

Army Tank-Automotive Command, Warren, Mich.: Salvatore B. Catalano, materials engineer, William Evans Jr., electrical engineer, Adolf W. Jarema, deputy project manager, Mechanized Infantry Combat Vehicle, all going to Wayne State U.; Anthony Comito, mechanical engineer, and Bernard Markofsky, program analyst, U. of Detroit; and Lynn A. Martin, research mechanical engineer, U. of Michigan.

Aviation Systems Command, St. Louis, Mo.: George J. Kovacich, aerospace engineer, U. of St. Louis; and John C. Walkenhorst, aerospace engineer, St. Louis Graduate Engineering Center.

Edgwood (Md.) Arsenal: Charles J. Shoemaker, supervisory chemist, Maryland Institute College; Mrs. Celestine T. Holmes, chemist, and Robert A. Stern, chemist, Johns Hopkins U.

Frankford Arsenal, Philadelphia, Pa.: Harold H. Byer, physicist, U. of Virginia; Daniel E. Frank, electronic engineer, and Harry A. Greveris, physicist, U. of Pennsylvania; John K. Gohagan, physicist, Massachusetts Institute of Technology (MIT); and Frederick W. Stowell, electrical engineer, Drexel U.

Materials and Mechanics Research Center, Watertown, Mass.: Jiro Adachi, research mechanical engineer, MIT; Daniel B. Dawson and Stanley M. Wolf, metallurgists, MIT; Mrs. Joyce L. Illinger, chemist, U. of Mas-

sachusetts; and Michael A. Kornitzky, research chemical engineer, MIT.

Army Missile Command, Redstone (Ala.) Arsenal: Rolland E. Dace, electronic engineer, Stanford U.; John P. Daly, general engineer, U. of Houston; Roy E. Pugh, aerospace engineer, U. of Tennessee; Doyce E. Satterfield, electronic engineer, Orval E. Ayres, research chemist, Kenneth W. Plunkett, aerospace engineer, and William B. Wahlheim, general engineer, U. of Alabama.

Natick (Mass.) Laboratories: Gregory C. DeSantis, aerospace engineer, Northeastern U.; Gaetano Falabella Jr., supervisory aerospace engineer, MIT; and Larry C. Hinnergardi, food technologist, U. of Nebraska.

Watervliet (N.Y.) Arsenal: William F. Rosenberger, mechanical engineer, and Robert J. Styczynski, mechanical engineer, Rensselaer Polytechnic Institute.

White Sands (N. Mex.) Missile Range: LeRoy J. Unglaub, electronic engineer, New Mexico State U.; and from an Army Test and Evaluation Command element at White Sands, Angelo C. Arcaro, supervisory electronic engineer, New Mexico State U.

Eighteen scientists and engineers will continue their training in FY 1971 as carry-overs from 1970:

Waterways Experiment Station: Frank B. Cox, research civil engineer, Mississippi State U.; Donald J. Day, supervisory research physicist, and Edward B. Perry, research civil engineer, Texas A&M.

Aberdeen R&D Center: Ernest W. Bloore, supervisory chemist, U. of Utah; Kevin S. Fansler, physicist, U. of Delaware; and Jonas A. Zukas, research physicist, U. of Arizona.

Army Tank-Automotive Command: Paul D. Denn, advanced concept manager, U. of Detroit.

Edgewood Arsenal: Frank Block, research chemist, U. of New Hampshire; Bertram L. Karpel, supervisory chemical engineer, and Walter W. Linkous, mechanical engineer, U. of Maryland; Frank Shanty, supervisory chemical engineer, Johns Hopkins U.

Army Missile Command: James R. Grabney, electronic engineer, Purdue U.; Harold L. Pastrick, aerospace engineer, Stanford U.; and James J. Richardson, general engineer, U. of Illinois.

Army Munitions Command: Joel M. Klein, research chemist, Boston U. and Harvard U.; William R. Peterson, research chemist, Temple U.; and Martin M. Roffman, physicist, U. of California.

Army Test and Evaluation Command: John J. Marley, electrical engineer, Johns Hopkins U.

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data are presented for the system helium-argon at nine temperatures in the range 98.02-159.90°K and at pressures up to 4000 atm. These data are presented graphically and the critical and three-phase lines are shown.

The results confirm earlier findings of partial miscibility (fluid-fluid or gas-gas equilibria) in helium-argon mixtures at temperatures above the critical temperatures of both components.

TITLE: Detonation Structure in Condensed Phase Explosives
AUTHOR: HOWE
Aberdeen Proving Ground

ABSTRACT: Experimental techniques and results of experiments performed upon liquid and solid phase explosives are described. It is found that propagation of a detonation in condensed phase explosives is not a steady phenomena as modeled in nearly all extant detonation theories. The detonation process is found to consist of a series of repetitive steps, each step of which involves the collision of several shocks leading to an acceleration of the main shock front and subsequent decay until another collision occurs. A method of obtaining quantitative data pertaining to the strengths and angles of incidence of the colliding shocks has been developed and data are presented which show that existing theories of transverse wave interactions in detonation phenomena in the gaseous phase are directly applicable to condensed phase detonations. Theoretical implications of these transverse wave phenomena to the initiation, propagation, and failure of detonations in condensed phase explosives are discussed. The relative importance of transverse waves, coupled with charge geometry, and shock interactions about voids and imperfections in solid phase detonations is discussed.

TITLE: T-T Indicating Systems
AUTHORS: HU and LOCONTI
Natick Laboratories

ABSTRACT: Numerous Army supply items deteriorate during storage. Their rates of deterioration depend on both the time of storage and the temperature history. This is why a T-T (time-temperature) indicating device which can be related to product deterioration, and yet, can be attached to each storage carton would have great practical value. Our basic concept is to make use of a known physical property of plastic films, namely, that the amount of oxygen permeating the film depends on the time and temperature. By inclosing a suitable oxygen reactive chemical system in a plastic pouch, the rate and extent of oxidation depends upon the amount of oxygen diffused through the film. This concept has been reduced to practice for four oxidizable chemical systems: 1. Redox dye system. A written message was revealed when the blood-red color of anthrahydroquinone salt was oxidized to colorless anthraquinone salt. 2. Inorganic system. Color change of Fe^{++}-Fe^{+++}, and the dissolving of copper foil in Cu^{o}-Cu^{+} system, were utilized to convey information. 3. Enzyme system. Change of pH due to oxidation of glucose to gluconic acid catalyzed by glucose oxidase. 4. Rubber sheet system. The breaking apart of specially compounded rubber sheets due to oxidation. The length of time to reach an end-point can be easily adjusted to correspond to the useful life of a storage item. The net result of incorporating T-T indicating system into our supply line will be an increase of product reliability in items taken from storage and the elimination of unnecessary storage wastes.

TITLE: Automated Raw Environmental Data Processing
AUTHOR: HUBER
Fort Monmouth

ABSTRACT: This paper describes the design and application of an automated raw environmental data processing system. Paramount to the imple-

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mentation of such a system is the solution of the pattern recognition problem. A method is presented for performing pattern recognition that involves the use of a specially designed electro-optical preprocessor. The preprocessor functions to filter and extract pertinent signature data, relative to the object of interest, directly from the raw data field. Signature data are then classified by adaptive-learning networks that are pretrained on similar but not necessarily identical data.

A detailed discussion is presented on the organization of adaptive-learning networks; how they are trained on raw environmental data; the formulation of the internal network statistics that comprise the decision logic; and the subsequent utilization of these statistics to effect data classification. The military importance of using adaptive-learning networks to process raw environmental data is stressed emphasizing their ability to perform with limited knowledge of the problem under consideration. This is substantiated by experimental results presented relative to the classification of hand-drawn map symbols, military vehicles, geographical areas, and waveforms.

TITLE: The Use of Martensite Materials in the Design of Thermally Activated Springs

AUTHORS: ROTHWARF, AUERBACH and FORD
Frankford Arsenal

ABSTRACT: Certain alloys such as NiTi and AuCd exhibit crystallographic changes, known as martensite transformations, on cooling from a body-centered cubic high temperature phase (htp) to a low temperature phase (ltp) of lower symmetry. The ltp is usually a twinned structure whose twins are very mobile under the application of stress. A specimen may deform plastically entirely by movement of twin boundaries. The effective elastic moduli of such materials can be significantly modified by these twinning effects. Interesting "memory" properties are also exhibited by these alloys. If a sample is constrained to a given shape while being given a special anneal in the htp, this shape will be retained and subsequently "remembered" even though the sample is severely plastically deformed in the ltp. Large differences in their htp and ltp force constants coupled with their "memory" properties make these alloys particularly interesting for use as thermally activated springs.

TITLE: Human Incapacitation Produced by Burns

AUTHORS: INGRAM, McHUGH and LEWIS
Research Laboratories, Edgewood Arsenal

ABSTRACT: A method has been derived to estimate human incapacitation produced by thermal burns as a function of the mechanical impairment of those functional elements of the anatomy involved in locomotion, manual dexterity, and vision either directly through burns of specific sites or indirectly through weakness resulting from the systemic responses to burns of any area of the body.

Basic data for anatomical site disability and systemic effects were gained through interviews with, and the administration of questionnaires to, nationally recognized staff surgeons who specialize in the treatment of burns and to a selected group of surgical residents who have served part of their residency in one of the large burn centers in the United States.

Data from interviews of military and civilian burn casualties at the U. S. Army Institute of Surgical Research, Fort Sam Houston, Texas indicate that this provisional method developed in this study can serve as a good prediction of the degree of incapacitation produced by thermal burns for various military stress situations.

Provisional estimates of the antipersonnel effectiveness of firebombs have been developed and incorporated into the Joint Munitions Effectiveness Manual.

TITLE: New Foods for Military Use. A Physico-Chemical Approach to Research and Development

AUTHORS: KAPSALIS, WALKER and WOLF
Food Laboratory, Natick Laboratories

ABSTRACT: A new class of dehydrated, compact, light-weight foods, which

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OCRD Assignments Include New Administration Chief

Under a recent redesignation of the title of OCRD executive, a new chief of administration is among 16 officers assigned since the previous edition of the *Army R&D Newsmagazine* through July 24, along with a new chief of the Communications-Electronics and Space Division. A new civilian is Dr. William W. Dorrell.

Col Clinton B. Haden, new chief of administration, OCRD, served until recently as executive secretary, Office of the Assistant Chief of Staff for Civil Operations and Rural Development Support, HQ Military Assistance Command Vietnam (MACV).

In 1968–69 he commanded the 4th Battalion, 18th Infantry, Berlin, Germany. He has also served a chief, Colonels Branch, Office of the Deputy Chief of Staff for Personnel, HQ, U.S. Army Europe (USAREUR) and Seventh Army.

From 1963–66 Col Haden was chief, Schools Branch, Enlisted Personnel Directorate, Office of Personnel Operations, HQ Department of the Army. He has also served as executive officer, G1, HQ Eighth Army, Korea.

A graduate of the Command and General Staff College (C&GSC), he has a BS degree in education from the University of Omaha.

Col Haden's awards include the Legion of Merit (LOM), Bronze Star Medal (BSM), Air Medal (AM) with two Oak Leaf Clusters (OLCs), the Joint Services Commendation Medal (JSCM) and the Army Commendation Medal (ARCOM) with OLC.

Lt Col Thomas H. Spence is assistant chief of administration, OCRD, following an assignment as operations officer of the 101st Artillery Division, Republic of Vietnam.

He has served as CO, 4th Battalion, 77th Artillery Division, Aerial Rocket Artillery, and has been action officer, Evaluation Directorate, HQ, Combat Developments Command, Fort Belvoir, Va.; action officer, Studies Research and Analysis Division, Department of Tactics, Fort Rucker, Ala.; and assistant chief of staff, 1st Cavalry Division Republic of Vietnam (RVN).

Col Spence has a bachelor of general education (BGE) degree from Omaha University and is a graduate of the C&GSC.

His awards include LOM, Distinguished Flying Cross (DFC), BSM, AM with seven OLCs and ARCOM with four OLCs.

Col G. O. Adkisson is chief, Communications-Electronics and Space Division, after serving as CO of the 3d

Brigade, 82d Airborne Division, Fort Bragg, N.C.

He was also CO of the Support Command, 82d Airborne Division, and senior adviser to the First Army Republic of Vietnam Division. In 1965–66 he served as chief, Plans Section, Deputy Chief of Staff for Personnel at USAREUR, and CO of the 2d Battalion, 19th Infantry, 24th Division, Augsberg, Germany (1963–64). From 1959 to 1963 he was assigned to the Communications-Electronics Division, OCRD.

Col Adkisson is a graduate of the U.S. Military Academy (USMA) and the U.S. Army War College (USAWC). He has a master's degree in electrical engineering from the University of Pennsylvania.

His awards include LOM with OLC, Meritorious Service Medal (MSM), AM with two OLCs, ARCOM with OLC and eight Vietnamese awards.

Lt Col Gerald G. Gibbs Jr., chief, Army and Joint Plans Branch, Plans Division, OCRD, graduated recently from the USAWC.

Graduated from the USMA in 1952, he is also a graduate of the C&GSC and has an MA degree in mathematics from Columbia University.

Col Gibbs has served as CO, 1st Battalion, 78th Artillery, 2d Artillery Division, Fort Hood, Tex., and province senior adviser, Pleiku, RVN; in the Institute of Special Studies, U.S. Army Combat Developments Command; and for three years an assistant professor of mathematics at the USMA.

He is a recipient of the LOM, MSM, AM, ARCOM and the Combat Infantryman Badge (CIB).

Dr. William W. Dorrell has joined the Life Sciences Division, OCRD, after serving six years as technical coordinator, Biological Activities, Office of the Assistant Chief of Staff for Force Development, HQ DA. He was assigned to the Chemical, Biological, Radiological and Nuclear Operations Directorate.

Dr. Dorrell fills a vacancy left by Dr. Arthur J. Emery Jr., who has become program director for microbiology, Biological Sciences Division, Office of Naval Research.

Dr. Dorrell has a PhD degree in bacteriology from the University of Wisconsin and an MS degree in plant pathology and a BA degree in bacteriology from West Virginia University.

He was for 21 years at Fort Detrick, Md., chief, Pilot Plants Branch, and a microbiologist Crops Division; deputy chief, F&MR Division; deputy assistant director for Weapons Development; director of Assessment; and

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materially extend the present-day operational flexibility of men in combat, are being introduced into Armed Forces feeding systems as a result of NLABS research and development efforts. Examples range from the highly successful Long Range Patrol Packet, used in S. E. Asia, to experimental concepts of laminated foods (sandwiches) bite-size cubes and compressed, flexibly packaged bars. The acceptability of these foods depends largely on the retention of textural qualities during the long journey through the supply and storage lines. Textural deterioration may include brittleness, dryness, excessive hardness, fragmentation, and even pulverization. Within a given composition, the critical variable affecting textural properties is the water, expressed as water activity, Aw. This investigation was undertaken to obtain understanding of the relationships between water sorption and texture, with control of texture as our goal. The range of Aw 0.15-0.30 affects the class of "low moisture" foods, while the range of 0.75-0.85 is important in the class of "intermediate moisture" foods. Inferences derived from thermo-dynamic functions indicated that crystallinity and other structural changes, caused by the sorption of water, are responsible for textural changes. It was convincingly demonstrated that control of water activity is an effective means of tailoring the textural properties of the above foods to meet specific military needs.

TITLE: Development of New High Fragmentation Shell Steel
AUTHORS: RIFFIN and KINAS
Materials and Mechanics Research Center

ABSTRACT: Fragmentation ammunition is used in tremendous quantities in combat. To obtain the greatest battlefield firepower per round fired, mortar and artillery shell should break up into the maximum number of small, lethal fragments.

An appropriate material which is strong enough to withstand launch setback forces yet brittle enough to break up into a large number of fragments upon detonation has been sought for many years.

Extensive materials research by the Army Materials and Mechanics Research Center has led to the invention of a series of high silicon steels which can be used for artillery shell as well as for mortar shell, grenades, and rocket warheads. This new steel contains no strategic alloys, can be forged by conventional methods into shell bodies, warm shaped to the desired nose configuration and readily machined using high production tooling.

A production engineering evaluation of 105mm shell made from this steel is currently underway, and it is expected to satisfy the urgent requirement for shell steel of high strength but low cost which can be processed in existing shell plants using available equipment and procedures.

TITLE: Gaseous Illuminant Pyrotechnic Systems
AUTHORS: KIRSHENBAUM and TAYLOR
Picatinny Arsenal

ABSTRACT: The candlepower efficiencies obtainable with conventional pyrotechnic systems have essentially reached a maximum. Gaseous systems having a number of distinct advantages over solid systems were investigated as to whether their luminous efficiencies can exceed those of standard pyrotechnic compositions. In this investigation gaseous boron containing compounds, such as boron trifluoride (BF_3) and diborane (B_2H_6) were added to pale, high temperature flames to produce high intensity, visible emission. The luminous efficiencies of these boron diffusion flames are reported over a range of compositions. Only 4 volume percent quantities of these boron compounds were added to these flames. The maximum efficiency obtained to date was 43,000 candleseconds per gram for the $H_2 + O_2 + B_2H_6$ system. The burning velocities of several of these flames were also determined. Unlike conventional pyrotechnic flames, these systems are relatively smokeless and consequently permit the use of parabolic reflectors. These reflectors increased the

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directional light efficiencies of these gaseous illuminant systems to ¼ - ½ million candleseconds per gram. Spectroscopic studies show that bulk of visible emission is due to excited BO_2*. Both grey body and specific emission from these gaseous systems were examined. Theoretical adiabatic flame temperatures and equilibrium conditions are reported.

TITLE: The Effect of Structure on Radiation Chemical Reactivity

AUTHOR: KLEIN
Ballistic Research Laboratories, Aberdeen Proving Ground

ABSTRACT: Recently developed experimental techniques have greatly expanded the versatility of kinetic spectroscopy as an investigative method in radiation chemistry. Improvements in speed and sensitivity now make possible the study of transient species with nanosecond time resolution at such concentrations that radiation pulses of 100 rads or less can be effectively used in pulse radiolysis studies.

Kinetic studies of the hydrated electron, e^-_{aq}, produced in alkaline solution by short pulses of ionizing radiation indicate that a non-classical reaction sequence takes place for as long as 500 ns after a radiation pulse. The transient species decays by what appears to be simple, second-order kinetics with a rate constant of $3.2 \times 10^{1}\ M^{-1} s^{-1}$. Although e^-_{aq} is homogeneously distributed in solution, its rate of decay exceeds the classical diffusion limited rate by at least a factor of four. Disruption of the long range forces normally present in these solutions by the addition of structure-breaking ions such as Cs^+, K^+, and Br^- strongly influences the observed decay of e^-_{aq} although the added salts do not enter into any known chemical reactions. It is believed that reactions of the ion H_2O^+ have been observed, and that a Wannier exciton-like species, H_2O*, is present in solution.

TITLE: The Development of Combat Related Measures for Small Arms Evaluation

AUTHORS: KLEIN and THOMAS
Infantry Board, Fort Benning

ABSTRACT: The United States Army Infantry Board is currently conducting a 5-year Infantry Weapons Methodology Study. The objective of the methodology study is to provide test procedures and techniques that will insure the unbiased selection of the most effective weapons and equipment for the Infantry soldier. The approach of the methodology study was to cast these procedures in terms of the environment in which the candidate weapons and support equipment will be used.

Thus far, weapons have been experimentally compared in two different tactical situations: quick fire and attack. The results have yielded 22 measures representing performance differences obtained in a real-world environment. By using the 22 measures, the resulting differences will tell which weapon is superior in each case but not the relative importance of these differences. So the question becomes "what is their relative weight or what is their relative importance in the combat environment?"

The ultimate value to be realized from the methodology study depends on how well these statistical measures can be weighted in this real-world atmosphere. This paper presents a few examples of weapon differences which have been observed in operational environment testing and then describes an approach toward weighting these measures of effectiveness.

TITLE: The Development of a Kalman Filtering Algorithm for Hybrid Navigation Systems for Army Aircraft

AUTHOR: KNIGHT
Avionics Laboratory, Fort Monmouth

ABSTRACT: Hybrid navigation systems seek to combine two or more types

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OCRD Assignments Include New Administration Chief

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director of Technical Services. He was awarded the Army Meritorious Civilian Service Award in 1962.

Dr. Dorrell is a member of the American Society for Microbiology, Scientific Research Society of America, the American Ordnance Association and Phi Beta Kappa.

Lt Col Marion F. Meador is chief, General Materiel Branch, Combat Materiel Division, after serving as CO, 46th Engineer Battalion, RVN.

He earned master's degrees in civil engineering and nuclear engineering from Massachusetts Institute of Technology (1960) and is a graduate of the C&GSC.

Col Meador has served as engineer staff officer, J4, HQ Strike Command MacDill Air Force Base, Fla., and resident engineer, Engineer District Far East, Korea. He was assistant professor of mechanics at the USMA in 1964.

His honors include the LOM, AM and JSCM.

Lt Col James E. Fiscus has been assigned to the Combat Support Aircraft Branch, Air Mobility Division, OCRD, after graduating from the C&GSC.

A 1955 graduate from the USMA, he has a master's degree in electrical engineering from Purdue University (1965).

Previous assignments have included service as deputy G5, 4th Infantry Division, Republic of Vietnam (RVN), and project officer, U.S. Army Airborne Electronics and Special Warfare Board. He has also been an assistant professor of mathematics at the USMA.

Col Fiscus has received the BSM with OLC, AM, CIB and the Master Parachutist Badge.

Lt Col John R. Matteson, a recent graduate of C&GSC, is chief of the Procurement and Support Branch, Management and Evaluation Division.

He received a BS degree from USMA in 1955 and an MS degree in mathematics from Rensselaer Polytechnic Institute, Troy, N.Y.

Col Matteson has served as executive officer, 1st Battalion, 14th Artillery, Americal Division, Republic of Vietnam (RVN), associate professor of mathematics at the USMA, and battery commander, 25th Target Acquisition Battalion, 1st Corps Artillery, Korea.

Col Matteson received the BSM in 1969 for service in Vietnam.

Lt Col Ernest E. Forrest Jr. served on the Joint Logistics Review Board, Office of the Secretary of Defense, before becoming a staff officer in the Programs Branch, Programs and Budget Division, OCRD.

He served a tour as CO of the 69th Maintenance Battalion in Vietnam. Col Forrest was chief, Customer Relations and Commodity Management Office and Army Materiel Command Commodity Manager for the Sentinel System HQ Munitions Command. He has also served as research and development coordinator for the R&D Directorate, HQ Weapons Command.

A graduate of the C&GCS, Col Forrest has an MBA degree from Babson Institute, Boston, Mass.

He is a recipient of LOM with OLC and ARCOM with two OLCs.

Lt Col James L. Tow, a 1970 graduate from the USAWC, is a new staff officer, Combat Support Aircraft Branch, Air Mobility Division, OCRD.

He has a 1955 BS degree from the USMA and is a graduate of the C&GSC, with BS and MS degrees in aeronautical engineering from Georgia Institute of Technology.

Col Tow has served as action officer with the Weapon Systems Analysis Directorate in the Office of the Assistant Vice Chief of Staff of the Army; and executive officer and battalion CO, 13th Combat Aviation Battalion, Vietnam; programer and chief of the Armament Programs Division, U.S. Army Aviation Test Board, Fort Rucker, Ala.

He has been awarded the LOM, Distinguished Flying Cross, AM with 29 OLCs, ARCOM with two OLCs, Purple Heart and Republic of Vietnam Cross of Gallantry with Gold Star.

Lt Col Harry D. Collins is assigned to the Military Advisers Branch, Studies and Analyses Division, OCRD, after graduating from the C&GSC.

He has BS and ME degrees from Carnegie Mellon University, Pittsburg, Pa., and a master's degree in nuclear effects engineering from the U.S. Naval Postgraduate School, Monterey, Calif.

Col Collins has served as senior adviser, RVN Armed Forces Engineer School, and branch chief, Weapons and Analysis Division, National Military Command Systems Support Center, Defense Communications Agency. He has also been CO, 738th Engineering Supply Point Company, 44th Engineering Group, Korat, Thailand, and staff officer, Nuclear Power Division, Office of the Chief of Engineers.

Col Collins has been awarded the BSM and JSCM.

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of navigation systems/sensors in such a manner that the resultant integrated system performance is superior to that of any subsystem. Hybrid navigation is a natural candidate for Kalman filtering -- a data processing technique yielding an "optimal" control based on an error model and the statistical parameters of the system to be controlled. No such systems for Army aircraft have yet been flown and this paper will investigate the feasibility of such a system.

The investigation will consist of four phases. The first phase will be a synoptic review of Kalman filter theory. The second will be a general determination of Army navigation needs to isolate suitable navigation system types. The third will be development of error models for Inertial, LORAN, and Doppler systems. The fourth and final phase will be development of a specific filter algorithm to be employed in an Army on-board environment.

TITLE: A New Sensitive Method for the Detection and Quantitative Analysis of Ammonia and Aliphatic Amines

AUTHORS: KRAMER and SECH
Research Laboratories, Edgewood Arsenal

ABSTRACT: A new reagent, o-(benzenesulfonamido)-p-benzoquinone, I, has been employed in the quantitative micro-analysis of ammonia and aliphatic amines in the air. Concentrations of ammonia in the range of 10^{-8} m/l have been measured with a relative error of approximately 5%. The structures of the reaction products of the amines and I, are discussed. The reaction of I, with aromatic amines is slow and requires elevated temperature. Acidic vapors interfere in the analysis and require removal by a suitable selective filtration method.

TITLE: Reduction of Biological Effectiveness of X-Rays at Very High Dose Rates

AUTHORS: KRONENBERG, LUX and NILSON
Fort Monmouth

ABSTRACT: It was hypothesized that direct radical-radical recombination reduces the relative biological effectiveness (RBE) of X-rays delivered at sufficiently high dose rates. Order of magnitude calculations indicated the effect would be pronounced at rates of 10^{14} rad/sec.

This hypothesis was tested experimentally using radish seeds (Raphanus Sativus). To establish their behavior at low dose rates the seeds were irradiated at a ^{60}Co source at 10 rad/sec. High rate exposures were made at the Air Force Weapons Laboratory flash X-ray generator at $5x10^{11}$ rad/sec.

Although these dose rates were three orders of magnitude lower than the estimate a large increase in germination probability was seen for seeds irradiated at high rates. A dose 1.5 to 2.5 times greater was required at the high rates to produce the same germination probability as that following the low-rate irradiation.

TITLE: Genetic Transformation in the Genus

AUTHORS: TYERYAR and LAWTON
Biological Laboratories, Fort Detrick

ABSTRACT: Genetic exchange by bacterial transformation was demonstrated for Pasteurella novicida. Portions of recipient cultures sensitive to streptomycin became resistant to the antibiotic when incubated with deoxyribonucleic acid (DNA) extracted from streptomycin-resistant cultures. Similarly, mutants requiring tryptophan or adenine for growth were also transformed to nutritional independence for these markers in the presence of DNA carrying the appropriate wild-type allele. A liquid medium was devised that permitted transformation frequencies in excess of 1%. The development of competence for P. novicida transformation was not restricted to a short phase of the growth cycle, but was present

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uniformly throughout the logarithmic and early stationary phase of growth The genetic relatedness of P. novicida and Pasteurella tularensis was was established by transforming P. novicida mutants with DNA extracted from P. tularensis.

TITLE: Rubber Toughened Acrylic Polymers for Armor Applications
AUTHORS: LEWIS, ROYLANCE and THOMAS
Materials and Mechanics Research Center
ABSTRACT: Modification of polymethylmethacrylate (PMMA) by incorporation of rubber particles in the glassy matrix has led to advances in the ballistic behavior of transparent materials solving two Army material problems. First, in the area of fragmentation resistance, use of a gradient rubber content not only increases the ballistic energy absorbing capacity sixfold over the unmodified PMMA, but it also eliminates spalling, a potentially serious hazard to personnel in aircraft. Second, in the area of transparent bullet-resistant composite armor, the rubber modification causes a twofold increase in the V_{50} ballistic resistance of the laminate enabling either a potential reduction in thickness of the expensive transparent ceramic component or increased ballistic performance or both. Rubber modification of the acrylic polymer thus renders it the best material for future transparent armor applications.

TITLE: A More Rigorous Expression for the Rate of Droplet Growth
AUTHOR: LOW
White Sands Missile Range
ABSTRACT: Weather modification, which is of considerable interest to the Army, involves several techniques, among which the seeding of warm fogs or clouds with hygroscopic condensation nuclei has lately been utilized with increasing frequency. One of the factors involved in understanding the physics of a seeding experiment is the condensation process itself, which finds its theoretical basis in the equation for the growth of a liquid solution droplet by condensation in a stationary medium of moist air - one of the fundamental equations in cloud physics. Several versions thereof may be found in the literature, but none of them can be used with confidence for two reasons: First, the hygroscopicity of a condensation nucleus in liquid state was not adequately taken into account. Secondly, the lowering of the vapor gradient toward the liquid nucleus or droplet due to the somewhat higher temperature of the environment resulting from the release of the latent heat of condensation, although noted by some authors, was disregarded. This results in an overestimate of the growth rate. A more rigorous equation is derived, which embodies these two important effects and which renders it possible to study various condensation nuclei for seeding purposes. Use of this new expression is demonstrated in graphical form and a comparison made with published values.

TITLE: ABM Discrimination Technology
AUTHORS: McDYSAN and MITCHELL
Advanced Ballistic Missile Defense Agency
ABSTRACT: The Army has actively conducted a continuing research and development program to identify techniques based upon radar measurements for discriminating reentry vehicles capable of carrying warheads from decoys and other penetration aids that could be included in an offensive missile threat to the nation. The objectives of this paper are to describe the general approach to discrimination development and to describe the primary designation and discrimination techniques that are available to the defense. The problems of implementing discrimination in operational radar systems are addressed and a preliminary discrimination combination logic schema is presented.

TITLE: Target Reaction to Continuous and Particulate Shaped Charge Jets
AUTHORS: MERENDINO and VITALI
Ballistic Research Laboratories, Aberdeen Proving Ground
ABSTRACT: A study of the reaction of targets to a continuous and to

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OCRD Assignments Include New Administration Chief

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Lt Col William P. Boyd is a new staff officer in the Nuclear, Chemical and Biological Division, OCRD.

He is a 1955 graduate from the USMA and the C&GSC (1967) and has a 1963 MS degree in nuclear physics from Tulane University.

His assignments have included operations officer, HQ, XVIII Airborne Corps, and CO, 4th Battalion, 73d Artillery, both at Fort Bragg, N.C. While serving in Vietnam, he was CO of the 4th Battalion, 42d Artillery, 4th Infantry Division; S–3, 6th Battalion, 29th Artillery, 4th Infantry Division; and assistant S–3, 4th Infantry Division, Artillery.

He is a recipient of the LOM, AM, JSCM and ARCOM.

Lt Col Charles W. Binney has been assigned as staff officer, Standardization Branch, International Division, OCRD, after graduating from the C&GSC. He has a BA degree in psychology from Washington University, St. Louis, Mo.

Prior to attending the C&GSC, he was plans officer, HQ Army Air Defense Command. While serving in Vietnam, he was adjutant, 41st Artillery Group, and executive officer, 7th Battalion, 13th Artillery. He has been executive officer, 1st Battalion, 2d Brigade, Army Training Center, Fort Lewis, Wash., and S–3, 2d Battalion, 34th Artillery, U.S. Army Europe (USAREUR).

His awards include BSM, AM and ARCOM with OLC.

Lt Col Hunter B. McElrath is staff officer, Life Sciences Division, OCRD, following a 3-year assignment as chief of microbiology, Pathology Department, Madigan General Hospital, Fort Lewis, Wash.

In 1965–67 he was a bacteriologist, U.S. Army Research Office for Infectious Diseases, Fort Detrick, Md.; bacteriologist and executive officer, 406th Mobile Medical Laboratory, RVN (1964–65); and chief, Lab Service, Munson Army Hospital, Fort Leavenworth, Kans.

Col McElrath has BS and MS degrees in microbiology from the University of Florida and has completed the Army Medical Department advanced course at Fort Sam Houston, Tex.

He has been awarded the BSM and the Purple Heart.

Lt Col Joseph H. Schmalhorst was assigned to the Communications Branch, Communications-Electronics and Space Division, Missiles and

Space Directorate, after graduating from the National War College. He completed a tour of duty in Vietnam in 1969 as deputy G–3, II Field Force and Battalion CO, 9th Infantry Division.

Other recent assignments include project officer with the Combat Developments Command Infantry Agency at Fort Benning, Ga., and assistant G–3, 24th Infantry Division, Germany.

He earned a BS degree in mathematics from Southwest Missouri State College (1949), attended Washington University at St. Louis, Mo., for postgraduate studies in 1950 and received a BS degree in electrical engineering from the University of Arizona in 1961. He is a graduate of C&GSC and the National War College.

Col Schmalhorst holds the Silver Star, LOM, BSM with V Device, AM with OLC, ARCOM with two OLCs, and Vietnam Cross of Gallantry with Palm.

Lt Col William Y. Epling served a tour of duty in Vietnam as chief of the Maintenance Branch, G–4, USARV HQ, and CO of the 84th Engineer Battalion, prior to assignment to the Nuclear Branch, Nuclear, Chemical and Biological Division, Missiles and Space Directorate.

From June 1965 to July 1967, he served as project engineer with the U.S. Army Engineer District, Baltimore, subsequent to service with the 13th Engineer Battalion in Korea.

A 1954 graduate of the USMA, Col Epling earned a master's degree in physics from North Carolina State University (1960) and completed the C&GSC (1968).

Among his awards and citations are the LOM and the Vietnamese Medal of Honor, 1st Class.

Maj Glen W. Williams completed the C&GSC prior to assignment to the Critical Projects Branch, Surveillance, Target Acquisition, Night Observation Division, Developments Directorate.

He earned a BS degree in chemistry and mathematics from Western Kentucky University (1957), and MSME degree from New Mexico State University (1962), and served as assistant professor, Department of Mechanics, USMA (1967–69).

He also served at Fort Devens, Mass., as CO and S–3 of the 100th Combat Service Support Battalion and as B Company commander, 8th Support Battalion, 196th Infantry Brigade.

Among his citations and awards are the AM, ARCOM with OLC, CIB, and Vietnam service and campaign medals.

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a particulate shaped charge jet is presented. Phenomenological models are proposed, hydrocode predictions are made, and radiographic studies are described. It is shown that the reaction of targets to penetration by a particulate jet differs markedly from the case of penetration by a continuous jet.

TITLE: Kinematics of Diffusion, Fluids and Plasma by Continuous Movement and Finite Velocities

AUTHOR: MEYERS
Fort Douglas

ABSTRACT: The preservation of a fundamental physical property of fluids, the continuity of the paths of the particles of which they are composed, leads to a general reformulation of the classical kinematics governing diffusion, fluids, and transport phenomena in general. Governing differential equations for these processes are derived from a Markov process in a hyperspace by means of generalized functions and found to be hyperbolic differential equations rather than the classical parabolic types such as the Fokker-Planck, Navier-Stokes and Fickian equations. The hyperbolic equations admit only finite velocities of propagation, while the parabolic equations give rise to nonphysical infinite velocities of propagation. G. I. Taylor's equation of Lagrangian diffusion and the Eulerian-Lagrangian relationships for the diffusing ensemble are shown to follow logically from the hyberbolic differential equations. The formal connection between the statistical properties and the classical properties becomes evident.

TITLE: The Preparation and Properties of New Oxidizers for Propellants, NH_4ClO_4-$KClO_4$ and NH_4ClO_4-NH_4NO_3 Mixed Crystals

AUTHOR: MORROW
Picatinny Arsenal

ABSTRACT: Theoretical interpretation and experimental investigations of the systems NH_4ClO_4-$KClO_4$-H_2O and NH_4ClO_4-NH_4NO_3-H_2O at 25.0°C have been made. These show that the former is a relatively ideal case from the standpoint of phase rule chemistry whereas the latter is not. Mixed crystal "alloys" of the salt pair in each system were synthesized and characterized. Both series of mixed crystals exhibited interesting properties. Introduction of NH_4ClO_4 into NH_4NO_3's crystal lattice tends to stabilize it thermally and reduce its moisture sensitivity. These mixed crystals are worthy of extended study from the standpoint of the development of low-cost oxidizers and explosive ingredients.

TITLE: Electrophysiological Measures of Cross-Sensory Interaction in the Central Nervous System

AUTHOR: OATMAN
Human Engineering Laboratories, Aberdeen Proving Ground

ABSTRACT: Potentials were recorded from unanesthetized animals with electrodes chronically implanted in the auditory cortex, cochlear nucleus, and round window. Noise clicks (irrelevant stimuli) were presented continuously as background before, during, and after the presentation of a visual discrimination task (relevant stimuli) which attempted to alter the attentive state of the animals. The mean peak-to-peak amplitudes of averaged click-evoked responses from six adult female cats were significantly smaller during attention to the visual discrimination stimuli when compared with the pre-discrimination and control periods. This relationship was present at all electrode placements for five experimental animals with middle ear muscles cut as well as one control animal with middle ear muscles intact. The results provide evidence that cross-sensory interactions occur within the central nervous system and suggest that during attention, a central inhibitory mechanism suppresses or "filters" click-evoked responses at very early stages in the afferent auditory pathway. The results are extremely significant and represent a first real step toward attaining an understanding of the central nervous system More research in this area is being conducted at the Human Engineering Laboratories at this time.

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(*Continued from page 73*)

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TITLE: A Similarity Model for Atmospheric Turbulence Structure in the Planetary Boundary Layer

AUTHOR: OHMSTEDE
Atmospheric Sciences Laboratory, Fort Huachuca

ABSTRACT: The modern Army confronts the meteorologist with many challenging problems; in particular, a recurring problem is the prediction of the turbulence structure of the planetary boundary layer. The objective of this study was to develop, from basic principles, a rational hypothesis for the prediction of the turbulence structure, including means to assess the limitations and methods to further generalize the hypothesis. The development is based upon the system of dynamic equations for the various turbulent interactions. Each of these equations contains four groups of terms, the Lagrangian term, the generative terms, the dispersive terms, and the molecular interaction terms. The elementary development presumes that a quasi-balance exists between the generative group of terms and the combination of the dispersive and molecular terms. State equations are derived which functionally relate each turbulent interaction term to the sum of the generative terms, each weighted by an appropriate Lagrangian time scale of the turbulence structure, which are then related to Eulerian length and velocity scales. Special problems stemming from pressure fluctuations are discussed. The elementary development results in a closed system of implicit state equations which can be used to solve for the turbulent interaction terms needed for practical applications. The general hypothesis offers a means to estimate the limitations of the elementary hypothesis when applied to general situations. Applications and the need for further theoretical and empirical research are discussed.

TITLE: CO_2 Laser Pulsing Produced by Cavity-Length Modulation

AUTHOR: PARDUE
Redstone Arsenal

ABSTRACT: A multipass CO_2-N_2-He laser oscillator was pulsed by means of a cavity-length modulation, achieved by using a movable gold-coated mirror as one of the end cavity reflectors. Movement of the mirror along the axis of the cavity, in either a constant velocity or sinusoidal velocity mode, was provided by a Mössbauer transducer, with a servo control unit to insure a pure waveform.

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Major Army Contracts Total $394 Million for RDT&E

U.S. Army research, development, test, evaluation (RDT&E) and procurement contracts from May 1 to July 1, in the $1 million or more category, totaled $394,249,477.

Hercules, Inc., received two contracts totaling $24,498,859 for rocket propellants and for operation of production facilities at Army ammunition plants. Sperry Rand Corp. will receive $24,367,765 for loading, assembling and packing ammunition and for operating an Army ammunition plant.

Day and Zimmerman, Inc., was awarded $23,367,722 (three contracts) for loading, assembling and packing ammunition and for operation of facilities at Army ammunition plants.

General Motors Corp. is receiving $19,726,302 (three contracts) for research and development and interim advanced production efforts on the MBT-70/XM803 Main Battle Tank; also, for rehabilitation work on facilities at an Army ammunition plant.

National Presto Industries gained three contracts totaling $19,386,770 for metal parts for projectiles. Olin Corp. will be paid $18,962,882 (four contracts) for loading, assembling and packing of propellants and for operation of Army ammunition plants.

Three contracts totaling $16,407,913 with Bell Helicopter Co. are for utility helicopters and an advanced development feasibility helicopter with multifunction systems.

The National Metals Manufacturing Co. will receive $12,444,071 for projectile parts; Philco Ford Corp. will get $12,357,793 (three contracts) for integration of communications systems in the AUTODIN network, for two transportable satellite communications terminals, and for XM182 pintle mounts.

Chrysler Corp. was issued two contracts totaling $11,225,000 for systems engineering management for M60A1 tanks and for the M728 Combat Engineer Vehicle. Western Electric Co. received four contracts totaling $11,086,364 for R&D on the modified Spartan subsystem of the Safeguard ABM system and for command and control equipment for the Safeguard missile radar tactical control site.

Atlas Chemical Industries, Inc., will receive $10,333,752 for maintaining and operating the Army Ammunition Plant at Chattanooga, Tenn.

Contracts under $10 million. Eastman Kodak Co., $8,611,094 for explosives and support services; AVCO Corp., $8,009,367 (five contracts) for overhaul and repair of helicopter engines and for classified R&D; and

Hughes Aircraft Co., $7,777,866 for TOW missile system ground support equipment; LTV Electrosystems, Inc., $7,165,108 for components of the AN/VRC-12 vehicular radio set; International Harvester Co., $7,152,639 (three contracts) for stake, van and trailer trucks; and

Beech Aircraft Corp., $6,862,000 for fixed-wing utility aircraft; Uniroyal, Inc., $6,662,264 for loading, assembling and packing of ammunition and for operation of an Army ammunition plant; and

R. G. Le Tourneau, Inc., $6,238,400 for metal parts for 750-pound bombs; Texas Instruments, Inc., $6,040,540 (two contracts) for electronic equipment for aircraft; and

SCM Corp., $5,900,000 for engineering development and service test models of the Forward Area Tactical Teletypewriter and ancillary items; TRW, Inc., $5,000,000 for classified research and development; and

RCA, $4,648,666 for research, development, test and evaluation programs for land combat support systems; Futuronics Corp., $4,629,426 for teletypewriter sets and transmitter reperforators; Mason and Hanger, Silas Mason Co., $4,469,420 for operation of munitions assemblies facilities, loading, assembling and packing projectile components; and

Harvey Aluminum Sales, Inc., $3,665,836 for loading, assembling and packing ammunition, and for operating an Army ammunition plant; Litton Systems, Inc., $3,522,434 for scientific and technical support for the CDC Experimental Command; and

Donovan Construction Co., $3,501,100 for projectile parts; Honeywell, Inc., $3,491,000 for classified development work; Pettibone Corp., $3,378,450 for rough-terrain, forklift trucks; Thiokol Chemical Corp., $3,309,924 for operating an Army ammunition plant; and

Goodyear Tire and Rubber Co., $3,152,554 (two contracts) for track assemblies for M113 personnel carriers; Teletype Corp., $3,000,000 for classified electronic equipment; and

Teledyne-Ryan Aeronautical Co., $2,810,218 for flight service for Firebee target missile system operations at various ranges in New Mexico; Medico Industries, Inc., $2,799,000 for 2.75-inch rocket parts; White Motor Corp., $2,712,845 for engineering services for M44 and M602 series trucks; and

Union Carbide Corp., $2,530,565 for dry batteries, production testing, and engineering; Lockheed Missiles and Space Co., $2,503,054 for support

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The investigation in the constant velocity mode considered various numbers of optical passes, ranging from 4 to 32, and mirror velocities between 0.5 and 40.0 cm/sec. The resulting pulses had repetition rates ranging from 1 to 60 kHz, with pulse halfwidths as small as 5 microseconds and apparent peak pulse amplitudes as high as 10 times the CW output level. The average power of the pulses was approximately equal to the CW power of the free-running laser oscillator. Although several longitudinal modes were underneath the gain profile of a given transition, as is typical of the multipass laser oscillator, the pulsing constituted a very definite Q-switching effect which was similar in pulse width and repetition rate to that occurring in a "reactive" Q-switched conventional straight laser with only one mode oscillating under the gain profile at a given instant. Pulse measurements made at various optical path lengths showed that the pulse time separation for the constant velocity mode was equivalent to the time required for the end mirror to move $\lambda/2$. The few tests made with a sinusoidal movement of the mirror gave similar results.

TITLE: A Concept of Row Crater Enhancement
AUTHOR: REDPATH
Engineer Nuclear Cratering Group

ABSTRACT: An observed characteristic of chemical explosive row craters is apparent crater dimensions which are larger than the corresponding dimensions of a single-charge crater of the same individual charge yield. This characteristic is called row crater enhancement. This paper describes an approach to the design of a row charge for the excavation of a specified row crater using a new concept of enhancement. The approach is based on the single charge cratering characteristics of the medium and a constant relationship between the crater volume excavated by each charge in a row and the volume of the optimum single-charge crater. The concept was tested in a series of experiments using one-ton charges of nitromethane in shale at the Nuclear Cratering Group's test site near Fort Peck, Montana. The experimental results support the concept.

TITLE: Tactics in the Development of Mine Detector Dogs
AUTHOR: ROMBA
Land Warfare Laboratory, Aberdeen Proving Ground

ABSTRACT: Two mine dog systems are described. System differences are found in the availability of cues which aid the dog in locating mines and in the animal's terrain working behavior. The Mine Detection Dog makes strong use of secondary odor cues, such as disturbed earth and human trace-odors, in its strategy for finding recently emplaced mines. The dog works off-leash about 30 meters ahead of its handler in open fields and trails. Speed of outgoing movement is about 3 km per hour. Operational evaluation results are provided. The Specialized Mine Dog, in current development, is designed to locate plastic antipersonnel mines in minefields without the aid of secondary cues. The dog works off-leash on a three foot wide strip of ground, bounded by white guide tapes. Its forward movement is slow as it makes a detailed examination of the strip. The detection indicator for both systems is the sit response made within two feet of the mine. An olfactometric technique for the delivery of odors to animals is described. The method provides for precise quantitative control of odorants, air-soil temperature and moisture content.

TITLE: Neodymium YAG Laser for Optical Radar Applications
AUTHORS: STROZYK and ROSATI
Electronics Components Laboratory, Fort Monmouth

ABSTRACT: With the announced observation of optically excited stimulated emission in ruby, and the ensuing research into the characteristics of

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lasers, various types of laser devices have been described. One of the most intensely investigated areas has been in devices suitable for optical rangefinders and radars. Most rangefinder requirements are easily filled by Q-switched laser devices. In addition to these requirements, a pulse-echo radar usually requires a relatively high pulse repetition frequency (PRF). With the development of Nd:YAG laser materials capable of high PRF or continuous operation at high powers, the investigations into optical radars were accelerated. This paper describes a bread-board type device which demonstrates the various capabilities of a Nd:YAG laser device. Several applications such as rangefinding, range and range rate determination, terrain mapping, wire detection and perimeter defense have been examined using this unit in a manual track mode.

TITLE: Mass Flow, Velocity and In-Flight Thrust Measurements by Ion Deflection

AUTHORS: VAUSE and RUDLAND
Aeronautical Research Laboratory. Moffett Field

ABSTRACT: The desire to maximize performance and utility of airmobile systems in battle tactics has led to sophisticated advances in many areas such as fire control, navigation, and aircraft stability and control. However, similar advances in more accurate measurement of aircraft velocity and installed thrust have not kept pace. Systems currently in use for these purposes have been used in generally the same form for over fifty years.

TITLE: Creation of Massive Offshore Surf Zones by Underwater Explosions

AUTHORS: STRANGE and WHALIN
Engineer Waterways Experiment Station

ABSTRACT: Studies have been accomplished to delineate the explosion generated wave environment associated with high yield surface and underwater detonations in the relative vicinity of continental masses. This paper describes the results of theoretical and experimental studies that were accomplished to define the scope and intensity of the wave systems generated.

Additional research is needed to quantify various side effects of the problem which were uncovered as a result of the experimental tests.

TITLE: The Insignificant Twig Which Cries "Alarm" When the Enemy Moves Down the Jungle Trails

AUTHOR: SCHOENING
Fort Monmouth

ABSTRACT: Rocks and twigs are insignificant items along the trails and roads of Vietnam. They are all shapes, all sizes, all colors and they draw little or no attention from the infiltrators from the north who are headed into battle with munitions and food. Some of these items are not as insignificant as they look as they contain tiny transmitters which are turned on by enemy disturbance and silently cry "alarm" when anyone moves along the seeded trails. The listening post is many miles away where artillery and air strikes are controlled against this intruding enemy.

The paper describes in detail how it was conceived, how it works, what were the major problem areas, and how it is being used as an early warning device.

TITLE: The Effect of Undifferentiated Mass Punishment on the Cohesiveness of the Group and the Attractiveness of the Rebel

AUTHOR: SEELY
Infantry, United States Military Academy

ABSTRACT: A 2x2x2 factorial design experiment was conducted with 114

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Major Army Contracts Total $394 Million for RDT&E

(*Continued from page 75*)

items for aircraft; Chamberlain Manufacturing Corp., $2,444,040 for projectile parts; and

Maxson Electronic Corp., $2,276,649 for loading and assembling of illuminating projectiles; Batesville Manufacturing Co., $2,257,700 for M72A1 rocket launchers; Gulf and Western Industries, $2,235,443 (two contracts) for parts for fuzes; and

Raytheon Co., $2,175,000 for engineering services for the improved Hawk missile system; Servo Corp. of America, $2,146,980 for development, fabrication and test of automatic atmospheric sounding sets to be used in the Meteorological Data Sounding Systems; and

Bristol Electronics, Inc., $2,114,016 for AN/PRC–25 radio sets; Zenith Radio Corp., $2,070,000 for fuzes for 2.75-inch rockets; E. I. du Pont de Nemours and Co., Inc., $2,009,601 for support of TNT production and operating an Army ammunition plant.

Contracts under $2 million. Stanford University, $1,948,529 for research in mathematical theory computation and related areas of computer science; United States Steel Corp., $1,893,711 for projectile parts; Pacific Car and Foundry Co., $1,715,860 for engineering services and support of tracked vehicles; Simplex Wire and Cable Co., $1,617,860 for ocean telephone coaxial cable; and

Industrial Design Labs, Inc., $1,572,460 for automatic chemical agent alarms, testers, parts and manuscripts; Herlo Engineering Corp., $1,538,606 for barrel assemblies for M1 and M2 carbines; Conductron Corp., $1,500,000 for classified electronics equipment; and

Allis-Chalmers Manufacturing Co., $1,502,123 for electric forklift trucks; DVA Corp., $1,475,761 for M125A1 booster parts; Etowah Manufacturing Co., Inc., $1,469,850 for booster parts; General Electric Co., $1,448,991 for 20mm automatic guns; and

System Development Corp., $1,348,562 for a training program for air defense control systems; Aluminum Co. of America, $1,338,000 for 2.75-inch rocket motor tubes; American Machine and Foundry Co., $1,327,656 for bomb parts; and

L. E. Mason, $1,312,000 for nose assemblies for air munitions; Electronic Memories and Magnetic Corp., $1,250,000 for classified electronic equipment; Washington University,

St. Louis, Mo., $1,200,000 for development of a macromodular computer system; and

Boeing Co., $1,185,000 for technical manuals, publications and work requirements for support of CH-47 helicopters; Allied Products, $1,167,407 for 2-wheeled trailer chassis; Rubber Fabricators, Inc., $1,151,186 for collapsible water tanks; and

Saginaw Products Corp., $1,137,436 for trailer chassis; Magline, Inc., $1,131,210 for electrical equipment shelters; Martin Marietta Corp., $1,124,411 for multiplexers; Electro Magnetic Technology Corp., $1,117,771 for test equipment for the Vulcan weapon system; Gichner Mobile Systems, Inc., $1,107,859 for electrical equipment shelters; and

Pitts Manufacturing Corp., $1,093,655 for plugs for 155mm, 175mm and 8-inch shells; Hamilton Watch Co., $1,085,796 for radio sets and receiver transmitters; Universal Automatic Machine, Inc., $1,032,299 for lifting plugs for projectiles; and

Radio Corp. of America, $1,017,076 for Land Combat Support System equipment; Baldwin Electronics, Inc., $1,000,080 for loading, assembling and packing motors for 2.75-inch rockets; Motorola, Inc., $1,000,000 for electronics equipment.

WES Recognizes Employes At Anniversary Ceremonies

Half a century of federal service—eight years since his retirement from the U.S. Bureau of Standards—was recognized when Dr. Garbis H. Keulegan was presented recently with a diamond pin at the U.S. Army Waterways Experiment Station.

Dr. Keulegan was the winner of a 1969 Army Research and Development Achievement Award, presented by Chief of R&D Lt Gen Austin W. Betts, for his studies of tsunamis (giant, highly destructive tidal waves) that ranged as far as California following the Alaska Earthquake.

Waterways Experiment Station director Col Levi A. Brown was honored at the same ceremony—commemorating also the 41st anniversary of WES and the 195th birthday of the Army Corps of Engineers—with the Legion of Merit for outstanding performance of duty during his two years at WES. He has been reassigned to Vietnam.

An Outstanding Civilian Service Award was presented to Louis P. Cushman Jr., editor and publisher of the Vicksburg, Miss., *Evening Post and Sunday Post*, for objectively portraying the activities of WES.

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Air Force basic trainees to test the following hypothesis: if a member of a group performs a rebellious act against higher authority -- the identity of the "rebel" being known to the rest of the group but not known to the higher authority -- group cohesiveness as well as group esteem of the rebel will change differentially, depending on certain factors, which are: 1) formal power ascribed to the authority, 2) general manner displayed toward the group by the authority, and 3) whether or not mass punishment was administered to the group by the authority. Results showed a predicted interactive effect of degrees of formal authority power and punishment on group cohesiveness. Other significant findings of 1) a main effect of harshness by the authority in producing low cohesiveness, and 2) a main effect of punishment in reducing the liking for the rebel, were also generated, but in directions opposite to those predicted. Possible implications were also indicated.

TITLE: A Lightweight Electronic Scanning Radar
AUTHOR: TATE
Fort Monmouth

ABSTRACT: This paper describes an in-house effort leading towards the development of a lightweight combat surveillance radar capable of scanning an azimuth sector of ± 800 Mils without any physical motion of the antenna. The initial effort involved the use of digital four bit reciprocal phase shifters controlled by a beam steering computer. Due to the physical size, weight and quality control on the ferrite devices, digital diode phase shifters are being investigated as replacement units.

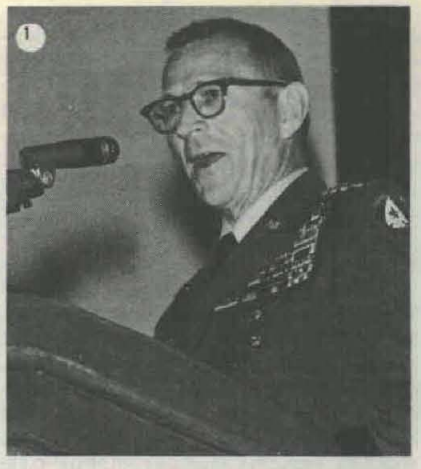
The system currently employs a novel device as a common pulsed transmitter and gated local oscillator in the interest of minimizing power consumption and simplifying design, development, fabrication and maintenance. This device is capable of generating a high level transmitter pulse at frequency f_1 (200 watts) and shifting to the local oscillator frequency f_2 and simultaneously reducing the output power level to milliwatts. The device is gated on for a time interval corresponding to the receive time and then it is passive. No AFC circuitry is required.

TITLE: Comparative Analysis of Mandibular and Mid-Face Fractures in Missile and Blunt Trauma: 4,015 Cases
AUTHOR: TINDER
Letterman Army Institute of Research

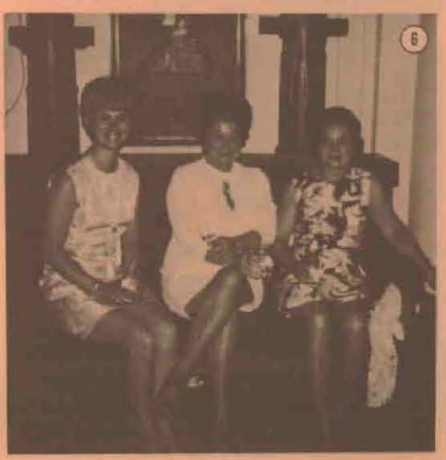
ABSTRACT: In a previous study it appeared that mid-face fractures were more common than mandibular fractures in certain types of trauma. The purpose of this study was to further investigate this relationship. Data from 4,015 patients with facial fractures, reported from selected U.S. Army Hospitals in Vietnam during a two-year period ending 30 June 1969, were analyzed with electronic data processing equipment. The types of trauma were classified as blunt trauma and missile trauma. Missiles were subdivided into: a) bullets; b) fragments (artillery shells, bombs, grenades, mines, and booby traps); c) "non-ballistic" missiles (rocks, gravel, glass, falling debris, and secondary missiles). Analysis of the 4,015 facial fracture patients revealed that 67.4 percent (2,705) were injured by missiles and 32.6 percent (1,310) were injured by blunt trauma. Of the 1,310 patients with facial fractures caused by blunt trauma, 48.0 percent had mandibular fractures alone; 43.6 percent had exclusive mid-face fractures; and 8.4 percent had combination fractures (mandibular and mid-face). Of the 2,705 patients with missile-induced facial fractures, 38.9 percent had mandibular fractures; 49.0 percent had mid-face fractures; and 12.1 percent had combination fractures. Mid-face fractures were 16 percent higher than mandibular fractures in patients incurring facial fractures by missile fragments and non-ballistic" missiles.

Scenes at 7th Army Science Conference

(1) KEYNOTE SPEAKER Lt Gen G. I. Forsythe, CG, CDC. Pictured below (l. to r.) are: (2) Maj Gen R. R. Ploger, CG, Army Engineer Center; Mrs. Ploger; Maj Gen J. R. Guthrie, director of RD&E, Army Materiel Command; Brig Gen H. L. Willard, USAR. (3) Dr. R. G. H. Siu, ASC banquet speaker; Army Chief Scientist Dr. M. E. Lasser; Jerry Mason, chief, Incentive Awards, HQ DA; Dr. C. M. Hudson, chief scientist, WECOM. (4) Dr. J. V. R. Kaufman, deputy director, AMC Plans, RD&E Directorate; Dr. G. L. Bushey, deputy chief scientist, AMC; Mrs. and Dr. C. M. Crenshaw, chief scientist, AMC; Dr. J. C. Hayes, ASC project officer; Dr. R. B. Watson, chief, PE&M Branch, ARO, OCRD. (5) Dr. H. A. Hunger, ECOM Electronics Components Lab; E. J. Fister, director, Technical Support Activity; Dr. R. S. Wiseman, ECOM Deputy for Laboratories; Col K. R. Aboe, deputy chief of staff for Logistics, HQ DA; V. J. Kublein, associate director, ECOM Electronics Components Lab. (6) B. O. Baker, chief, Canadian Defence Research Staff; Mrs. Baker; Dr. L. S. Wilson, chief, Environmental Sciences, OCRD; Dr. G. G. Quarles, chief scientific adviser, Office, Chief of Engineers; Col D. L. Howie, chief, Life Sciences, OCRD.



(1) Dr. E. E. Anderson, deputy director, DoD Food Programs, Natick Labs; J. F. Falconi, chief, ECOM Research and Advanced Projects, Airdrop Engineering; Dr. A. Assur, chief scientist, Cold Regions Research and Engineering Laboratories; M. P. Gionfrieddo, chief, Natick Aeronautical Systems Div.; I. Weitzler, deputy director, Natick General Equipment and Packing Labs; Dr. D. H. Sieling, scientific director, Natick. (2) Lt Gen H. B. Jennings, Army Surgeon General; Dr. A. L. Slafkosky, scientific adviser, U.S. Marine Corps; Dr. P. King, chief scientist, Office, Chief of Naval Operations; B. O. Baker, chief, Canadian Defence Research Staff; Maj Gen L. Metzger, deputy chief of staff for R&D Studies, Marine Corps. (3) D. L. Harris, chief, Oceanography Branch, Corps of Engineers Research Laboratory; Dr. R. J. Eichelberger, director, Ballistics Research Labs, APG, Md.; W. R. Benson, chief, Fuze Div., MUCOM; Dr. P. F. Chen, TOPOCOM; Dr. A. A. Baldini, ETL; L. A. Gambini, ETL. (4) A. B. Colman, WRAMC; Col R. Nims, WRAIR; Col I. C. Plough, CO, Medical R&D Command; Mrs. and Col Helmuth Sprinz, WRAIR; Lt Col O. Oestereich, WRAIR. (5) N. E. Sells, OCE; F. R. Brown, WES technical director; Linda M. Bartochuk, Natick; R. G. Ahlvin, WES; R. Jackson, chief, R&D Office, OCE. (6) Receptionists Sharon Hunnicutt, Anne Taylor and Beatrice Hester, OCRD.



Scenes at 1970 Army Science Conference

INFORMAL DISCUSSION, typical of many at 1970 Army Science Conference, involves (from left) Assistant Secretary of the Air Force (R&D) Grant L. Hansen; Dr. William W. Dorrell, Life Sciences Division, Army Research Office, Office of the Chief of R&D; Maj Gen John R. Guthrie, Army Materiel Command Director of Research, Development and Engineering; Chief of R&D Lt Gen A. W. Betts; and Lt Gen Hal B. Jennings, the Army Surgeon General.

DIRECTOR of Army Research Brig Gen George M. Snead Jr. renews an old friendship with Adamant Brown, technical director, Communications-Electronics Agency, Electronics Command.

AUSTRALIAN EMBASSY representatives (from left) Lt Col John H. Bird, Peter J. Oswald and Edward G. Hayman enjoy coffee break chat with Dr. Richard A. Weiss, Deputy and Scientific Director of Army Research, OCRD.

DISCUSSION PANEL on "How Do You Determine Your R&D Needs?" included (from left) Harold W. Duchek, vice president for Engineering and Research, Emerson Electric Co.; Dr. Wilmer A. Jenkins, director of R&D Division, E. I. du Pont de Nemours & Co.; Dr. Henry Lee, executive vice president, Epoxylite Corp.; Dr. Alvin E. Gorum, technical director, U.S. Army Material and Mechanics Research Center; Dr. Robert B. Dillaway (moderator), Army Materiel Command Director of Laboratories; Dr. Arthur M. Bueche, vice president, Corporate Research & Development Division, General Electric Corp; Dr. Richard S. Schreiber, vice president for Corporate Research, Upjohn Co.

BRITISH PARTICIPANTS included (from left) W. Sam Hall, British Defence Staff, Washington, D.C.; Dr. William H. Penley, director of Royal Armament R&D Establishment, Fort Halstead, England; Frederick Ward, director of Munitions, Office of the British Defence Staff, Washington, D.C.

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