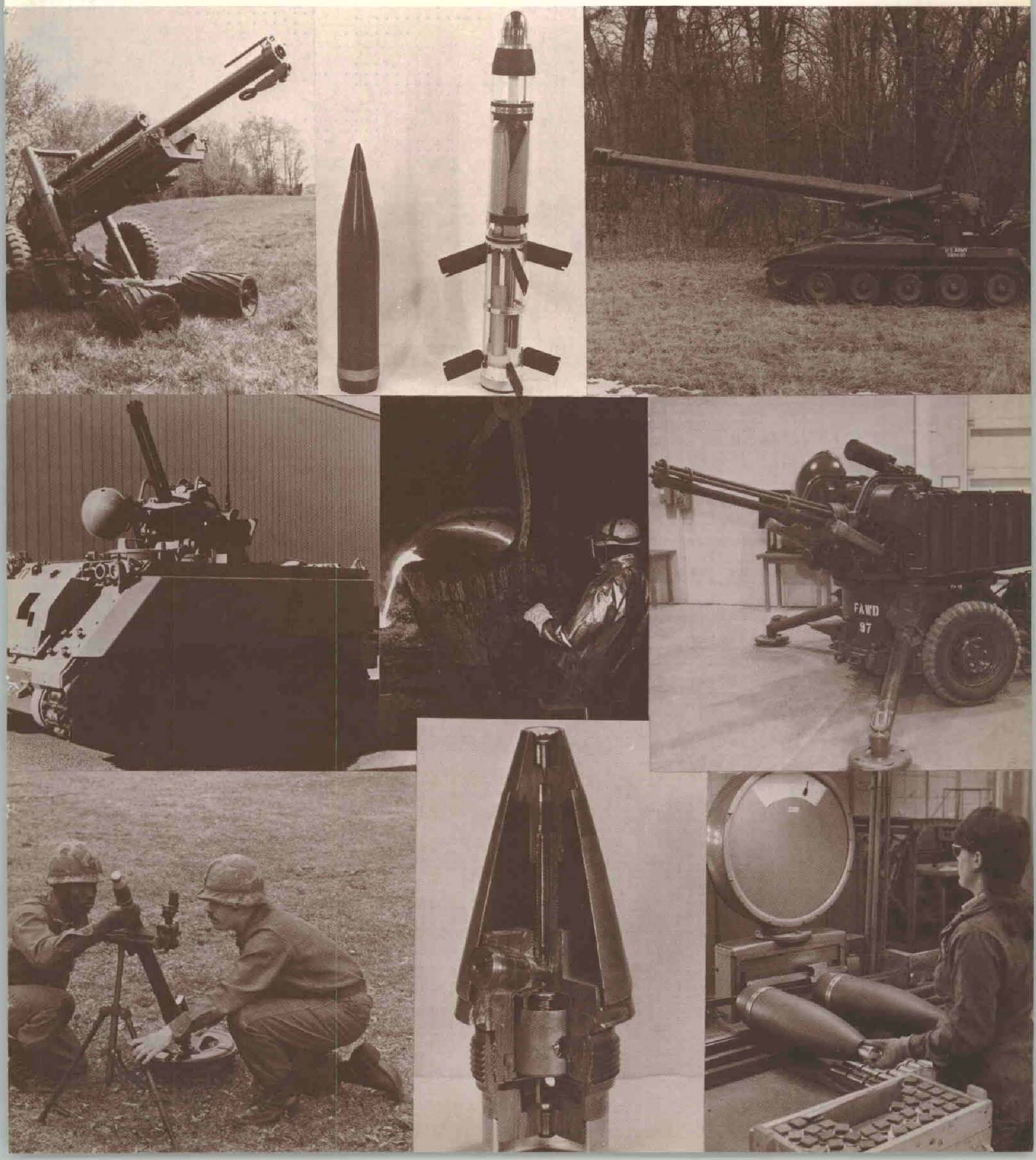
ARMY
RESEARCH AND DEVELOPMENT
August-September 1977

Annual R&D Awards Honor 63 In-House Lab Employes

Page 4

Feature Article, Page 16

Mission Realignments Detailed for ARRCOM, ARRADCOM



SPEAKING ON . . .

Major Thrusts for Increasing Reliability of Electronics Materiel

BERNARD REICH *has gained prominence during recent years working as a scientist with the U.S. Army Electronics Command at Fort Monmouth, NJ, in the critical problem area of increasing reliability of electronics materiel. He spoke at the meeting of the Technical Cooperation Program Panel W-6, NATO, held Aug. 2-4 at the U.S. Air Force Academy, Colorado Springs, CO. Currently, Reich is chairman of the Joint Logistics Commanders (JLC) Joint Technical Coordinating Group for Reliability, Availability and Maintainability of military equipment/systems. He is also chairman of the North Atlantic Treaty Organization Group of Experts on Electronic Parts, and heads the Special Working Group on Semi- conductor Devices and Integrated Circuits. He is a Fellow of the Institute of Electrical and Electronics Engineers in the United States, and a charter member and Fellow of the Institution of Electrical Engineers in the United Kingdom.*

* * *

The Joint Services, U.S. Army Materiel Development and Readiness Command (DARCOM), Naval Material Command (NMC), Air Force Logistics Command (AFLC), and Air Force Systems Command (AFSC) have launched a major program in the area of weapons systems reliability. The current major priority thrusts are in the areas of Computer Aided Design; Environmental Profiles and Methodology; and Combined Environmental Reliability Testing.

Additional priority thrusts include the revision of MIL-STDs 781 and 785, and development of an Engineering Education Program.

One previous noteworthy achievement of JTCG activities has resulted in the preparation of a uniform standard, MIL-STD-965, for Parts Control and Selection following other standardization action recommendations. Similar payoffs are expected to be forthcoming from current Reliability, Availability and Maintainability (RAM) activities.

Responsible for meeting the needs of the U.S. operating forces are: Commander, U.S. Army Materiel Development and Readiness Command (DARCOM); Chief of Naval Material (CNM); Commander of the Air Force Logistics Command (AFLC) and Commander, Air Force Systems Command (AFSC).

These four commanders are commonly referred to as the Joint Logistics Commanders, or JLC. This presentation offers information relative to the activities of one of the JLC Joint Technical Coordinating Groups on Reliability, Availability and Maintainability (JTCG-RAM).

The charter of the JTCG-RAM describes the direction/purpose of the group as being responsible for coordinating the Services' implementation of the recommendations of the JLC Electronics Systems Reliability Workshop held in May 1975. A paper summarizing the output of the workshop was presented at the 1976 Reliability, Availability and Maintainability Symposium.

An additional direction/purpose of the JTCG-RAM is to develop policies and procedures that will improve the management and utilization of RAM engineering disciplines within the various military departments and Department of Defense agencies.

The JTCG-RAM organization has representation from the four elements of the JLC, i.e., DARCOM, NMC, AFSC and AFLC. Six Working Groups and three Ad-Hoc Groups report to the JTCG-RAM.

The Working Groups cover the areas of Reliability Testing and Analysis; Reliability Design; Field Data Collection; Reliability Acquisition Management; Software Reliability; and Reliability Documentation Management.

Efforts of these working groups are directed primarily to electronic equipment/systems reliability. The Ad-Hoc Groups cover maintainability, reliability design, and testing on nonelectronic systems.

The JTCG-RAM interfaces in various operational areas with the Office of the Secretary of Defense (OSD), the Office of the Director of Defense Research and Engineering (DDR&E), and the Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics. The formal channel followed is through the Joint Commanders, Service Chiefs, Military Secretaries and finally to the OSD.

In many instances, excellent informal contacts have been developed with OSD in instances where formality is not required. In the past, the informal route has been used to OSD on the Electronics-X Study follow-on; participation in the JLC Workshop; and interaction with some of the Working Groups of interest.

JTCG-RAM Chronology. JTCG-RAM was chartered in October 1976. However, prior to this time, predecessor JTCGs were formed whose activities were limited either to electronic parts or electronic systems reliability.

During the period August to December 1973, an Ad-Hoc Group was formed and was quickly followed by a Joint Technical Coordinating Group on Electronic Equipment Reliability (JTCG-EER).

Prime activities of these groups were directed to electronic parts standardization problems, primarily on microcircuits. JTCG-EER spawned the Electronics Systems Reliability Workshop held at the Airlie House in May 1975, directing its attention to topical areas affecting electronic systems reliability.

Following the workshop, the Joint Technical Coordinating Group on Electronic Systems Reliability (JTCG-ESR) was formed in September 1975. In October 1976 it was expanded to include the total area of RAM with the chartering of JTCG-RAM.

Accomplishments of the Joint Technical Coordinating Groups mentioned already have been noteworthy. JTCGs have been instrumental in lifting the DoD policy prohibiting the preparation of a list of standard parts.

Accordingly, MIL-STD-1562, List of Standard Parts for Microcircuits, was issued Nov. 5, 1974. The groups were instrumental in getting the Military Services to implement the use of the Defense Electronic Supply Center, Military Parts Control Advisory Group, MPCAG.

Similarly the group was influential in having MIL-STD-965 prepared, covering unified procedures for Parts Control and Selection for the Services. A forecasting procedure has been developed and implemented on a trial basis to give industry a better visibility of DoD microcircuit requirements.

In the equipment area, MIL-STD-781, covering reliability testing for equipment/systems following an exponential distribution, has been updated to the "C" version and should be issued within the near future.

Finally, the group serves as an excellent inter- and intra-service forum on RAM and associated disciplines. Similarly, the group serves as a forum for industry where new concepts and ideas can be presented.

JTCG-RAM Tasks. The priority tasks of JTCG-RAM include application to weapons systems (MIL-STD-781 and MIL-STD-785); environmental profiles and methodology; guidance documentation; and engineering education program. Also, application to electronic equipment (reliability in computer-aided design, and screening/burn-in).

These tasks are being supported and implemented by the Services in accordance with an approved schedule and funding. They have been categorized as to their applicability to both electronic and nonelectronic equipment/systems or their sole applicability to electronic equipment/systems.

Most of the priority tasks have application to Weapons Systems Reliability. MIL-STD-781 relates to Reliability Testing and MIL-STD-785 to Reliability Program Planning. Environmental Profiles cover expected "real world" environmental levels in military platforms and methods of their definition.

The preparation of contractual guidance and government program plan documentation, and the development of a nonstatistical practical engineering program, are also deemed equally applicable to electronic and nonelectronic systems.

The integration of reliability methods and techniques in a computer-aided design program and development of effective screening/burn-in procedures are deemed applicable solely to electronic equipment reliability as currently defined.

TABLE 1

Funding (K) JTCG-RAM Priority Tasks

	FY 76	FY 7T	FY 77	FY 78
Army	—	—	175	325
Navy	40	—	520	45
Air Force	40	96	425	134
	80	96	1120	504

FY 76 - 78

1800

Total

(Continued on page 23)

ABOUT THE COVER:

Pictured are some of the weapons systems and production processes that are involved in the mission of the Armament Materiel Readiness Command (ARRCOM), created along with the Armament R&D Command (ARRADCOM) from resources of the abolished Armament Command (ARMCOM), as major subcommands of the Army Materiel Development and Readiness Command (DARCOM). Shown are (1) the XM204 105mm Soft Recoil Howitzer, (2) M163A1 Tank Mounted Vulcan Air Defense Gun (VAD), (3) XM224 60mm mortar, (4) 155mm round and XM172 Copperhead CLGP (Cannon Launched Guided Projectile), (5) Rock Island Arsenal workman pouring liquid steel into molding machine, (6) M524A6 mortar fuze, (7) M110E1 self-propelled 155mm full-tracked Howitzer, (8) M167A1 VADS, (9) 155mm M107 shell before final assembly. The back cover *shows scenes and weapons representative of the ARRADCOM.*

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FEATURES

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Selective Scanner ◆◆◆

Army Slates Operations Research Symposium XVI

New weapon systems, related doctrine, personnel and training, and logistic concepts are among topics programed for presentation in technical papers at the U.S. Army Operations Research Symposium XVI, Oct. 12-14.

Themed on Operations Research Support for the 80s - Looking Ahead, the symposium is scheduled at Fort Lee, VA. Cohosts for the fourth consecutive year are the Army Logistics Center, the Quartermaster Center and Fort Lee, and the Logistics Management Center. Cohosts are commanders MG Homer D. Smith, MG Dean Van Lydegraf and COL Don A. Wilkinson.

Army Vice Chief of Staff GEN Walter T. Kerwin Jr. is scheduled for one of the principal addresses. Keynoter is Dr. Seth Bonder, president of Vector Research Inc. Banquet speaker is Dr. Daniel McDonald of Braddock, Dunn and McDonald Inc. Another featured speaker is Dr. Marvin E. Lasser, Army chief scientist and director of Army Research.

About 300 expected attendees will be invited, stated Walter Hollis, who heads the arrangements committee for the U.S. Army Operational Test and Evaluation Agency, Falls Church, VA. Inquiries for additional information should be directed to him or MAJ Will Griffith, AUTOVON 289-2368 or 289-2367. The address is 5600 Columbia Pike, Falls Church, VA 22401.

AVSCOM, TROSCOM Change to AVRADCOM, TSARCOM

Another of the organizational changes effected within major elements of the U.S. Army Materiel Development and Readiness Command during the past two years has split functions of the former U.S. Army Aviation Systems Command (AVSCOM) and the Troop Support Command, headquartered in St. Louis, MO.

More than a year of intensive planning was climaxed when AVSCOM and TROSCOM were divided into the U.S. Army Troop Support and Aviation Materiel Readiness Command (TSARCOM) and the U.S. Army Aviation Research and Development Command (AVRADCOM), both headquartered in St. Louis.

Commanded by MG Richard H. Thompson with BG Arthur J. Junot as deputy, TSARCOM is charged with responsibility as the host command and will provide common service support to AVRADCOM as a "tenant." AVRADCOM is commanded by MG Story C. Stevens and COL William E. Dasch is deputy.

Prior to the AVSCOM realignment, COL Thompson was in the Office of the Deputy Chief of Staff for Logistics, HQ DA. BG Junot was commander of the TROSCOM and COL Dasch was AVSCOM chief of staff.

AVRADCOM's mission includes development and initial acquisition of aviation materiel. Responsibility for additional acquisitions and materiel readiness throughout its life cycle is assigned to TSARCOM.

Natick Plans Combat Flame-Resistant Uniform

Planned development of a one-piece, flame-resistant uniform for ground combat vehicle crewmen in hot and temperate climates has been announced by the U.S. Army Natick (MA) Research and Development Command.

Designed with special pockets to carry necessary equipment and items for survival and protection, the uniform will have a "breathing" capability to help prevent abnormal build-up of body heat.

Other features will include an extraction strap to help in removal of injured crewmen from the vehicle and a special collar for protection of the neck. Repeated washings will not destroy the fabric's flame-resistant characteristics. Development completion is scheduled in 1979.

DARCOM Film Depicts Weapons System Development

Depicting the latest progress of the U.S. Army Materiel Development and Readiness Command in weapons system development is a 35-minute, 16-millimeter color film available through local training aid support officers.

Produced by HQ DARCOM training aids personnel, the film responds to a request from retiring Deputy CG for Materiel Development LTG George Sammet Jr. DARCOM Special Briefing Film 77-8 is intended for use by officers on oversea trips or in the Continental U.S., primarily for showing to combat arms personnel.

The weapons items film report deals principally with materiel that is project/product-managed including armor, antiarmor, aviation, field artillery, air defense and target acquisition. For example, it shows how the XM1 tank and the TOW antitank missile can complement one another in repelling enemy armor.

Army Funds Infantry Assault Weapon Development

Exploratory development of an infantry assault weapon with a cantaloupe-size, rocket-propelled, high-explosive warhead is called for in a $509,000 contract announced by the U.S. Army Missile Research and Development Command, Redstone Arsenal, AL.

Funded by the Defense Advanced Research Projects Agency (DARPA), the work will be done by the Defense Division of Brunswick Corp. Success of test firings provided a satisfactory basis for follow-on work.

The Rifleman's Assault Weapon (RAW) warhead mounts on a launcher bracket that slips on the end of an M-16 rifle barrel. Firing a regular cartridge round in the rifle activates a small rocket motor that propels the RAW to the target.

The RAW is expected to enable a rifleman to hit a close-in target, such as a building or bunker, with an impact now obtained only with mortars, satchel charges or artillery. Designers envision spinning the RAW to stabilize the warhead as it leaves the launcher.

USMC Air Station Wins Environmental Quality Award

Recipient of the 1976 Secretary of Defense Environmental Quality Award is the United States Marine Corps Air Station Kaneohe, HI. Fort Sill, OK, Vandenberg Air Force Base, CA, and Point Mugu Test Center, CA, also are commended for exemplary environmental programs.

Announced by Secretary of Defense Harold Brown, award winners were selected by a committee that commended the efforts to meet the spirit as well as the intent of national environmental policies. The committee made specific reference to the Kaneohe Stations's excellent cooperative effort to work with state and local officials to protect the Oahu environment.

The committee consisted of Rob Robson, Office of Management and Budget; Ms. Becky Hanmer, director of Federal Activities, Environmental Protection Agency; and Harold O'Connor, deputy associate director, U.S. Fish and Wildlife Service, Department of the Interior.

CORADCOM Contract Calls for REMBASS Fabrication

Final design and fabrication of the basic Remotely Monitored Battlefield Sensor System (REMBASS), including initial delivery of hardware for testing in about 14 months, is ordered in an $8,986,200 contract announced by the U.S. Army Communications R&D Command (CORADCOM).

RCA Corp., Camden, NJ, one of three competing contractors, will provide engineering development support leading to a projected production phase in 1980. Establishment of initial operational capability is set for 1982.

Department of the Army descriptive requirements for REMBASS, first approved in 1972 and revised in 1976, call for an unattended ground sensor system providing early warning surveillance and target acquisition capabilities in a worldwide environment.

Implanted by hand, air delivery or projectiles, the REMBASS sensors are designed for responsiveness to passage of target objects, including sensitivity to seismic, acoustic, magnetic and infrared disturbances.

REMBASS is expected to replace the Phase III Sensor (formerly known as the Southeast Asia Operational Sensor System), currently in limited use.

$2.5 Million Awarded for X-Shaped Wing Aircraft

Initial funding of $2.5 million for development of an X-shaped wing aircraft, designed for vertical takeoffs and high-speed horizontal flight, has been announced by the Defense Advanced Research Projects Agency.

Lockheed-California Co., prime contractor, reports that with the wing rotating, the aircraft will take off and land vertically, and attain flight speeds up to 233 mph.

Transonic speeds equivalent to those attained by commercial jet aircraft will be possible with the wings locked in a fixed "X" position. Conventional takeoffs and landings can be made in the fixed-wing configuration.

Turbofan jet engines will provide forward-thrust and rotary-wing power. The developers expect the aircraft to be faster and feature greater lift power than any vertical takeoff and landing plane currently in use.

2 Contractors to Develop DIVAD Gun System

Two contractors will be selected in October to undertake a 2-year competitive development of a Division Air Defense (DIVAD) Gun System, using 30, 35 or 40mm ammunition, to replace the 6-barrelled, 20mm Vulcan Air Defense System (VADS) now in the field.

Five prime-system proposals for developing the DIVAD Gun System have been submitted by contractors desiring to participate in the program. Development will differ from former procedures by minimizing government involvement and emphasizing industry initiative.

Mounted on a modified M48A5 tank chassis, the DIVAD gun will provide better mobility and armor protection for infantry division troops, and faster reaction against low-flying aircraft. The system will employ acquisition and tracking radars and is expected to use the most modern fire control digital computer.

Overseeing the effort for the U.S. Army Armament R&D Command (ARRADCOM) will be the Project Management Office (PMO) for the Army Gun Air Defense Systems (ARGADS), recently relocated from Rock Island (IL) Arsenal to Dover, NJ. The PMO is headed by COL Leonard S. Marrella, who will supervise the development phase and the testing program for DIVAD.

Communications Satellite to Serve 40 VA Hospitals

Patients in some 40 Veterans Administration hospitals will be served, beginning in September, by the "world's most powerful communications satellite" in the second phase of a VA program to improve medical education.

The VA first used satellites for medical consultation in 1974 when 10 VA hospitals in the Appalachian region participated in weekly television broadcasts for 11 months. Administrator of Veterans Affairs Max Cleland said weekly 2-way telecasts will link 31 VA hospitals in 11 western states and as many as 10 other institutions during the new 15-month experimental program.

Launched into orbit above the equator at an altitude of 22,300 miles in January 1976, and currently used for experiments by other organizations in the United States and Canada, the satellite will relay telecasts from various points in the nation to the VA hospitals. Staff members will view a wide range of presentations and pose questions or solicit comments from broadcast participants through 2-way video transmissions.

Participating VA hospitals include Fresno, Livermore, Long Beach, Brentwood, Wadsworth, Martinex, Palo Alto, San Francisco and Sepulveda, all in California; Fort Lyon, Grand Junction and Denver, CO; Miles City and Fort Harrison, MT; Phoenix, Prescott and Tuscon, AZ; Portland, Roseburg and White City, OR; Reno, NV; Salt Lake City, UT; Seattle, Spokane, Tacoma, Vancouver and Walla Walla, WA; Sheridan and Cheyenne, WY; Boise, ID; and Albuquerque, NM.

USACSC Relocates AT Directorate to GIT Campus

Establishment of the U.S. Army Institute for Research in Management Information and Computer Sciences at the Georgia Institute of Technology, Atlanta, has been announced by the U.S. Army Computer Systems Command.

Relocation of USACSC's Advanced Technology Directorate from Fort Belvoir, VA, to the GIT campus is made to "provide improved technology transfer from the research source to the operational environment."

Georgia Tech was selected by the Army partially because of recent expansion of its School of Information and Computer Science and because of GIT's strong traditional emphasis on interdisciplinary research.

AIRMICS is programed as a focal point for numerous Army agencies seeking information relative to data-base technology, distribution systems, software, engineering, system performance and programing languages.

Army Audit Agency Establishes Office at USACSC

Establishment of a U.S. Army Audit Agency (USAAA) Office at HQ U.S. Army Computer Systems Command, Fort Belvoir, VA, to improve accuracy, security and privacy of processing data was effected June 1.

"Dramatic advances in the capabilities of computer hardware and software," an announcement stated, "have permitted many systems to reside in common computer environments. . . . While advanced technology has improved computer capabilities, it has at the same time, created potentially serious security problems.

"The USAAA has accepted an invitation from USACSC to expand the current audit concept to include ongoing audit during the system design phase. This expanded concept will insure that proper audit-trail, security, and privacy controls are built into the systems."

R&D News...

R&D Achievement Awards Recognize Work of 63 Army In-House Scientists, Engineers

Sixty-three Army scientists and engineers will receive U.S. Army 17th annual R&D Achievement Awards in recognition of scientific advancements of "military importance and/or which contribute to the national welfare."

Consisting of a wall plaque and a 2-inch cast-bronze medallion, the award was initiated in 1961 as the most prestigious recognition the Army bestows annually for Army in-house laboratory R&D activities. High-ranking Army R&D leaders will make the presentations during coming months at field activities where the recipients are employed.

Army Chief Scientist and Director of Army Research Dr. Marvin E. Lasser, Office of the Deputy Chief of Staff for Research, Development, and Acquisition (ODCSRDA), was chairman of the panel of judges. Winners were selected from nominations submitted by laboratories throughout the U.S. Army Materiel Development and Readiness Command (DARCOM), the Office of the Chief of Engineers (OCE), and the Office of the Surgeon General (OTSG).

An individual award will be presented for U.S. Army Medical Service research. Two group awards, involving five personnel, and four individual awards will go to U.S. Army Corps of Engineers researchers. The remaining 53 award winners are assigned to activities of DARCOM, which includes more than 80 percent of all U.S. Army in-house laboratories.

Listed within their major command, subcommand and/or installations, the award winners and brief excerpts from their nomination justifications and citations follow.

U.S. ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND (DARCOM). **U.S. Army Missile R&D Command (MIRADCOM), Redstone Arsenal, AL.** A 13-man team, all with the U.S. Army Missile RD&E Laboratory, will receive awards for significant achievements in high-energy laser R&D.

Cited for competence, skill and boldness in the design, fabrication, operation and testing of the Mobile Test Unit (MTU), the group consists of *Dr. John A. Hoyle, Myron W. Cole, Winifred E. Buffington, Dean C. Reese, Joe C. Walters, Kenneth R. Smith, Sylvan A. Walliser, William Brinda, William H. Gurley III, Joel W. Strickland, Herbert Gray, Edward O. Branum* and *Robert L. Light.*

The MTU is the first high-energy laser device to be packaged in a military track vehicle and operated successfully on a test range. The quality and timeliness of this achievement establishes a "sound technical basis for evaluation of high-energy laser potential in future Army missions and advanced military applications."

A second award will go to *Stephen P. Golden* and *Joseph R. McGinty* for a major breakthrough in infrared guidance for air-defense missiles. Their citation states, in part:

"They independently originated an infrared counter-countermeasure concept, fabricated feasibility hardware and successfully demonstrated, through captive and flight tests, the ability of their concept to provide major improvements in infrared seeker performance, in a countermeasure environment.

"Their technique, in conjunction with an improved Chaparral seeker, greatly enhances the United States' air-defense capability."

U.S. Army Electronics Command (ECOM), Fort Monmouth, NJ. *Dr. Harold Jacobs* and *Metro M. Chrepta,* Electronics Technology and Devices Laboratory, were cited for the conception and development of practical, low-cost millimeter-wave integrated circuits.

"This innovative approach has resulted in extension of application into portions of the electromagnetic spectrum heretofore not considered economically feasible," the citation states.

"The impact of these developments on systems has been considerable. Fresh and effective systems approaches have been made possible in the areas of millimeter-waves for radar, electronic warfare, secure communications and terminal homing.

"Immediate applications have been found in the 60 GHz to 94 GHz region with proven potential for higher frequencies, including the submillimeter regions."

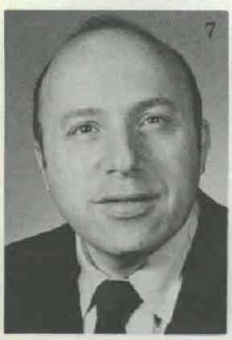
Drs. Louis D. Duncan and *Willis L. Webb,* both with the ECOM **Atmospheric Sciences Laboratory (ASL)** at **White Sands Missile Range, NM,** will be honored for developing techniques and designing a system to use meteorological data in the 15-30 kilometer altitude range.

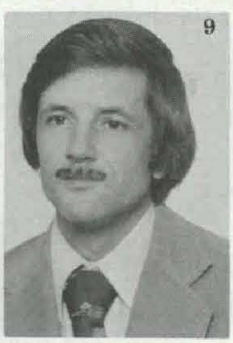
"The system is based upon the analysis of spectral radiance data measurements obtained from satellite-borne thermal sounders and will result in significant cost reductions in operational battlefield meteorological support."

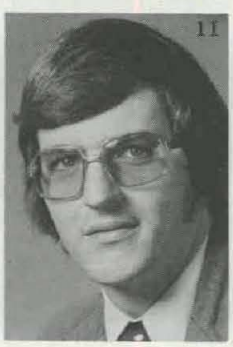
Harry Diamond Laboratories (HDL), Adelphi, MD. *Tadeusz M. Drzewiecki* and *Francis M. Manion* were selected for a breakthrough in scientific knowledge that improves the Army's capability in fluidic systems.

They were cited for "technical competence in fluid mechanics and fluidic circuits which en-

U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, MA— (1) **Dr. Joseph J. Prifti** (2) **Eugenio DeLuca** (3) **Anthony L. Alesi.** U.S. Army Air Mobility R&D Laboratory (AAMRDL), Eustis Directorate, Fort Eustis, VA— (4) **Timothy D. Evans** (5) **Robert Hall** (6) **Gary R. Newport.** Picatinny Arsenal, Dover, NJ— (7) **Raymond Goldstein.** U.S. Army Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA— (8) **Stanely S. Kurpit.** Ballistic Research Laboratory (BRL), Aberdeen Proving Ground (APG), MD— (9) **Dr. Andrew M. Dietrich.** Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH— (10) **Dr. Malcolm Mellor.** Construction Engineering Research Laboratory (CERL), Champaign, IL— (11) **Douglas C. Hittle,** Brooke Army Medical Center, Fort Sam Houston, TX— (12) **Dr. Douglas W. Wilmore.**







abled them to significantly reduce the temperature dependence of fluid amplifiers, such that these inexpensive and reliable systems can be utilized in numerous additional applications of precision fluidic control systems."

Night Vision Laboratory (NVL), Fort Belvoir, VA. *Sen-Te Chow* will be honored for design and development of a new image-processing concept called Automatic Low Frequency Gain Limiting Circuit (ALFGL) for use in all thermal imaging systems. This circuit eliminates the serious image streaking problem (loss of scene detail) that occurs in thermal imaging systems when the scenes being viewed contain extended hot/cold objects.

His citation states: "This major advancement in the development of signal processing circuitry for infrared systems will improve the performance of all thermal imaging systems for the Army and for more general Department of Defense system applications and, in fact, the performance of any electro-optical system that requires AC-coupled signal processing."

U.S. Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA, nominated *Stanley S. Kurpit,* Electrical Power Laboratory, for development and design of a low-temperature methanol-steam reformer and its demonstration in fuel-cell power plants.

"This has resulted in a technical approach that meets the major requirements of the SLEEP family and has allowed progression of this program into engineering development.

"This will provide the Army with silent, lightweight, efficient, low-signature power plants

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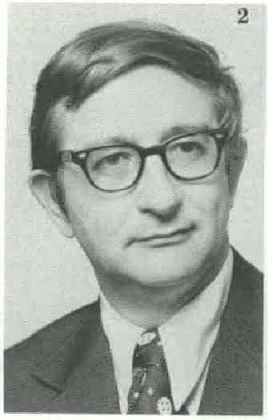
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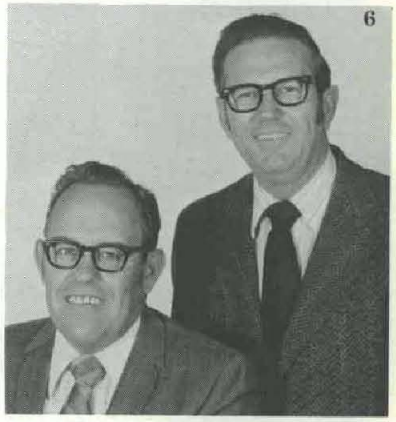
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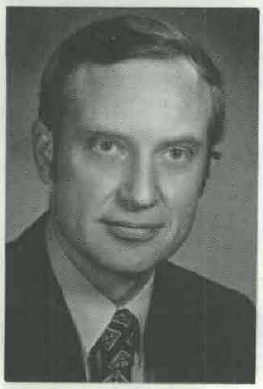

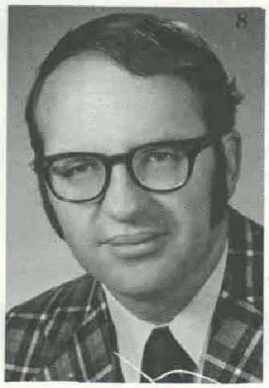
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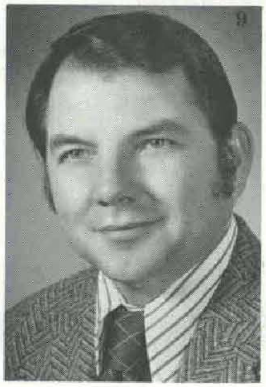
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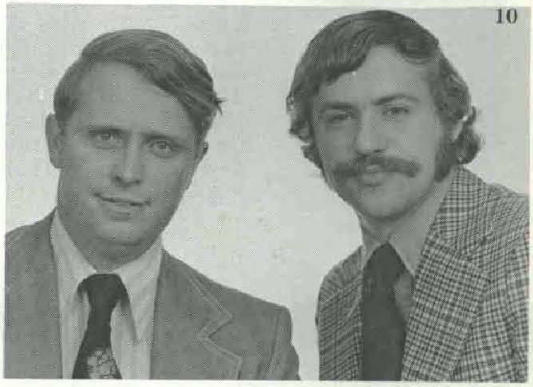
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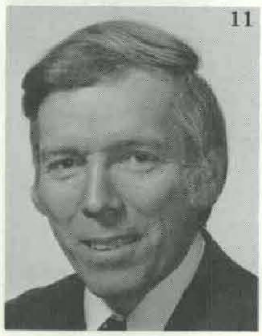
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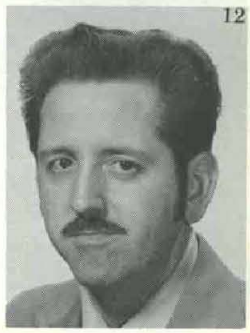
R&D Achievement Award Winners

Watervliet Arsenal, Watervliet, NY— (1) Front row (l. to r.): **David P. Kendall, Dr. Thomas E. Davidson, Clarke G. Homan.** Back row: **William Korman, John A. Barrett, Joseph W. Hart, Julius Frankel, William M. Yaiser.** U.S. Army Armament R&D Command (ARRADCOM), Edgewood Arsenal, Aberdeen Proving Ground (APG), MD— (2) **Dr. George T. Davis** (3) **Dr. Joseph Epstein** (4) **Arthur K. Stuempfle** (5) **Joseph P. Sansonetti, Larry T. Shaff, Donald M. Cohen, Ned L. Surratt, William C. Dee.** Atmospheric Sciences Laboratory (ASL), White Sands Missile Range (WSMR), NM— (6) **Drs. Louis D. Duncan** and **Willis L. Webb.** Waterways Experiment Station (WES), Vicksburg, MS— (7) **Jerry R. Lundien** (8) **Daniel H. Cress** (9) **Bob O. Benn.** Construction Engineering Research Laboratory (CERL), Champaign, IL— (10) **Ronald D. Webster** and **Rikki L. Welsh.** U.S. Army Engineer Topographic Laboratory (USAETL), Fort Belvoir, VA— (11) **Gwynne H. Jones Jr.** (12) **Dr. Bryce Schrock.**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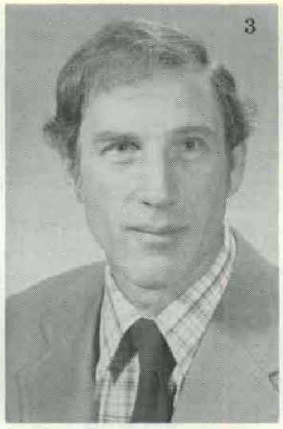
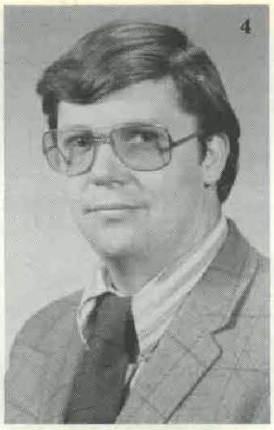
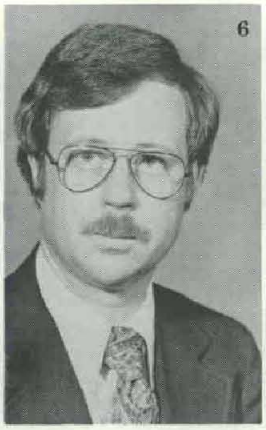
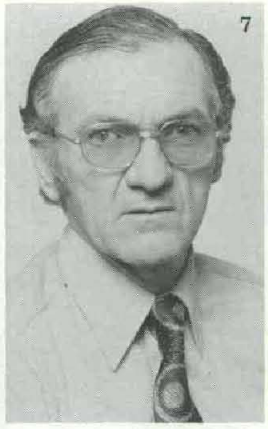
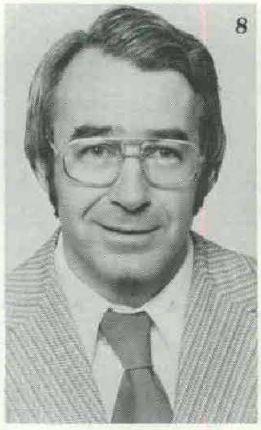
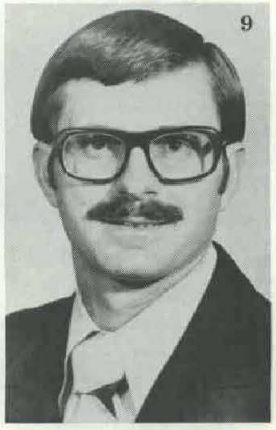


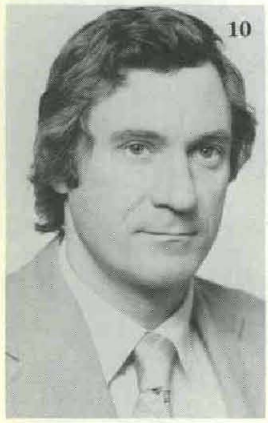






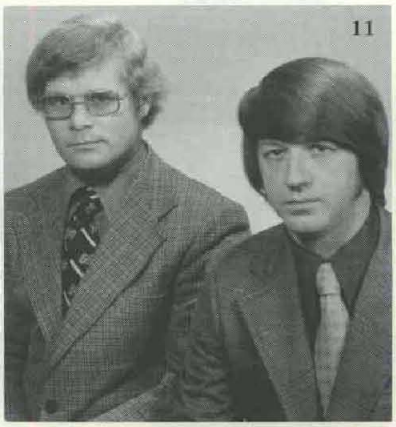






R&D Achievement Award Winners

U.S. Army Electronics Command (ECOM), Fort Monmouth, NJ— (1) **Metro M. Chrepta** and **Dr. Harold Jacobs.** Night Vision Laboratory (NVL), Fort Belvoir, VA— (2) **Sen-Te Chow.** Harry Diamond Laboratories (HDL), Adelphi, MD— (3) **Francis M. Manion** (4) **Tadeusz M. Drzewiecki.** U.S. Army Armament R&D Command (ARRADCOM). Edgewood Arsenal, Aberdeen Proving Ground (APG), MD— (5) **Leo G. Appel** (6) **Robert B. Moll** (7) **Harold L. Feller** (8) **Donald C. Behringer** (9) **Dale H. Tomlinson** (10) **Frederick C. Baldauf.** U.S. Army Missile R&D Command (MIRADCOM), Redstone Arsenal, AL— (11) **Stephen P. Golden** and **Joseph R. McGinty** (12) **William Brinda, Kenneth R. Smith, Dr. John A. Hoyle, Joe C. Walters, Winifred E. Buffington, William H. Gurley III, Edward O. Branum, Herbert Gray, Dean C. Reese, Myron W. Cole, Joel W. Strickland, Robert L. Light, Sylvan A. Walliser.**



R&E Achievement Awards Recognize 63 Army Scientists, Engineers

(Continued from page 5)

for use in forward areas. . . ."

U.S. Army Armament R&D Command (ARRADCOM). Edgewood Arsenal, Aberdeen Proving Ground (APG), MD, nominated *Donald C. Behringer, Leo G. Appel, Frederick C. Baldauf* of its Development and Engineering Directorate, *Harold L. Feller* of its Chemical Laboratory, and *Robert B. Moll* and *Dale H. Tomlinson,* Chemical Agent Munition Disposal System Directorate, Toole Army Depot, UT.

The group was cited for contributions in the development of a "real-time" air-monitoring device. "In the course of satisfying strict requirements of emission control, specificity, and response time," the citation states, "they developed a detector that reliably monitors both ambient and stack effluents at and around demilitarized sites to detect subtoxic-level emissions."

A 5-man team from the arsenal will receive achievement awards for scientific and engineering contributions to successful development of the 155mm M687 projectile.

"In the course of this effort, they were responsible for important advances in technology in a number of areas including reaction kinetics, chemical engineering design, special projectile ballistics and techniques for simulation."

The team consists of *Joseph P. Sansonetti, William C. Dee, Larry T. Shaff* and *Ned L. Surratt,* Development and Engineering Directorate, and *Donald M. Cohen,* Office of the Project Manager for Smoke/Obscurants, APG.

Under the direction of *Dr. Joseph Epstein* and *Dr. George T. Davis,* both with the Chemical Laboratory at the arsenal, a team was nominated in recognition of technical contributions that have led to significant advances in demilitarizing obsolete toxic chemical munitions.

"Through imaginative concepts, followed by outstanding design and execution of experiments to validate the concepts, together with masterful interpretation and extrapolation of the test data, the team succeeded in finding the cause for evolution of toxic materials into the atmosphere and ways for minimizing this occurrence."

Arthur K. Stuempfle will be honored for progress in clarifying and mathematically describing the liquid dissemination and breakup process from spin-stabilized expulsive delivery systems. "As a result of his efforts, substantial improvements have been made in the chemical deterrent development program and a new tool for systems analysts has been made available."

Watervliet (NY) Arsenal. An 8-man team from the Benet Weapons Laboratory at Watervliet was recognized for outstanding contributions to ultra-high pressure research.

The citation states: "Through its efforts, the range of attainable static high pressures has been significantly extended, ultra-high pressure has been successfully coupled with cryogenics, and new measurement techniques developed.

"These achievements now make possible the conduct of meaningful experiments to previously unexplored pressures of 400-500 kbars. They have discovered several new phenomena that are not only important in themselves, but indicate the potential of this new regime for the synthesis of unique new materials of significantly practical importance."

Team members include *Dr. Thomas E. Davidson, David P. Kendall, Clarke G. Homan, Julius Frankel, John A. Barrett, William Korman, Joseph W. Hart* and *William M. Yaiser.*

Ballistic Research Laboratory (BRL), APG, MD. *Dr. Andrew M. Dietrich* was selected for highly effective formulation, planning and supervision of the Crossing Velocity Research Program, a high-priority effort to determine the effect of missile flight characteristics and the dynamic motion of armored targets on the performance of high-explosive antitank missile warheads.

"He completed the objectives of this project through the use of a combined experimental and computational analysis program, and utilized the results of this study to develop a (mathematical) model to predict the effect of crossing velocity on antitank missile warhead performance."

In addition, he is cited for "the application of this research to the design of unique high-explosive, antitank warheads, the modeling of warhead-armor interactions, and his effective adviser assistance to U.S. Army program managers."

Picatinny Arsenal, Dover, NJ. *Raymond Godstein's* award justification states that impact of his work on "modernization and expansion of TNT production facilities is substantial. Using computer simulation, Goldstein has been able to generate a number of improvements in the design, operation and control of the Continuous TNT Process, which will not only result in significant production cost savings, but will improve the safety, reliability and operability of the process."

U.S. Army Aviation Systems Command (AVSCOM). Three aerospace engineers from the **U.S. Army Air Mobility R&D Laboratory (AAMRDL), Eustis Directorate, Fort Eustis, VA,** will be recognized for their part in advancing helicopter evaluation methodology.

Timothy D. Evans, Robert Hall and *Gary R. Newport* are credited with developing a simulation model capable of comparing ". . .different kinds of helicopters performing typical Army utility helicopter tasks in a combat environment, including enemy threat weapons and missiles. . . . Based on the current cost of new helicopters, potential savings of millions of dollars will result from this procurement decision and future applications of this new evaluation methodology."

U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, MA. *Anthony L. Alesi, Eugenio DeLuca* and *Dr. Joseph J. Prifti* are recognized for their efforts in developing a "practical production process for molding thick, large-size armor panels (electromagnetic radiation transparent) from multiple plies of unidirectionally oriented polypropylene film.

"This achievement provides the Army with the capability of hardening radomes (housing sheltering the antenna assembly of radio sets) against fragmenting munitions."

U.S. ARMY CORPS OF ENGINEERS. **Waterways Experiment Station, Vicksburg, MS.** *Bob O. Benn, Jerry R. Lundien* and *Daniel H. Cress* were selected for conducting research activities leading to a system evaluation tool for defining advantages and limitations of discriminating logic designs used to activate mine warheads and intrusion-detection systems.

Using mathematical modeling techniques, they devised "methods and techniques for predicting performance as a function of terrain conditions of existing and proposed seismic mine and intrusion-detection logics.

"This work appreciably extends the state-of-the-art for designing new and more sophisticated discriminating logics for seismically activated mine and intrusion detection systems, and represents a significant engineering achievement. . . ."

Construction Engineering Research Laboratory (CERL), Champaign, IL. *Ronald D. Webster* and *Rikki L. Welsh* will be honored for their work in developing procedures for "assessing the socio-economic impact of Army programs that will permit the Army to comply with the provisions of the National Environmental Policy Act at a minimum of cost and effort."

Douglas C. Hittle, Energy Systems Branch, was cited for his part in developing a computer simulation program for analyzing building energy consumption, evaluating energy conservation alternatives, and for developing a manual method for assessing the feasibility of solar energy systems. "Application of these tools and procedures will permit the Army to design and retrofit buildings with greatly reduced energy consumption requirements."

Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH. *Dr. Malcom Mellor* is cited for "outstanding scientific and engineering contributions to the fields of earth materials cutting and earth excavation," The citation states. "His work has formed a technology base for the U.S. Army in excavation technology, providing a rational basis for the design of excavating machines."

U.S. Army Engineer Topographic Laboratory (USAETL), Fort Belvoir, VA. *Gwynne H. Jones Jr.* will receive an award for successful development of the Replacement of Photography Imagery Equipment (RPIE). The award justification states:

"This new instrument provides a unique and effective means for producing image-based topographic products as well as significantly reducing the time required to interpret and extract photographic images in support of the map-making process at the Defense Mapping Agency Topographic Center.

"Successful development and implementation of this new high-resolution, high-speed orthophoto printing capability is largely the result of Jones' outstanding technical and administrative efforts."

Dr. Bryce Schrock was selected for his efforts in developing a flexible and computationally powerful interactive digital image-processing facility to be used for R&D work. The facility "can be used easily by engineers and scientists who are not computer experts, and has a rapid response for most image processing functions."

OFFICE OF THE SURGEON GENERAL. **Brooke Army Medical Center, Fort Sam Houston, TX.** *Dr. Douglas W. Wilmore* will be honored for his role in contributing new medical knowledge concerning the metabolic and nutritional consequences of burn injury.

The summary of achievement states: "The contributions of Dr. Wilmore to the total body of medical knowledge provide a secure foundation for investigations offering great promise of furthering the understanding of the response to injury and the ability to control and manipulate that response."

Portable Dispenser Eyed as MP Riot Control Aid

Riot control in outdoor areas will be eased for military police by a portable dispenser being readied for use in the Chemical Systems Laboratory at Aberdeen Proving Ground, MD, it was announced Aug. 17.

Known as the M33A1, the multi-purpose dispenser was redesignated from the M33 when a liquid dispensing capability was added by a 3-gallon (11.4 liters) tank. Initial development of the system began at Edgewood Arsenal, which this year was redesignated the CSL.

A 4-port rotating nozzle on the end of the disperser gun provides a steady stream or spray of irritant solution which can be fired in either continuous or intermittant bursts up to 20 meters, about 70 feet.

The disperser can be converted to fire a dry powder riot-control agent (CS) by substituting a single port in place of the 4-port nozzle and replacing the agent container valve with an agitator-type assembly. This CS can be dispersed at a range of more than 50 feet in 60 to 120 seconds.

CS is a non-hazardous but effective chemical agent for the temporary restraining conditions long sought by civil law enforcement agencies in riot-control situations. The multi-purpose disperser concept was developed by Fred Alter, assigned to the projectiles and mortars section of CSL's Munitions Division.

Alter conceived the idea after spearheading development of a lightweight portable flame thrower for use by small-statured troops of the Vietnamese Army. He was awarded a U.S. patent in 1972 along with an Army commendation for developing the dispenser. Larry Shaff is the current CSL development engineer.

Possible applications for the dispenser include a fire-fighting apparatus on Naval ships, as a portable flame thrower, and for crop dusting. A potential use is as backpack fire-fighting equipment by the Department of Interior National Park Service, and as a device for decontaminating obsolete field equipment.

Shaff is also development engineer in the Army's program to provide individuals engaged in riot control operations and police duties with a small disperser which can be carried on the person without restricting movement.

Designated the M36 liquid riot-control agent disperser, the small, cylindrical device, 1½ inches in diameter and a little more than six inches long, fits into a compact leather case with an easy accessible flap button and belt loop. Weighing less than a pound, it provides individual protection from 3 to 12 feet against unruly crowds or small groups.

Chesapeake Hydraulic Model Earns National Acclaim

Acclaim as one of the nation's 10 outstanding engineering achievements of 1976 is the latest honor that has been accorded to the $15 million Chesapeake Bay Hydraulic Model, a U.S. Army Corps of Engineers achievement that reduces 64,000 square miles of the bay to 9 acres for research purposes.

Selection of the model for this distinction was announced in July by the National Society of Professional Engineers (NSPE), which earlier had voted the project its Professional Development Award for "advancement of the engineering profession."

Designed, built and being operated by the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, for the Baltimore District of the Corps, the model was initiated with ground-breaking ceremonies June 11, 1973. Planning began in 1965 under provisions of the Rivers and Harbors Act of Congress.

The model was created as the result of years of cooperative planning and effort in support of the Corps of Engineers by 11 major federal agencies and four state governments — Maryland, Virginia, Pennsylvania and Delaware.

Federal agencies interested in the model's assigned mission are the Departments of Interior, Transportation, Housing and Urban Development; also, the Environmental Protection Agency, Federal Power Commission, National Science Foundation, Smithsonian Institution, Atomic Energy Commission, and U.S. Navy.

Publicized as "unique and the largest project of its type in the world," the model provides a complete means to study water utilization and navigation, fisheries, flood control, water pollution, control of noxious weeds, beach erosion, recreation resources, and water quality control.

When work on the hydraulic model was started, it was stated: "Determinations in the research will be used to evolve an over-all management plan for the Chesapeake area that will be submitted to Congress with recommendations for cooperative federal and state implementation. Estimates predict the bay area population will more than double in 50 years, creating many study problems."

$3.5 Million Contract Funds ABC High-Speed Flight Tests

Flight tests of the Advancing Blade Concept research helicopter, XH-59A, at high speeds using two auxiliary jet engines, are stipulated in a $3.5 million contract funded by the U.S. Army, Navy, and National Aeronautics and Space Administration.

The U.S. Air Force is providing two Pratt and Whitney J-60 turbojet engines for the test aircraft. The funding agreement requirements are managed by the U.S. Army Air Mobility R&D Laboratory's Fort Eustis (VA) Directorate. Terms call for 45 hours of flight testing at speeds up to 345 mph in level flight, beginning in early 1978.

Successful flight tests of the ABC in its pure helicopter configurations were completed in March 1977 under a program funded by the Army. That effort achieved gradual expansion of the flight envelope to 184 mph in level flight.

Other accomplishments of the program have included flight speeds up to 224 mph in a shallow dive, up to 180 mph at an altitude of 10,000 feet, up to 46 mph in sideward flight and up tp 35 mph in rearward flight.

Featuring two counter-rotating rigid main rotors mounted in piggyback fashion on a common shaft, the ABC system combines advantages of low-speed helicopters with those of a high-speed aircraft without using a wing.

Communications Center Links HQ DARCOM, APG Computers

Computers at Aberdeen (MD) Proving Ground are being linked to APG's communication system and the U.S. Army Materiel Development and Readiness Command headquarters computers in Alexandria, VA, in a new data processing and communications center.

Complete renovation of a former warehouse has provided space to accommodate APG's Management Information Systems Office and the Communications Command detachment, previously located about two miles apart. The new decor is compatible with the Army Test and Evaluation Command HQ building.

The MISO operation occupies an area 75 by 40 feet on the first floor and about one-half of the second floor. The remainder of the upper floor is programed for future use by the Army Communications Command detachment.

The detachment provides the post and tenant activities with administrative telephone service, firing range and test facility communications, and communications management planning and project services.

Heat generated by the computers is recycled to heat the computer rooms and a back-up generator assures uninterrupted operation of the facility in case of emergency.

Contract design and construction of the center was under jurisdiction of the Baltimore (MD) District Corps of Engineers.

M33A1 Portable Disperser

DPE May Improve Protection From Hazardous Chemicals

Persons working in a chemically hazardous environment have the promise of better protection at less cost by using the Demilitarization Protective Ensemble (DPE) which is in the final stages of a 2-year expedited development program at the U.S. Army Chemical Systems Laboratory (CSL).

Located in the Edgewood Area of Aberdeen Proving Ground, MD, CSL is a major research activity of the Army Armament R&D Command (ARRADCOM).

Designed for use in the Chemical Agent Munitions Disposal System (CAMDS), the primary function of the DPE is to provide respiratory protection, with secondary emphasis on whole body protection.

Using a modular concept of a reusable respirator and a disposable outergarment, the DPE has shown that it is compatible with the requirements of the Army Demilitarization and Installation Restoration Program Manager's Office.

The air supplied respirator system of the ensemble includes a full facepiece under positive pressure. An automatically actuated auxiliary air supply is also provided for emergency use. The respirator has been certified to the requirements established by the National Institute of Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA).

More than 35 different materials were investigated and rigidly tested before two were selected to be used in the outergarment. These materials provide a durable barrier against the hazardous chemicals. The disposal-after-use concept with the outergarment eliminates the costly decontamination, laundry, and recertification process required with other types of chemical environment protective ensembles. The outergarment is air supplied and ventilated, which provides an additional protective barrier. Tests have shown that since the DPE is ventilated, it provides a reduced heat burden when worn for extended periods.

A unique communications system utilizing infrared to transmit through the outergarment, along with reusable boots, and gloves complete the ensemble.

Under the direction of David English, this crash program has touched on almost every R&D facet of CSL and its predecessor, Edgewood Arsenal.

An engineer, English previously headed up the program on the development of the Army's M51 protective shelter system, and directed the Army's exploitation program of foreign material. Thomas Mitchell, who assists English as technical manager, is a textile technologist with more than 16 years experience in developing chemical protective clothing.

English noted that most of the vigorous test program has been completed. "NIOSH has certified the respirators," he said, "and we have completed a series of tests with mannikins in chemicals. Only the final manned tests in a toxic agent environment remain."

The U.S. Army Materiel Development and Readiness Command Safety Office, the U.S. Food and Drug Administration and industrial firms have expressed interest in the ensemble.

MERADCOM, ERDA Testing 4 Battery-Powered Vehicles

Four passenger-type electric vehicles are being tested under a 2-year program conducted by the U.S. Army Mobility Equipment R&D Command (MERADCOM) and the federal Energy R&D Administration (ERDA) at Aberdeen Proving Ground (APG), MD.

Testing of the battery-powered vehicles was made possible by Public Law 94-413, enacted in September 1976, which states that ". . . the Secretary of Defense and heads of other federal agencies shall:

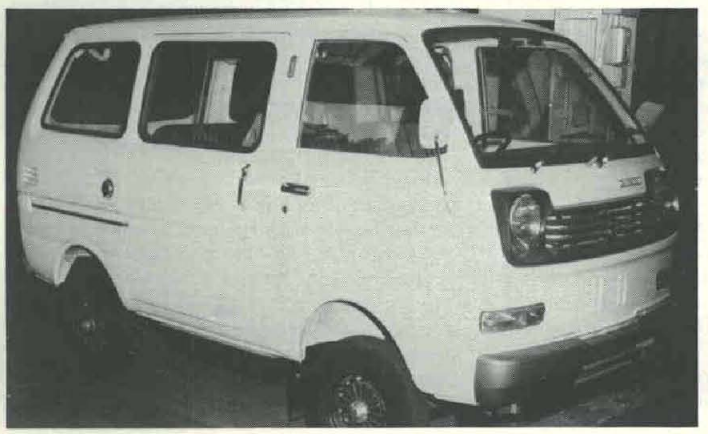
- Carry out a study of the practicability of using electric and hybrid vehicles in the performance of some or all of the functions of their agencies; and
- Arrange for the introduction of electric and hybrid vehicles into their fleets as soon as possible."

Scheduled for completion of tests by the end of September are vehicles built by Electric Vehicle Associates, Jet Industries Inc., Sebring-Vanguard Inc., and the Daihatsu Motor Co. At least eight more electric vehicles are scheduled for tests at APG in 1978.

The Army has a large inventory of special-purpose electric vehicles in service, mostly forklift trucks and 3-wheeled, golf-cart-like carriers. A MERADCOM spokesman stated: "A survey of a typical Army base has indicated that 50 percent of the 3/4-ton engineering utility trucks, and 57 percent of the half-ton pick-up vehicles could be replaced with electrics.

"The Army needs early access to actual performance of state-of-the-art vehicles to ascertain the extent that these could be used on military installations, and . . . is studying the apparent potential advantages stemming from lower operating costs; improved logistics, because of an independence from petroleum fuels; and reduced air pollution."

THREE OR FOUR experimental battery-powered electric vehicles, all manufactured by different companies, currently under test for the Army at Aberdeen Proving Ground, MD.



PM Value Shown on Vehicle 'Running Well' at 244,000

Value of preventive maintenance on vehicles of all types has a phenomenally successful advocate in Al Tatyrek, a U.S. Army Armament Research and Development Command (ARRADCOM) employe. His 1969 car has rolled more than 244,000 miles with a minimum of trouble.

Tatyrek's PM "Bible" is the owner's manual, which he follows religiously for trouble-saving guidance. Except for repairs that require special tools or heavy lifting, he does all his PM. His pocket-size notebook is a complete documentary on the PM he has performed, and at what cost.

Use of good engine oil is basic to him, including synthetic oil, which he says he does not have to change for about 20,000 miles. What about gas? "The cheapest I can find," he responds - says he averages about 21 miles a gallon.

"Luck has been a lady" riding with him, he admits, because he has never had to replace internal engine parts, the differential, electronic voltage regulator, radiator, transmission, brake master cyclinder or power steering unit. Only recently did he have to install a new fuel pump. He has replaced the clutch, water pump and (several times) exhaust system.

His worst trouble was the clutch, which went bad on the road, leading to a 35-mile tow and repair at a total cost of $317.89.

His 1969 American Rebel is, in the parlance of used-car salesman, "a cream puff," that is, "in mint condition," immaculately shiny, without dents, rust or other deteriorating signs of age.

"The way it's running," he says, "I think it has a lot of life left in it."

Army Supports $334 Million Coal Conversion Project

Conceptual design of a $334 million demonstration plant for converting coal into pipeline quality gas and low-sulfur crude oil is being funded under a $24 million contract awarded recently by the Energy Research and Development Administration (ERDA).

The contract, in which the U.S. Army will have a support role through its Chemical Systems Laboratory (CSL) at Aberdeen Proving Ground, MD, was awarded to the Illinois Coal Gasification Group of Chicago (ICGG). It calls for design of a plant to use a conversion process of the COGAS Development Co., Princeton, NJ.

The process involves pyrolysis (chemical decomposition of coal by heat) to produce liquid fuels and char (coal residue) for production of high Btu gas. The plant is expected to use 2,200 tons of coal daily to produce 18 million cubic feet of gas and 2,400 barrels of crude oil.

The Fossil Energy Office of ERDA anticipates that the demonstration facility could advance coal conversion technology to the commercial production stages in the 1980s. Engineers from the ERDA Support Office in the Chemical Systems Laboratory, the U.S. Army's only fossil energy support group, will assist in process engineering for the joint ERDA-industry plant.

Under the direction of Hugh T. Reilly, the ERDA Support Office staff of about 25 will monitor purchases, changes and tests; supply input; and recommend approval to ERDA for all final decisions.

Reilly describes the effort as a "partner" project between ERDA and U.S. industrial organizations. CSL engineers, he said, will coordinate in all phases. In the construction and operation of the pilot plant, funding will be shared equally by ERDA and the Illinois group, a consortium of utilities.

Participating with the Illinois-based group, headed by ICGG in Chicago, will be the Dravo Corp. of Pittsburg, an architectural engineering contractor, as well as the COGAS Development Co., the process licensor providing the technical support.

Input into the environmental consideration of the project will be provided by Gibbs and Hill in New York City, and the Army Corps of Engineers may be involved in construction of the plant. A pilot test plant in Leatherhead, England, will provide research data to help guide design of the demonstration facility.

HDL Reports High Reliability With M734 Multi-Option Fuze

With no premature detonations in its final series of development tests, the M734 Multi-Option Fuze has been type classified for the Army inventory in general field use, it was announced Sept. 2.

Introduction of the M734 — developed by the U.S. Army Harry Diamond Laboratories for the new 60mm Lightweight Company Mortar System — will permit elimination of seven different fuzes from the stockpile. Other advantages are increased safety and simpler training for users; also, adaptability to the 81mm mortar.

The Multi-Option Fuze gives the mortarman a choice of time for the warhead detonation, i.e., airburst or proximity, near surface, at the surface or delay burst, and as a target of opportunity is encountered.

Developed as a joint Army-Marine Corps program, the LWCMS enables the infantryman to increase flexibility of firepower.

Increased safety is achieved via several state-of-the-art technology advances. A fluidic turbine/alternator sensor, coupled with the safety and arming mechanism, integrates the projectile's velocity to give the minimum safe arming distance while providing electrical power to the rf and amplifier assemblies. The safety and arming meccanism was designed with an independent setback sensor that recognizes the proper sustained launch acceleration.

The M734 is the first mortar fuze to meet the dual safety requirements of the MIL-STD-1316. The use of CMOS (Complementary Metal-Oxide Semi-conductor) electronic technology in the signal processor permits the Army to take advantage of modern, reliable, low-cost technology.

The fuze becomes the third in as many years to be developed by the Harry Diamond Laboratories and to be accepted into the Army's arsenal. Following completion of an ongoing cost reduction program, multi-year procurements are programed, starting in FY78, and field deployment is scheduled in FY80.

TARCOM Allocates $252 Million for Heavy Trucks

Award of a $252 million multiyear contract for more than 5,500 heavy trucks - believed the largest single contract ever issued by government or industry for commercial trucks - was announced July 28 by the U.S. Army Tank-Automotive Materiel Readiness Command (TARCOM), Warren, MI.

TARCOM Project Manager for Heavy Equipment Transporter Systems COL Robert W. Pointer Jr. said the successful bid by AM General Corp. was lower than expected, and that the cost will save about $80 million from the Army budget estimate. Other bidders were International Harvester Corp, FWD (Four Wheel Drive) Corp., White Autocar Corp., GM Truck and Coach, and Kenworth Truck Co.

Six types of vehicles in the XM915-920 series will be produced with 400-hp Cummins diesel engines, new 16-speed Caterpillar semiautomatic transmissions, heavy-duty Rockwell axles, and a Crane Carrier Co. chassis.

Included in the series are a line-haul truck tractor (XM915) designed to pull the Army's new M872 breakbulk container trailer; an 8 x 6, 20-ton dump truck (XM917); a 1,500-gallon bituminous distributor for road building (XM918); a heavy-duty concrete mixer (XM919); a high-performance, light-duty transporter (XM916); and a medium-duty transporter (XM920).

XM915-920 Series Chassis

The transporters will replace the Army's 10-ton truck tractors. About 3,000 of the vehicles will be line-haul tractors; 1,000 will be light-equipment transporters, and an equal number will be medium-equipment transporters. Special military requirements were held to a minimum. The only specified extras were winches on some and forest green paint for all vehicles.

The concept of chassis, parts and other components commonality is expected to bring about substantial savings to the Army, not only in the initial buy but during the life-cycle of the vehicles. Commercial dealer service facilities will be responsible for repairs or adjustments to the trucks, in most cases, under a 12,000-mile, 15-month warranty.

One of the big advantages of the acquisition program is that the proliferation of models generally associated with commercial vehicle buys will be eliminated; also, requirements for spare parts, technical publications, and mechanics and operators training are greatly reduced.

First delivery of vehicles to transportation and engineer construction units is scheduled during the fall of 1978, with production continuing until July 1981. Specifications require that all models will meet U.S. Government emission, noise control and applicable safety standards for the year they are produced.

Helicopter R&D Contracts Total More Than $1 Million

Helicopter technology research, testing and development contracts announced recently by the U.S. Army Air Mobility R&D Laboratory, Moffett Field, CA, an element of the U.S. Army Aviation R&D Command, total $1,163,297.

The largest award, a 24-month $352,600 contract, is with Kaman Aerospace Corp. to verify and demonstrate a Force Determination concept, as applied to helicopter hub loads from measured in-flight fuselage accelerations.

Joseph H. McGarvey, project engineer, in the AMRDL Eustis Directorate, Fort Eustis, VA, reports that Force Determination has undergone successful laboratory verification. If implemented, he expects the concept will have far- reaching possibilities.

Lockheed-California Co. will receive $351,085 to complete fabrication of improved ice-protected UH-1H main rotor blades, improve ice protection and data acquisition systems, and support government- conducted simulated and natural icing flight tests.

Boeing-Vertol was awarded $99,900 to investigate single-rotor helicopter configuration interactional aerodynamics, and develop a set of generalized configuration guidelines for design and operation of single-rotor helicopters.

Hughes Helicopters will get $191,690 (two contracts) for flight tests of an OH-6A helicopter equipped with an experimental tailboom, using circulation control principles to produce an antitorque force; and for evaluation of an energy distribution system for helicopter landing gears during hard landings.

Bell Helicopter Textron is gaining $63,367 to analyze and evaluate response characteristics of a helicopter performing low-speed nap- of-the-earth operations. AMRDL's Eustis Directorate will monitor the work.

Fiber Science Inc. will receive $62,225 for development of an improved, lighter weight apex fitting for use with the new advanced technology cargo slings now being tested.

Honeywell Inc. gained a $42,430 contract to study a simple servoactuator concept with performance reduced to the minimum levels of slew rate, output force, output stroke and response, sufficient to meet requirements for a safe hydrofluidic stability augmentation system.

Project Indocom Supports Economic Growth Through Modern Communications

Modern communications systems are recognized as a prime requisite of rapid industrial and economic growth in developing countries, as evidenced in Indonesia where Project Indocom, a Military Assistance Program aided by the U.S. Army Communications Systems Agency, is contributing to "winds of change."

Long regarded as "one of the last frontiers of the Pacific Ocean" - a "romantic paradise" in tourist literature - Indonesia brings to mind places like Java, Timor, Sumatra and the Spice Islands.

In less than 10 years, however, vast sections of a breath-takingly beautiful country have yielded to modernization expansion. Immense development projects have brought electricity to the remote interior, along with new roads, hospitals, schools and other civilian accommodations.

When Project Indocom was initiated, the Indonesian military service used many different types of communications, ranging in quality from "good to very poor." The project is designed to provide effective command and control communications.

Originally, the project was expected to cost under $18 million and be completed by July 1975. Because of budgetary restrictions and inflationary price increases in equipments, Indocom is still an ongoing project.

Initially, it was decided that the best communications system to satisfy the over-all requirements of the Indonesian Department of Defense and Security would be multi-channel, common-user type, similar to the U.S. Defense Communications Systems. Soon it became apparent that such a system would be prohibitively expensive.

Indonesia's 3,000 mineral-rich islands are scattered over 3,000 miles of ocean; and with an annual per capita income of $185, Indonesia's 140 million people rank among the world's poorest. As a result, the communication networks to be installed to satisfy the immediate long-haul requirements were limited primarily to low-cost, single-channel high-frequency systems.

In view of many different types of equipment furnished by other governments, it was determined that replacement of total systems rather than individual pieces would be most beneficial. This would provide a commonality of equipment and also simplify logistics, maintenance and training.

Commercially available communications equipment was selected since replacement equipment and follow-on spare parts would be available on the world market. Project Indocom consists of 37 subprojects.

INDONESIANS, trained by American advisers, assemble an antenna at Army Regional VI HQ near Djakarta. Training enables the Indonesian Department of Defense and Security to plan, install, operate and maintain communications networks.

The U.S. Army Communications Systems Agency/Project Manager DCS (Army) Communications Systems, Fort Monmouth, NJ, is responsible for completion of four of the subprojects - one of which is near completion: installation of the communications networks between the Army Regional (KODAM), Subregional (KOREM), and District (KODIM) Commands.

The networks are high-frequency (HF), ultra-high frequency (UHF) and very-high frequency (VHF) radio command, administrative and logistics communications networks. They provide single-channel teletype or simplex voice between the 16 Army area commands and their sector and district commands.

The U.S. Army Communications Systems Agency, Project Manager DCS (Army) Communications Systems has also been tasked to procure equipment for four direct-support and 38 general support maintenance facilities. These two subprojects, expected to be completed this fall, will provide the Indonesians with third- and fourth-level radio maintenance capabilities.

The fourth subproject also has been assigned to the Fort Monmouth, NJ, agency. It requires integration of existing subordinate headquarters HF radio communications systems into the telephone switching systems in eight major Indonesian cities.

The Radio/Cable and Switching Integration subproject, scheduled for completion by December 1979, will permit semi-automatic communications switching, and will enable voice and teletypewriter inter-connection at specific Indonesian armed forces commands and units.

The Indonesian government will assume more and more of the workload, for engineering and equipment selection as well as installation, as Project Indocom moves closer to completion. The ultimate goal is to give complete authority to the Indonesian Department of Defense and Security to plan, install, operate and maintain each new network.

Project Indocom is an example of an international cooperative effort which assists developing nations grow into today's communications society.

APG Climatic Chambers Control Weather for Tests

Man can control the weather, very precisely in fact, to produce conditions in which weapon systems and other military materiel may have to operate - by using various environmental test chambers at Aberdeen (MD) Proving Ground.

APG's Materiel Test Directorate teams can, merely by the flick of control switches, produce temperatures from 100 below to 200 above zero F., or they can vary the humidity from 5 to 95 percent. Salt-fog, sanddust, light-heat and other extremes of weather are producible in the test chambers.

Currently, for example, the U.S. Army's new XM911 Heavy Equipment Transporter is being tested following exposure to temperature extremes from 12 to 24 hours. The surface temperature of ten tons of steel can be changed from 90 above to 70 below zero F. in 12 hours for tests scientifically calculated and measured.

Most of the chambers are constructed of 4-inch-thick aluminum sheeting and insulation. They vary in size from 3 x 3 x 3 feet for portable units to 15-feet wide, 24-feet long and 10-feet high for the larger cold rooms. Some chambers are mounted on trailers. Others are readily portable with the aid of cranes for loading onto flat-bed trucks.

Subnormal temperatures and dehumidification are achieved by use of carbon dioxide (stored in pressurized tanks) or mechanical refrigeration. Electrical heating units provide warmer temperatures. Temperatures may range from 70 to 185 F. in the solar radiation chamber, by using two sets of movable lights to achieve the solar spectrum.

Almost in constant use, the chambers are monitored by operators and mechanics, often round-the-clock on a 3-shift basis. Testing is planned and administered by directors who transmit instructions to the mechanics and operators.

In addition to the massive systems or units, such as guns, tanks, aircraft components, trucks, personnel carriers and other vehicles, test items may include electronic devices, fuzes and explosives, lubricants, paints and other protective coatings.

ARTILLERY PROJECTILES are placed in a mobile environmental test chamber which produces low humidity and high temperatures for storage of weapons and test materiel.

Materiel Product Improvement Program

Product Improvement Program activities are planned to involve expenditure of more than $950 million within the U.S. Army Materiel Development and Readiness Command's elements during Fiscal Year 1979. A substantial portion of PIP funding is directed to improvement of the reliability, availability and maintainability (RAM) of fielded materiel, the DARCOM Product Improvement Program Office stated. More than $100 million has been approved for improvement of the M551 Sheridan Weapon System. RAM improvements on this Armored Reconnaissance Airborne Assault Vehicle (AR/AAV) will use about 50 percent of the funding for over-all improvements to the system. Most of the M551 program is the responsibility of, and is managed by, the Tank-Automotive Materiel Readiness Command (TARCOM) headquartered at Warren, MI.

Correlated efforts for improvement of the Shillelagh missile guidance on the M551 are the management responsibility of the Missile Materiel Readiness Command, headquartered at Redstone Arsenal, AL. The Armament Materiel Readiness Command, Rock Island, IL, is concerned with the turret and armament system. TARCOM efforts on the Product Improvement Program for the chassis of the M551 are described in the following article.

By Robert B. deClaire

The Product Improvement Program for the M551 AR/AAV (Armored Reconnaissance/Airborne Assault Vehicle) resulting from the 1974 M551 Mid-Life Review is approaching its midpoint. Prototype testing is completed and procurement is being initiated. The M551 Product Improvement Program addresses implementation of user-suggested improvements.

The objective of this program was to research and implement corrective solutions to those problems considered most important to the user community — improvements aimed at easing the maintenance burden, removing safety hazards, or improving crew comfort. One of the most important considerations has been improving user confidence in the vehicle system.

Since the M551 PIP was derived from field complaint listings rather than from tabulated failure data, in many cases all that was available to work with was the problem statement.

Little information was on hand regarding failure modes, frequency, etc. Therefore, the program was structured in such a way as to provide time and funds for an investigative phase. Out of these investigations, concept solutions have been proposed, finalized and tested.

Philosophy of Design. This program was established to find technical solutions to a number of problems important to the user. It was not the typical PIP effort to dieselize, up-gun, etc. Consequently, it was necessary to establish the following guidelines:

Solutions to be fielded by FY 1980; investigative phase would establish whether cost-effective solutions could be found; wherever possible, modify existing hardware; minimize long-term testing; installation of modification kits to be performed by depot-level technicians on team visits to using installations; wherever possible, design repair parts which can be fielded prior to depot team visits.

Testing. Corrective design was biased towards keeping test requirements to a minimum. Many PIP items did not require long-term durability testing, since they are essentially human engineering changes. TECOM durability testing was unavoidable in some cases, however, and it was performed at Aberdeen (MD) Proving Ground and Yuma (AZ) PG.

TARADCOM M551 PIP Items. The following are the 26 automotive items included in the Army Tank-Automotive R&D Command M551 PIP. Additional M551 PIPs are being performed by the Armament R&D Command and the Missile R&D Command. Included is a statement of the problem.

The Engine Exhaust System Clamps (Beyond the turbocharger) have not proved reliable. The muffler becomes disconnected from the exhaust elbow and hot gas escapes to impinge upon vital components. This can result in engine compartment fires. In the sub-PIP, V-band type clamps will be used to connect two flanged ducts. In addition, the exhaust elbow outlet muffler inlet port will be modified.

Fuel Cells. The earlier M551s were equipped with metal fuel cells which, as they aged, became "work hardened" due to tympanic flexure. This led to the development of hairline cracks and fuel leakage. A subordinate PIP provides for a rebuild/rework procedure wherein weld repairs will be made, followed by an annealing process to relieve "work hardening" due to vehicle vibration and firing shock.

The Slave Receptacle is currently located inside the vehicle, just over the combustible case ammunition. During a typical "slave" start operation, arcing usually occurs, and hot particles could fall on the ammo. The fix relocates the receptacle to a position on the front armor, outside the vehicle. The slave connector also will be changed from a U.S. standard to a NATO standard.

The Driver's Hatch, Open Position Latch incorporates a small roller and locking-cam assembly at both ends of the closed and open hatch position. In the open position, this roller may jar loose due to vehicle vibration. If this occurs, the hatch is then a free-moving piece of heavy armor which could inflict serious bodily harm. The sub-PIP provided for reevaluation of an MWO to prevent such retention failure.

CBR Unit (Driver's) Stowage. The M551 initially lacked a proper place to stow the driver's individual CBR (chemical, biological, radiological warfare protection) unit. As a result, it is often left to lay on the floor, where it becomes contaminated with water, dust and grease. The sub-PIP will solve the problem by installing a holding bracket to cradle the CBR unit to keep it readily available and uncontaminated.

The Drive Sprockets mounting method has had a problem of lug breakage and bolt shearing. The sprocket and mounting hardware have been redesigned to prevent the lugs and bolts from moving with respect to one another, which was the origin of the problem.

Power Pack Mounting. The M551 engine mounts are located deep within the engine compartment. It has been difficult to ascertain that mounts have been properly secured after engine installation. Due to vibration and recoil shock, failed engine mounts and loosening of the engine/transmission junction may occur. The sub-PIP involves the designing of a positive means of determining when the power pack mounting is properly secured. A more positive means of attaching the engine to the transmission also was developed.

Generator Mount. The current method of mounting the generator to the engine uses a light aluminum alloy bracket. In time, this bracket fatigues out, and a high incidence of failure is occurring. The sub-PIP involves two changes. First, the bracket has been redesigned in steel. Second, the bracket has been relocated to the engine mounting rail to remove the tension load on the mounting bolts.

Generator Drive. The drain plug in the generator drive assembly gearbox may loosen and fall out from vehicle vibration, causing loss of lubricant and destruction of the unit. The generator drive assembly housing will now be made out of steel to increase durability. The drain plug will be replaced with a filler type dipstick to facilitate checking the oil level.

The Personnel Heater fuel supply/fuel filter is located in an almost inaccessible manner, making maintenance difficult to perform. This often results in improper assembly of the glass sediment bowl after servicing, causing leaks and bowl breakage. The fuel sediment bowl is being relocated to make it more accessible and improve maintenance operations.

Towing Provisions. Cross-cable towing, side-angle pulling and LAPES operations place demands on the present towing provisions beyond their design limits. This results in broken welds and torn-off tow lugs. The sub-PIP will replace the welded-on-aluminum tow lugs with steel lugs bolted to the hull, with backing plates on the inside.

Vehicle Smoke Reduction. When accelerating, the amount of exhaust smoke from the M551 is quite large. This could prevent successful accomplishment of reconnaissance missions. The sub-PIP will reduce the level of exhaust smoke by use of a throttle delay mechanism which has been used extensively in commercial trucks.

Driver Communication Controls. The cord leading from the driver's communication control box to his headset is allowed to lie on the floor where it becomes contaminated with water, dirt and grease. This results in a squeal in the vehicle communication system. The fix is a holding clip to keep the cord away from all contaminates.

Roadwheel Arm Lubrication. The conversion of the suspension systems from oil to grease during the early production phase of the M551 did not made adequate provisions for grease to traverse the labyrinthal passages within the upper roadarm spindle/housing assembly. The external relief valve pops off during lubrication, giving a full signal when, in reality, the grease has not reached the inboard bearing. This causes premature failure. Modification of the upper roadarm spindle assemblage will provide more open passages for grease to the inboard bearings.

The Track Adjustor often "freezes," after long use, in the extended position, thereby preventing track maintenance.

The fix will provide for modification of the grease cylinders. New channels will be drilled straight in from exterior fittings to the inner cavity, preventing the grease from being trapped in angled passages.

Diesel Engine (6V53T) 300 HP. The M551 vehicle currently is powered by a 6V53T, 300 HP engine with an aluminum block. The present problem with the aluminum engines is their

age; they have been rebuilt many times. The sub-PIP will provide a cast-iron version of the same engine that will be rugged, less subject to temperature warp, have a more efficient turbocharger, a water pump with increased capacity, a new air box heater system, an improved crankcase breather system, and will cost approximately half as much.

The Engine Oil Filter Location has made it very difficult to service. It is, therefore, often neglected, compromising the life of the engine. In the fix, the filter has been relocated over the hull floor access hole, remote from the engine.

The Cold Start System Pressure Gauge location has made it susceptible to damage and breakage during maintenance, causing fuel leakage and a possible fire hazard. Relocation of the gauge will make it less susceptible to breakage, and a bracket will shield it.

Crossover Tube and Coolant Drain. The M551 vehicle's radiator outlet is often damaged due to corrosion and faulty engine support when it is removed during maintenance. The sub-PIP provides for a 2-part solution. A protective bracket will shield the crossover tube from damage when the engine is removed and improperly supported on the ground. Secondly, a noncorrosive and easily removed drain plug will be used to prevent damage.

Fuel Line Disconnect. A new cast iron 6V53T engine comes with new style metal fittings and an improved method of attachment. PIP #22 provides improvements in the return-line quick-disconnect shock mount to remedy a former source of wear.

The Fuel Filter Drains presently are located immediately adjacent to the engine exhaust manifold, causing a dangerous condition if the manifold is hot when the fuel filters are drained. The sub-PIP relocates the filters with a redesigned bracket, away from the manifold.

Generator Wiring Harness. The smaller cables within the existing generator wiring harness do not have the desired length to obtain the proper installation of this component. A more "tailored" wiring harness will replace it.

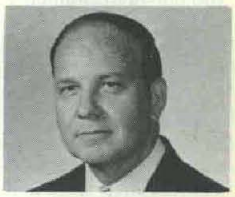
The Headlight Protective Bracket on the M551 is used as a handhold (for which it was not initially designed) when mounting the vehicle leading to frequent breakage. A redesigned bracket will be better able to stand the strain placed upon it; it also will deflect tree limbs and branches, instead of catching them, as the present one does.

Driver's Hatch Seal. The geometry of the driver's rotatable hatch can accumulate water which falls on the driver upon opening the hatch; or when the hatch seal is worn. The PIP provides a corrective drip tray and drain tube.

The M551 Speedometer/Tachometer Drive is difficult to disconnect and service without loss of the driving pin into the engine compartment, necessitating removal of the engine to retrieve it. The sub-PIP will provide a driving pin as an integral part to prevent loss.

The Voltage Regulator currently contains some mechanical relays and the fix will replace it with the M60-type solid-state regulator.

Conclusion. The M551 AR/AAV Product Improvement Program, currently under way at TARADCOM, is finding and implementing cost-effective solutions to the automotive/chassis deficiencies that will restore user confidence.



Robert B. deClaire is weapon systems manager in the Tank- Automotive Research and Development Lab on the M551 chassis and development engineer for the reliability, availability and maintainability Product Improvement Program. He has a BS degree in aeronautical engineering from the University of Detroit and is a graduate of Defense Systems Management School, Fort Belvoir, VA.

Sentinel Radar Eyed for Industrial Security Use

Used successfully to protect fire bases in Vietnam from enemy ground infiltration, a Camp Sentinel Radar (CSR), designed by Harry Diamond Laboratories, Adelphi, MD, has been modified and is currently undergoing testing for industrial security suitability at the Indiana Army Ammunition Plant (IAAP).

The CSR senses moving targets by recording Doppler shifts in the radar waves that are reflected back to its 100-foot-high antenna. A balancing process is used to differentiate the random movement of, say, blowing leaves from the calculated movement of an intruder.

The CSR has demonstrated in tests that it has much to offer a wide-perimeter installation such as IAAP because it provides the ability to detect and track a single person target at significant ranges and at a competitive price. Tests have shown that an appropriately modified CSR will eliminate the need for other intruder-detection systems and will monitor a wider area without being degraded by rain, snow, fog, foliage.

Modifications are being made by Harry Diamond Laboratories researchers to simplify CSR use while making it more reliable, as well as adjusting the system to the particular dimensions and terrain of IAAP. Changes include: A remote-display screen to permit large physical separation between the antenna tower and screen, low-temperature operation capability, a target-decisioning and display technique obviate the need for a skilled radar operator, and a radar-timing technique to establish a range coverage best suited to IAAP.

The CSR is designed to overcome many problems involved in maintaining security at a large installation, such as the IAAP, surrounded by an 8-foot-high fence patrolled by guards; therefore, security depends upon chance detection.

Other systems are available but the "line of sight" systems that sound an alarm when a radar beam is interrupted, and the "seismic tape" systems, which respond to slight seismic disturbances, do not offer the ability to track an intruder once his presence has been detected.

Moreover, as the exclusion area of an effective security system increases, the quantity of perimeter equipment can present a severe financial burden. An electronic protection system originally proposed for IAAP, including line-of-sight radar, seismic tape, and television monitoring, would have cost $850,000. Harry Diamond Labs' modified CSR will cost $455,000.

New Aircraft Batteries Eliminate In-Flight Overheating

U.S. Army aircraft batteries redesigned to eliminate in-flight over-heating are a new development of the Electronics Command.

ECOM will separate effective Oct. 1 into an Electronics R&D Command (ERADCOM), a Communications R&D Command (CORADCOM) and 2 Communications and Electronics Materiel Readiness Command (CERCOM).

Non-degrading materials will replace conventional separators in the nickel-cadmium batteries used presently for aircraft cranking and emergency power. Overheating of batteries, known as "thermal runaway," has caused many precautionary and some forced landings.

Non-degrading separators use either polyethylene or polypropylene as a base material - opposed to the conventional cellophane separator which oxidizes and degrades under high temperature operating conditions.

In their natural state, however, the new materials are insulators rather than electrolytic conductors, as required in battery separators. Two or more processes can be used to make them wettable and conductive.

One process provides a controlled microporosity by mechanical means and subsequent treatment by a surfactant; an alternative is radiation grafting of methacrylic acid to a polyethylene film, followed by use of wetting agents. Longer service life reportedly is assured by using the new separators.

Power Sources Technical Area personnel credited with team effort in developing the improved separators are John Murphy, Martin J. Sulkes, Otto Wagner, Dorothy Williams, John Perry, Robert Smith, Stephen Bartosh.

NAS Documents Safety of Navy Seafarer Elf Research Project

Seafarer Elf, a U. S. Navy research project on extremely low-frequency radio communication intended to permit submarines to remain deeply submerged for protection while receiving signals, is safe - for humans, wildlife and the environment. That is the conclusion of an 18 month National Academy of Sciences report announced Aug. 18 which states in summary:

"A number of concerns raised over the years that Seafarer Elf fields might constitute a source of dangerous - even catastrophic - environmental contamination have been examined and found invalid and unwarranted."

More than eight years of research findings are substantiated by the NAS report. No ecological effects or cause for concern in the area of genetics, fertility, growth and development, serum triglycerides, circadian rhythms, plants, neurophysiology and behavior of mammals were found, the report states.

While the committee indicated there was no need for human studies, it recommended new or additional research on Seafarer Elf possible effects on cell growth, bird migration and fish behavior. Recognizing the possibility of electric shock under certain conditions, the report termed this a problem that can be solved by system design improvements being studied.

Future development of the Seafarer system has Joint House/Senate Appropriations Committee funding approval of $15 million for FY 1978. Development of receivers, transmitters and antenna, continuing biological and ecological studies - independent of final site selection - will be supported.

Selection of a site for the project will be recommended by the Navy to the Secretary of Defense after completion of the Final Environmental Impact Statement. The Navy has indicated a preference of the Upper Peninsula of Michigan because the granite substructure helps signal transmission.

Contractor Support Alternative for Simulation Programs

By LTC Robert L. Catron
PM-Armored Combat Vehicle Technology Program

The capability of simulation devices to perform a significant portion of our training requirements has been achieved. State-of-the-art technology in computer, visual, and instructional systems has reached a level where the transfer of the training function from aircraft to simulators has approached or exceeds a 1:1 ratio.

Utilizing simulators in pilot training has the inherent advantages of personnel safety, energy savings, instructional flexibility, efficient use of aviator resources, and cost effectiveness. Specifically, cost effectiveness is the area where the maximum utilization parameter can be emphasized.

Each hour spent in simulator training frees the aircraft to perform those tasks which can only be accomplished in flight programs. This capability must be utilized to the maximum if we are to receive the potential benefits that training devices afford.

Daily availability of simulation devices to meet goals of pilot training programs is of paramount concern. In our current Synthetic Flight Training System (SFTS) Program, the scheduled utilization time has exceeded 100,000 hours annually.

Using a $200 an hour operating cost differential between aircraft and simulator operation, the impact of lost simulator time replaced by aircraft time to achieve the same pilot proficiency thus becomes a $2 million-a-year cost differential.

Recognizing this need for optimum trainer utilization, much emphasis has been placed in recent years on reliability and maintainability while at the same time minimizing life-cycle cost. Built-in test features have been incorporated into simulator systems to provide quick isolation of problems and replacement of failed assemblies.

Due to the economic impact of "downtime," rapid diagnosis and repair is required, with the corresponding need for expert technical support. The need for responsive maintenance on-site is emphasized by the dependence of the entire simulator on several centralized or time-shared elements such as the central processing unit and the display system.

The Basic Support Decision. During early development of the SFTS program, the nature of the support requirement was addressed. The U.S. Army has not embarked on a training mission of this magnitude for some time. Consequently, there were no existing procedures inhibiting the planning for a support program to meet the mission objectives.

The basic decision to be addressed was to develop either an organic (in-house) support/maintenance capability or to continue under contract to private industry for the support requirements of the SFTS program.

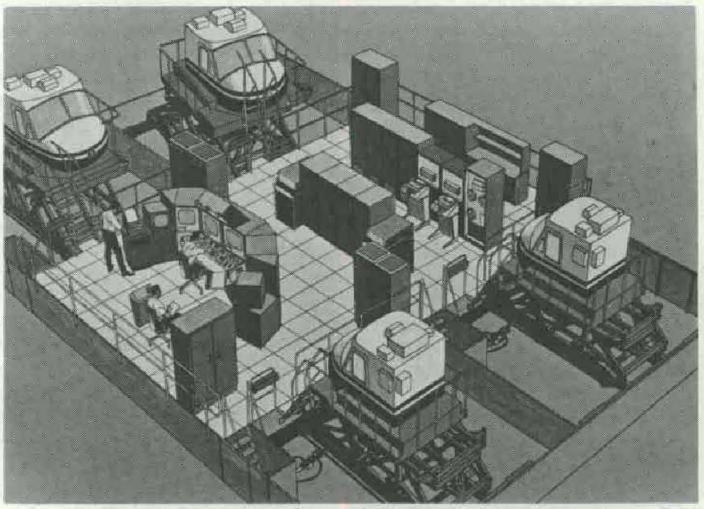
The Basis of Issue Plan for Device 2B24 (the initial system in the SFTS Program) indicated a potential support requirement not only at the U.S. Army Aviation School at Fort Rucker, AL, but at numerous locations throughout the U.S. and several overseas sites.

Planning was developed which addressed the support needs of the prototype unit but, more significantly, looked to the long-range of device deployment to establish the direction for a performance-oriented, cost-effective support program. The plan was analyzed and compared to the projected organic support program outlined in the Qualitative and Quantitive Personnel Requirements Information (QQPRI). The study yielded the following observations:

- Contractor performance during the initial support phase for the development model met all program objectives.
- Although an organic support activity could be developed to support the projected program, a risk in performance/cost was identified due to forecasted limited personnel resources, potential technical training costs, and statistical personnel attrition.
- Policy defined in Department of Defense Directive 4100.15 provides for reliance on the private sector for services of this nature.
- A cost analysis and comparison was prepared in accordance with DoD Instruction 4100.33. Generally, the comparison indicated that the cost for organic support versus contractor support was not substantially different, and therefore was not a primary decision factor.
- Recognized also was that a commitment for long-range contractor support must be accompanied by a contingency plan to allow for competition in the private sector or for future development of an in-house support program. Basic investment material and data assets should be procured by the Army, and a government quality assurance element should be assigned to remain technically current with the devices.

Based upon the analysis, a continuing contractor support program was recommended.

SFTS Contract Support History. The initial training system in the program being developed by the U.S. Army is Device 2B24. Each complex is made up of four cockpits to simulate the UHIH helicopter, a centralized computer system; an instructor station which employs digitally driven CRT displays; automated instructional systems; and the associated peripherals and interface electronics.



Helicopter Flight Training System Concept

The Basis of Issue Plan for these devices call for up to 30 2B24 systems to be operational at various Army installations within CONUS and overseas. Currently, six 2B24 systems are in operation at the Army Aviation School, Fort Rucker. Single 2B24 complexes are at Fort Campbell, KY; Hanau, Germany; Fort Lewis, WA; Fort Shafter, HI; and Fort Hunter/Stewart, GA.

The initial flight simulator development was accepted and type classified in 1972 and a production contract was awarded in December, with the first unit delivery in March 1974. The decision to continue and expand the contractor support activity was made in late 1974.

Through close coordination with the Army, the contractor developed a long-range support plan which provided an efficient self-contained organization to support the projected multi-site requirements.

In developing the contractual document, a relatively simple approach was adopted. The utilization requirements were identified and minimum acceptable criteria were established - defined as 90 percent availability for the scheduled training exercises.

The definition of system availability was identified and a fixed-price contract executed to provide the performance. A Government Quality Assurance element was assigned to monitor the contractor activity and to act as a liaison between the user requirements and the contractor team.

The contract support effort for the 2B24 program has been in operation for three years. The performance and cost history over that time has justified the contract support decision.

The average availability of the 2B24 devices for scheduled aviator training has exceeded 97 percent over the 3-year period. This performance has been achieved during a significant build-up mode from the original development device (four cockpits) to the current 11 devices containing 44 cockpits at six locations.

The Support Organization has been developed around a base activity at Fort Rucker which supplies depot-type support and program management for the remaining operating sites. Required support functions of manpower development, logistics support, reliability improvements, and specialized repair have been expanded within the SFTS support activity.

All technician requirements are filled through an acquisition and training capability set up within the support program at Fort Rucker, and a technical training school covering all skill disciplines for the program has been developed. Experienced personnel in the 2B24 support areas conduct classroom and on-the-job training for new employes, as well as cross training for the support team. This program has proven extremely effective in providing required skills on-site for the emerging 2B24 operating sites.

Under the support contract, the contractor is responsible to provide all material required to support the program. This effort includes full replenishment of the basic investment spares provided by the Army as government furnished equipment at each operating site. The base activity performs the major material acquisition function and provides replenishment and unique material to all operating sites.

In response to troublesome areas exhibiting high failure rates, the sup-

port team has recommended and implemented minor design modifications to the equipment to improve reliability. Also in areas that have been identified as critical for spares availability, such as cockpit instrumentation, a repair depot has been developed within the maintenance activity at Fort Rucker. Special test equipment and manpower skills have been provided for support of all operating sites.

In addition to this management and depot capability at Fort Rucker, the program is staffed with skilled technicians at each operating site for all training activity as well as to perform the basic maintenance and device readiness activities.

The contractor support program has yielded exceptional device availability performance in a relatively cost-effective manner - identified by summarizing the cost per cockpit availability hour delivered. The estimate for 158.5 operational device months in FY 77 is $17.50 per cockpit availability hour, including all manpower and manpower acquisition.

The hourly cost is affected by several parameters including reduction when devices are grouped at one operating site. During FY 75 when the program was basically limited to the Fort Rucker operation, the availability hour cost was $13.00 for 69.5 operational device months.

Since pre-operational start-up costs are amortized over the operational period, the cost becomes a function of the amount of sites being activated during the period. FY 76 costs of $15.20 an hour include pre- operational costs for the device activated in Hanau, Germany.

The FY 77 estimate includes pre-operational as well as operational support costs during a significant build-up of eight additional 2B24 device sites. The projected 2B24 costs for steady-state operational support is estimated to be $16.00/cockpit availability hour. This value along with the performance achieved compares very favorably with similar support programs within the Department of Defense.

Summary. As an extension to the Government/Industry team in simulation development, the contractor maintenance concept has proven very beneficial to follow-on support programs. Today's emphasis on simulation utilization for a wide variety of training requirements demands an optimum cost effective support posture. The U.S. Army, along with other DoD agencies, has tested the viability of contractor support for large programs. Through proper planning and coordination, the success realized in our SFTS program can be obtained for similar support requirements.

LTC ROBERT L. CATRON, product manager-Armored Combat Vehicle Technology at the Tank-Automotive R&D Command (TARADCOM), Warren, MI, has been engaged in flight simulator development since 1972. LTC Catron holds BS and MBA degrees, and is a graduate of the Army's Command and General Staff College and the Defense Systems Management College.

LTG ROBERT J. BAER's promotion to that rank occurred Sept. 1 when he succeeded LTG George Sammet Jr. as DARCOM Deputy Commander for Materiel Development. DARCOM Commander GEN John R. Guthrie and Mrs. Baer (Ann) join in the ceremony.

Information Computers Serve All Active Army Divisions

All 16 Active Army divisions now have, for the first time, mobile computer-based management information systems capable of providing commanders current data to aid decisions.

Installation of the Combat Service Support System (CS3) in the 5th Infantry Division (Mech), Fort Polk, LA, the 16th of the active divisions to receive the most modern tool of management decision-makers, was announced late in August by the Computer Systems Command.

MG Jack L. Hancock, who heads the command, is also project manager for Tactical Management Information Systems. Software systems included in CS3 are: Division Logisticss System (DLOGS); Executive Software, Maintenance Reporting and Management (MRM), and Standard Installation/Division Personnel System (SIDPERS).

Using the IBM 360/30 computer mounted in vans, the CS3 is termed "much more sophisticated and considerably more reliable than the previous system" (a UNIVAC 1005 computer). The computer system is mounted in two 35-foot mobile "air-ride" vans and 3 M109 shop vans.

The purpose of the CS3 is explained as "to enhance the combat readiness of all division units through improved support in the field."

How Do You Simulate An Earthquake?

WSMR Aids Los Alamos on Plutonium Plant Problem

How do you simulate an earthquake in research to determine what can be done during design and fabrication to assure that control mechanisms of a plutonium processing plant shut it down safely in event of catastrophe?

Essentially, that is the question with which scientists and engineers in the Army Materiel Test and Evaluation Directorate (ARMTE), White Sands (NM) Missiel Range, have been dealing since construction of the plant, now nearing completion and started two years ago.

Guidelines of the U.S. Energy Research and Development Administration require a plant capable of withstanding natural phenomena, including an earthquake, with a safe shutdown.

Searchers for a viable answer to the problem in the Dynamic Environments Branch of ARMTE's Applied Sciences Division have been working with their counterparts in the Los Alamos (NM) Scientific Laboratories, where the plutonium processing plant is being built.

Improvisation has been a key word in meeting test requirements of the plant components within the WSMR launch complex 33 and static test site 300K. Modifications costing about $10,000 have served to conduct the vibration and shock testing. WSMR tests of missiles required a shock displacement of only an inch but Los Alamos called for up to 10 inches.

A special vibration table had to be constructed, involving machining to accuracy of one ten-thousandth of an inch, and mounting on hydro-static bearings. With the modifications, the shock table can simulate destructiveness of an earthquake reading eight on the Richter scale, as required by design specifications.

WSMR, however, is now building a large-scale hydraulic facility with a triaxial independent shaking table to be completed in June 1978.

Phil Pellette, responsible for seismic qualifications at the Los Alamos Plutonium facility, reports that items ranging from one-inch valves to diesel-driven fire pumps have been tested at WSMR. About 90 percent of the equipment required for tests was available - at very substantial savings to the government.

Perhaps more important, the tests have proved that some of the equipment designed for the plutonium plant was being over-built, and that it could be redesigned to satisfy seismic requirements and yield savings fabrication.

Although the design basis is for an earthquake registering eight on the Richter scale, the operational basis for equipment is only about half that force. Los Alamos scientists determined, by geological and topographical studies, what the ground motion would be during an earthquake. Computers linked to the vibration table duplicate that pattern for test purposes.

Operation of the plutonium facility is expected to begin late this year.

TRITIUM SAMPLERS, part of the exhaust stack monitoring system in a plutonium processing facility being built for Los Alamos Scientific Laboratories, are strapped onto a vibrating table in preparation for a simulated earthquake. Positioning the components are Dick Shaw (left) of Los Alamos, and Roger Green, of ARMTE's Applied Science Division at WSMR. Phil Pellette of Los Alamos looks on.

Armament Materiel Readiness Command . . .

Serves Impressively Large Role in National Defense Structure

Viewed in terms of programs, people, facilities, an inventory valued wholesale at more than $6 billion, and scope of mission, the U.S. Army Armament Materiel Readiness Command, headquartered at Rock Island, IL, is an impressively large and important part of the national defense structure.

Activated Jan. 31, 1977, along with its mission-related partner, the Armament Research and Development Command (ARRADCOM), Dover, NJ, the ARRCOM is an element of the Army Materiel Development and Readiness Command (DARCOM), headquartered in Alexandria, VA. Both evolved from reorganization of DARCOM's commodity commands into materiel readiness, and R&D commands.

ARRCOM prides itself on being second in size only to the Army Depot System Command (DESCOM), headquartered at Letterkenny Army Depot, Chambersburg, PA, among DARCOM's 15 major subcommands. DARCOM has an overall strength of about 116,000 civilian and 9,700 military personnel. DESCOM has about 40,000 personnel as compared to ARRCOM's 12,700.

ARRCOM includes five government-owned and operated arsenals, 25 Army ammunition plants, one product management office, and field support elements such as the DARCOM ammunition activity at Savanna, IL, and the U.S. Army Central Ammunition Management Office-Pacific in Hawaii.

ARRCOM functions as a national procurement, inventory control and maintenance point for DARCOM and is responsible for product quality assurance in its assigned areas of materiel. This involves support for many weapons systems and components, including towed and self-propelled artillery, mortars and recoilless rifles, rocket launchers, individual and crew-served weapons - about 57,000 line items.

ARRCOM's management responsibility extends to hundreds of line items such as tools and maintenance equipment common to materiel assigned to two or more commodity commands.

Supported Items. The self-propelled artillery weapons for which ARRCOM provides logistics support and follow-on production responsibility include the M107 and M110, being modified by a product improvement redesignated as the M110A1 8-inch howitzer. ARRCOM also supports the M109 155mm howitzer, which has been in the field since the early 1960s. A product improvement package which extends range capability is being developed for this system.

In the towed artillery category, ARRCOM supports the XM204 105mm howitzer, designed to replace (time still to be decided) the M101 A1 and M102 howitzers, and the new M198 155mm howitzer. The M198 has a range of 30,000 meters with a rocket-assisted projectile and will replace the M114A1 howitzer.

Other weapons supported by ARRCOM include the 106mm recoilless rifle, 4.2" mortar, the new M224 lightweight company mortar, recently type-classified Standard A, and the M16A1 rifle with 40mm grenade launcher attachment.

M110E2 Product Manager. Currently, one ARRCOM program, the M110E2 8-inch self-propelled howitzer is under control of a product manager responsible also for its ammunition, related components, training devices and test equipment.

Retrofit of the M110 to the M110A1 began in January 1977 when the M2A2 cannon assembly was replaced with the M201 and the M116 direct-fire telescope was replaced with the M139 scope. Currently being tested are munitions and a muzzle brake that will extend the system's range capability.

Conventional Ammunition. Effective Oct. 1, ARRCOM will become the joint services manager for procurement, production, supply and maintenance missions for conventional ammunition within the Department of Defense. The single manager concept is to integrate under one roof conventional ammunition management of items currently assigned to each individual service.

The objective is to minimize overlapping or duplication of effort by each service.

Single manager missions and functions will be absorbed into the existing ARRCOM structure in FY 78 with one exception: an additional directorate will be established to perform the conventional ammunition inventory management mission.

Top Programs. ARRCOM is involved in some of the Army's highest priority programs. The Tank Project Office has responsibility for overall management of ARRCOM support to the new production of M60A1 tanks, conversion of 90mm gun M48 series tanks to the M48A5 105mm configuration, and overhaul and return to the field of damaged or worn out M60 tanks.

ARRCOM ensures that adequate quantities of ARRCOM-managed items and components are delivered to the Detroit Army Tank Plant and the Anniston Army Depot to allow the tank production-acceleration program to continue on schedule.

The Tank Allocation Board, chaired by the head of the Tank Project Office, determines where scarce resources should be used to ensure there is no slippage of production schedules, if any tank item should become in short supply.

Another important project is the $45 million product improvement program (PIP) for the

MG William E. Eicher has commanded the U.S. Army Armament Materiel Readiness Command since it was activated in January 1977, a year after he was assigned as deputy commander of the Armament Command from which it evolved.

Prior to a 3-year assignment as director, Maintenance, HQ U.S. Army Materiel Command, he commanded Red River Army Depot for a year, following a 1971 tour of duty in Vietnam as commander of the 26th General Support Group. Upon his return, he became acting chief of staff, G-4, HQ XXIV Corps.

During 1969-71, he was with the Ammunition Branch, Service Division, J-4, Office of the Joint Chiefs of Staff in Washington, DC. He commanded the 3d Ordnance Bn, USARPAC, Vietnam during 1966-67, following a 2-year tour as chief, Data Collection Division, White Sands (NM) Missile Range.

MG Eicher was commissioned a second lieutenant in the Infantry in 1950 under the ROTC Program and was wounded in Korea in 1951 while serving in the Far East Command as a platoon leader in the 27th Infantry Regiment, 25th Infantry Division. During World War II he served as an enlisted man.

Graduated in 1950 from State College of Washington with a BS degree, he received a master's degree in business administration in 1960 from Syracuse University. He is also a graduate of the Infantry School, Ordnance School, Command and General Staff College, and Industrial College of the Armed Forces. Among his military awards are the Silver Star, Legion of Merit w/OLC, Bronze Star w/V Device (3 OLCs), Joint Service Commendation Medal, Army Commendation Medal w/OLC, and RVNAF Gallantry Cross w/Gold Star.

Leonard R. Ambrosini's appointment as deputy for Life Cycle Management, HQ U.S. Army Armament Materiel Readiness Command, following its activation in January 1977, is backed by a 35-year industrial and U.S. Army career as a civilian scientist and inventor.

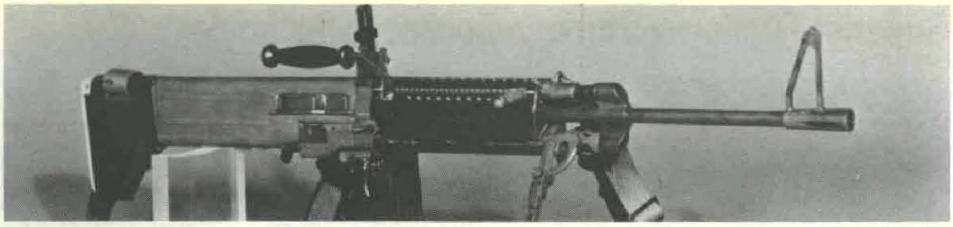
Ambrosini's U.S. Civil Service career began in 1967 at Rock Island Arsenal, IL, HQ of the ARRCOM, 10 years after he emigrated from Switzerland to the United States. When he departed, he was manager of R&D for Hispano-Suiza in Geneva, where he started his industrial career.

In the U.S. he served 10 years with Lear-Spiegler in Santa Monica, CA, achieving the titles of director, Weapons Systems and VP for Ordnance.

More than 100 patent awards attest to his inventive talents, including the Meridian Seeker, a gyro compass for artillery, ballistic missiles and topographic alignment. His double-salvo rifle is believed the highest rate salvo rifle in existence. Other inventions have contributed to effectiveness of tank ammunition.

Ambrosini is known as an expert in electronic and mechanical fuzes, high-cycle automatic weapons, hydraulic servomechanisms, inertial gyro platforms, self-extinguishing propellants, auto pilot and automatic landing systems, and electronic fly-by-wire concepts. He is a voting member of the U.S. Army Materiel Development and Readiness Command Fuze Review Board.

Among his affiliations are membership in the American Institute of Aeronautics and Astronautics, Swiss Society of Engineers and Architects, Federal Executive Institute Alumni Association, and American Defense Preparedness Association.



XM235 5.56 Squad Automatic Weapon

Vulcan Air Defense Systems (VADS). ARRCOM has developed a series of modifications to improve the reliability, availability and maintainability (RAM) of the M163 self-propelled and M167 towed VADS.

Because of the number of modifications, the total impact is considered a major change and modified systems have an "A1" model designation. This retrofit program began in April 1976 and is scheduled for completion in March 1978.

Directorate Changes. Reorganization has brought a number of changes to the directorates. For example, the Procurement and Production Directorate has been reorganized into four units. They are the Procurement Directorate, the Production Directorate, the Industrial Management Directorate, and Procurement and Production Policy/Plans Office.

The Maintenance Directorate was reorganized into 11 divisions to provide better operations and logistic support for fielded armaments, components and related materiel. The new Customer Support Division is responsible for assuring that the maintenance customer receives adequate usable fielding plans, new equipment training publications, and technical assistance.

The Logistics Engineering Directorate (LED) became operational Mar. 30, 1977, and the Product Improvement Coordination Office was established 2 months earlier.

The LED assumed responsibility for directing ARRCOM's product engineering mission, with prime functions of providing product and process engineering assistance to ARRCOM contractors, plants and arsenals; controlling the configuration of mission items and providing technical data for procurement actions; and serving as the engineering interface with ARRADCOM for item pre-transition engineering and product design changes.

The Product Improvement Coordination Office is concerned with upgrading performance, reliability, availability and maintainability for all weapons and ammunition managed by ARRCOM. The $60 million program is planned to provide the Army with the most effective modification concepts at the lowest practicable expense.

Approval has been given for the development of a charter for the Industrial Base Management Systems Project Office, intended to develop and improve management systems for the ARRCOM mobilization and production base.

Arsenals. ARRCOM deals with a situation unusual among materiel readiness commands. Because the extensive capacity to produce a major part of its product line is not readily available from industrial sources, this capability is built into the ARRCOM organization.

The arsenals represent a dependable in-house capability to provide limited production, procurement, supply and maintenance management. Rocky Mountain Arsenal (RMA) near Denver, CO, and Pine Bluff Arsenal, south of Little Rock, AR, are government-owned and operated plants (GOGO) facilities with the responsibility of supporting the ARRADCOM Chemical Systems Laboratory.

RMA's primary materiel responsibility is demilitarization of chemical mixes. Pine Bluff is tasked with the production of chemicals, smoke, riot control, incapacitating, incendiary agents and other pyrotechnic mixes. Pine Bluff also operates a depot which has an engineering and technological program related to manufacturing processes.

Frankford Arsenal's closing date is Sept. 30. Logistics functions will be transferred to ARRCOM and the R&D functions to ARRADCOM. The Cartridge Actuated Devices (CAD) and Propellant Actuated Devices (PAD) mission has been transferred to the Navy.

Watervliet Arsenal near Albany, NY, produces gun and cannon tubes, mortars and recoilless rifles, cannon subsystems and components.

Rock Island (IL) Arsenal is noted for production and assembly of gun mounts, receivers, recoil mechanisms, and special and common tool set assemblies. Realignment of the armament community into the two new functionally oriented commands resulted in deactivation of RIA's Rodman Laboratory.

Rodman's engineering mission was transferred to ARRCOM and its R&D mission to ARRADCOM. A small portion of engineering direct support to production was retained in the arsenal's recently formed Engineering Directorate, which mirrors the major change to the arsenal's over-all mission.

Currently, RIA is manufacturing the M198 155mm howitzer on a limited basis until designs are stabilized and follow-on large-scale production can be initiated.

GOCO Facilities. ARRCOM's production capabilities include 25 government-owned, contractor-operated plants (GOCOs). Only 12 are currently active and the others are in stand-by status. The plants employ 760 government personnel and over 16,300 contractor personnel.

Other ARRCOM production facilities include one active small arms plant, two active propellant and explosive plants, two active metal parts plants, and seven active load and assembly ammunition plants.

When the single manager mission is implemented fully the Naval Ammunition Depots at McAlester, OK, and Hawthorne, NV, will be added to the ARRCOM organization as Army ammunition plants. The ammunition activity located at the Naval Weapons Support Center, Crane, IN, will come under ARRCOM control.

Expenditure of $200 million dollars for each of the next 20 years is forecast for modernizing and expanding ARRCOM's government-owned production facilities. Major projects include a new M42/M46 grenade metal parts production facility at Riverbank AAP, CA, and small- caliber ammunition plant modernization at Lake City, MO, and the "Twin Cities" of Minneapolis and St. Paul, MN.

The M483 Improved Conventional Munition (ICM) Complex is a planned GOCO facility to be constructed at a site not yet determined although the 1978 budget includes a request for funds for commencement of construction. Three production facilities - projectile metal parts, cargo metal parts and load-assemble-pack - are planned.

Interface with Other Commands. ARRCOM maintains a strong interface of support to numerous DARCOM commands. Examples are the Troop Support and Aviation Materiel Readiness Command (TSARCOM), with airborne armament and munitions; Tank Automotive Materiel Readiness Command (TARCOM), with armament for M60A1 and M60A2 tanks, the infantry/calvary fighting vehicle and M551 Sheridan tank; Missile Materiel Readiness Command (MIRCOM), with warhead explosive components, fuzing and firing devices.

Personnel. Current ARRCOM manpower strength totals about 12,000 military and civilian personnel. Assignment of the McAlester and Hawthorne plants and the Crane activity, as mentioned earlier, will add about 2,600 personnel. About 60 percent of the civilians are assigned to the five arsenals and ammunition plants. About 95 military and civilian representatives of ARRCOM are stationed around the world to monitor and assist in the operation of fielded products.

Mentioned at the beginning of this article, as an indicator of ARRCOM's magnitude of operations, was its materiel wholesale cost inventory of $6 billion. Similar indicators are the $14.5 billion total replacement cost of ARRCOM arsenal and plant facilities and equipment. Another $114.2 million (estimated) for HQ ARRCOM, the Ammunition Center, Atchison Army Storage Activity and the DARCOM firing range. ARRCOM is a big organization - even in the over-all immensity of its parent U.S. Army Materiel Development and Readiness Command. Moreover, its 12,000 personnel have a prideful appreciation of the importance of their mission in achieving U.S. Army objectives of combat readiness for any requirement.

M109A1 155mm Self-propelled Howitzer

ARRADCOM Mission: Superior Firepower Through Advanced Technology

Technology advances to assure that superior firepower is designed and engineered into weapons and ammunition are inherent in the mission of the new U.S. Army Armament Research and Development Command (ARRADCOM), Dover, NJ.

Established in January 1977, ARRADCOM consolidates elements of the separated (abolished) Armament Command, formerly headquartered at Rock Island, IL - including five historic arsenals, namely Frankford, Rock Island, Watervliet, Edgewood and Picatinny, the last having occupied for more than 100 years the Dover, NJ, site on which HQ ARRADCOM and many of its functional elements are now located.

Integration of research and development activities, in the interest of cost-cutting efficiency in use of manpower and facilities resources, will give ARRADCOM about 8,000 employes, a decrease of about 2,500, when completed.

The research, development, test and evaluation budget for FY 1978 is $245 million and is programed to increase to $280 million in FY 79.

Major parts of the over-all mission are assigned to: Large Caliber Weapons Systems Laboratory, Dover, NJ; Ballistic Research Laboratory, Aberdeen Proving Ground, MD; Chemical Systems Laboratory, in the Edgewood area of the APG; and the Fire Control and Small Caliber Weapon Systems Laboratory Dover, NJ.

New construction projects to provide adequate facilities for the ARRADCOM mission are moving ahead rapidly. Scheduled for completion during the summer of FY 78 at a cost of more than $4.720 million are a new explosives laboratory and a technical data facility.

Plans have been prepared for a new physical sciences laboratory and an energetics laboratory, programed for FY 78 at a cost of $6,770,000. Contracts totaling $12,450,760 have been placed for modifications to six buildings, including installation of equipment.

Scheduled for FY 79 is construction of an engineering/administration building and renovation of two other buildings at a cost of $13.750 million.

ARRADCOM Commander MG Bennett L. Lewis also turned the first spadeful of earth during groundbreaking ceremonies in August for the technical data facility, to be completed next summer at a cost of $1,812,000.

The facility will manage ARRADCOM's micro data repository and will link up with all ARRADCOM and Armament Materiel Readiness Command data sources. An anti-fire gas suppression system is designed to smother a fire withut causing damage to millions of data cards on armament R&D projects.

Sophisticated testing equipment to perform ARRADCOM's mission includes an X-ray machine that can "see" through six inches of solid steel; wind tunnels that permit evaluation of aerodynamic characteristics of ballistic projectiles over ranges varying in velocity up to supersonic speeds; and a facility believed unique that makes "soft" in-flight projectile catches.

The scope of RDT&E effort assigned to the four major in-house laboratories mentioned earlier is reflected by an FY 78 budget of $147 million (including $37 million to other U.S. Government agencies) as compared to contract activities totaling $98 million.

The Mission. MG Lewis sees ARRADCOM's mission as 3-fold: To develop product improvements and new items, and provide for transition into quantity production; maintain a strong technology base - in government, industry and academic institutions - from which to apply new knowledge to improve materiel systems or components; to prevent technological surprise by the potential enemy, and to provide technical support for combat readiness objectives.

ARRADCOM is responsible for managing all research, development and life-cycle engineering of assigned weapon systems - including initial low-rate production for conventional systems, and life-cycle procurement and production for nuclear munitions.

The Large Caliber Weapon Systems Laboratory is responsible for armament systems including R&D and initial acquisition exceeding 40mm, and is the Army's lead laboratory for energetic materials. Its support function includes rocket and missile warheads along with tank and aircraft armaments. Where the Army has assigned primary responsibility to a project/product manager, managerial and technical support is provided.

A cross-section of this laboratory's commodity responsibilities includes sub-systems such as howitzers, tank guns, ammunition, fuzes, nuclear devices (less physics package), mortars, mines and demolition items, energetic materials, recoilless rifles, and fire control (the last being technically supported by the Small Caliber Weapon Systems Laboratory).

One of the laboratory's major projects may reward the Army's 25-year search for the ultimate antitank weapon. Known as SADARM (Sense and Destroy Armor), the system is well along in the exploratory development phase. It is expected to enter advanced engineering development during FY79 and could be in the field in the early 1980s.

Acclaimed as a "miracle of packaging," the SADARM round is only eight inches in diameter and 45 inches long, but it contains three submunitions. Each contain a lethal mechanism, a vortex ring parachute, a power supply, a sensor, a signal processor and a safe-and-arm mechanism. The primary sensor candidate is a millimeter wave radiometer.

SADARM does not need external guidance and control equipment nor require illumination of the target. An all-weather system, with multiple strike capabilities, it is designed for use against massed armor beyond the forward edge of the battle area. A low-cost system, SADARM is designed for delivery by any of the artillery weapons already in use, and will require no maintenance or adjustments at any time during its life-cycle.

A project nearing the end of engineering development is the 105mm towed howitzer intended to replace the aging inventory of M101A1 and M102s.

The XM204 howitzer uses a unique soft recoil or fire-out-of-battery principle. The soft recoil's energy-conserving system allows trunnion forces to be reduced 60 to 70 percent; no stakes

MG Bennett L. Lewis, commander of the U.S. Army Armament Command at Rock Island, IL, from September 1975 to January 1977, is commander of the U.S. Army Armament R&D Command (ARRADCOM), Dover, NJ.

MG Lewis was special assistant to the commander, U.S. Army Materiel Command from May 1974 to September 1975; chief, Requirements and Developments Division, J-5, Joint Chiefs of Staff in Washington, DC, July 1973 to April 1974; and chief, Engineer Branch, Officer Personnel Directorate, U.S. Army Military Personnel Center, Alexandria, VA, February-June 1973.

An assignment as commander and director of Research, Development and Engineering at the U.S. Army Mobility Equipment R&D Command (MERADCOM), Fort Belvoir, VA (1970-73) followed graduation from the U.S. Army War College at Carlisle Barracks, PA.

Graduated from the U.S. Military Academy at West Point, NY, in 1950, he obtained a master's degree in civil engineering from Harvard University in 1955, and in 1963 completed the resident course at the Command and General Staff College (C&GSC), Fort Leavenworth, KS.

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

Stateside assignments include chief, Readiness Division, Office of the Assistant Secretary of the Army (Manpower and Reserve Affairs); staff assistant, Land Forces Program Division, Office, Assistant Secretary of Defense (Systems Analysis); and instructor at the C&GSC.

His awards and decorations include the Legion of Merit with two Oak Leaf Clusters, Bronze Star Medal with "V" Device, Meritorious Service Medal, Air Medal, Joint Service Commendation Medal, Army Commendation Medal with 2 OLCs, and the Parachutist Badge.

BG David W. Einsel Jr. is deputy commander of the U.S. Army Armament Research and Development Command, following 1976 duty as commander of ARRADCOM's Implementation Force.

Designated as a Distinguished Military Graduate, BG Einsel earned a BA degree (cum laude) in an honors program in chemistry and an MA in physical chemistry from Ohio State University. He has a 1956 MS degree in physics from the University of Virginia and has completed requirements of the Army Command and General Staff College, Army War College and the Chemical Corps Associate Advanced Course (honor graduate).

During 1975, BG Einsel was chief, Chemical-Nuclear Office, Office, Deputy Chief of Staff for Operations, Department of the Army, after serving five years as commander of the U.S. Army Harry Diamond Laboratories.

Duties as a joint staff planner, Requirements and Development Division, J5, Office Joint Chiefs of Staff, DA, followed service as chief, Nuclear Weapons Effects and Research, Nuclear Branch, HQ Army Materiel Command (now DARCOM). He was chemical officer and deputy G-3, 1st Cavalry Division in Vietnam.

BG Einsel is a member of Phi Beta Kappa, Society of Sigma Xi, American Association for the Advancement of Science, and the Association of the U.S. Army. He is also a graduate of the University of Pittsburgh's Management Program for Executives.

His military decorations include the Silver Star, Legion of Merit, Bronze Star Medal for Valor with Oak Leaf Cluster, Meritorious Service Medal, Army Commendation Medal, and Purple Heart.

or spades are needed for improved stability and reliability.

The weapon can be emplaced in one minute and because it has no trails, the crew has easy access to the breech. This allows for a rate of 15 rounds a minute compared to 20 rounds a minute for conventional 105mm howitzers. The XM200 supercharge under development will provide a 27-percent increase in range. The XM204 is scheduled for type classification this winter.

The Small Caliber Weapon Systems Laboratory is assigned exploratory, advanced, and engineering development including life-cycle technical responsibility for systems and certain ancillary items through 40mm. Weapons systems include small arms, grenade launchers, automatic cannons for ground use, air defense and aircraft and combat vehicle armament; also, fire-control systems and components for close-support weapons irrespective of caliber.

The Chemical Systems Laboratory is charged with the mission of research on a variety of weapons and munitions, along with riot control and antipersonnel agents, programs in detection and identification, and warning systems for chemical and biological agents. CSL also functions as Department of Defense executive agent for all R&D for CW/CBD (Chemical Warfare/Chemical Biological Defense) and standardization.

CSL is placing much emphasis on the development of smoke obscurants and screening techniques as a protection against antiarmor missiles. One effort, to provide the Army with a quick-forming, long-lasting visual screen for armor vehicles, is being pursued by adopting a system of multitube launchers and red phosphorous grenades which has been used successfully by the United Kingdom. The adaptation of these devices is expected to protect the series of U.S. Armor and special-purpose vehicles.

The Ballistic Research Laboratory has lead laboratory responsibility for research in ballistics and vulnerability reduction. Investigations are made of launch and flight dynamics, propulsion dynamics, terminal ballistics, ballistic modeling, and work in mathematical and physical sciences. Advanced computer technology and scientific instrumentation fall into this grouping.

BRL Director Dr. Robert J. Eichelberger recently was awarded the Department of Defense Distinguished Civilian Service Medal for notable achievement. BRL also was designated 1977 Army Laboratory of the Year in an announcement by the Assistant Secretary of the Army for Research, Development and Acquisition, who initiated this awards program in 1974.

Outstanding progress has been made by BRL in exterior ballistic theory, including the calculations of magnum forces for supersonic shell and the calculations of spin-up frequencies for liquid-filled shell. Progress also has been made in weight effectiveness of new armor concepts, in charge design for solid propellants, and in experiments that provide important data on the basic physical and chemical processes of wear and erosion in gun tubes.

ERDA Support. ARRADCOM's organizational structure includes a support office for the Energy Research and Development Administration for major programs as requested. Services include, but are not limited to, technical expertise for industrial energy conversion plant design, ecology and economics, by-product and waste disposal, and process monitoring.

Project Managers. Three project managers are also assigned to ARRADCOM, the PM for Cannon Artillery Weapons Systems (CAWS), PM for Selected Ammunition (SA), and PM for Army Gun Air Defense System (ARGADS).

The PM CAWS is responsibile for engineering development of all 155mm cannon artillery weapon systems and ancillary equipment up through first procurement. Recently he has been assigned responsibility for managing the Navy's Semiactive laser-guided 5-inch and 8-inch projectiles.

This dual-service effort is programed to maximize component commonality, and thus minimize costs of both the Army and Navy guided projectiles. The Army's "Copperhead" has onboard electronics and controls which make flight corrections to bring the projectile into contact with either stationary or moving targets which have been fixed by a laser's beam.

Another major CAWS project is the M199 towed howitzer. This weapon is air-transportable and will have greater range and traverse capability than the currently fielded M114 series howitzer. The PM CAWS is also responsible for insuring interoperability of 155mm weapon systems with our quadrapartite agreement allies, the Federal Republic of Germany, Italy and the United Kingdom.

Selected Ammunition is one of the Department of the Army's largest programs, considering the number of commodities involved, and the financial, personnel and physical resources invested. SA involves the interface of all three military services, numerous other U.S. Government agencies, and scores of private industrial and research organizations.

Since 1961, more than $4 billion has been invested in SA research, development and production, which involves improved Conventional Munitions (ICM) and mass Scatterable Mines (MSM).

ICM are a class of ammunition utilizing submissiling and advanced terminal ballistics techniques. ICM munitions cover the full spectrum rangng from 40mm through artillery projectiles and missile warheads, and air-delivered missiles requiring advanced R&D technology and highly automated production.

MSM have recently been given major emphasis by U.S. military forces. The new mines being developed, produced and deployed, utilize advanced fuzing, sensing and terminal effects technology, coupled with a means for rapid emplacement by a wide variety of delivery methods.

Meanwhile, the PM ARGADS in overseeing development of a Division Air Defense (DIVAD) Gun System to replace the Vulcan Air Defense System now in the field. It will be mounted on a modified M48A5 tank chassis, and will have better mobility and armor protection. The system will use both acquisition and tracking radars and the most modern fire control digital computer available. Two contractors will be selected for a 2-year competitive development program.

Interface. ARRADCOM interfaces with numerous U.S. Government agencies and industrial organizations. Armament Materiel Readiness Command liaison detachment of nearly 300 personnel has been permanently assigned to HQ ARRADCOM, and it is planned to have ARRADCOM personnel stationed at HQ ARRCOM, Rock Island, IL, in the near future.

Each of these commands has a separate and significant role to play in keeping America's military forces fully prepared at all times. The coordination of effort they are demonstrating is expected to assure mutual success in their role of making available to the U.S. Army soldier the maximum of the most effective armament at the lowest practicable cost.

Dr. Robert E. Weigle, whose research achievements earned him a Presidential Citation in 1965, is technical director of ARRADCOM, following duty since 1968 as TD of Watervliet (NY) Arsenal's Benet Weapons Laboratory and the arsenal's chief scientist.

Dr. Weigle has a 1951 BCE degree in structures, a 1957 MS degree and a 1959 PhD in applied mechanics, all from Rensselaer Polytechnic Institute, where he served (1955-59) as an associate research scientist. Briefly during 1968 he was vice president for Engineering, Allied Research Associates Inc. and later, while employed at Watervliet, a consultant to the U.S. Army Research Office, Durham, NC.

Dr. Weigle was, in 1971, an Army Materiel Command representative on Mutual Weapons Development Exchange Agreements with the Federal Republic of Germany and met with Austrian and Norway representatives on similar matters.

In 1965 he also received a Department of the Army Decoration for Meritorious Civilian Service. A registered professional engineer in New York and Pennsylvania, he is listed in Who's Who in the East, Men and Women in Science and the *International Biographical Dictionary.*

Among his professional affiliations are the National Society of Professional Engineers, American Society for Experimental Stress Analysis, American Association for the Advancement of Science, Scientific Research Society of America, and American Academy of Mechanics.

Human Engineering Lab Wins Third Award for Excellence

Presentation of a third consecutive annual Army Award for Excellence to the Army Human Engineering Laboratory, Aberdeen (MD) Proving Ground, was one of LTG George Sammet Jr.'s farewell honorary acts before his Sept. 1 retirement, after 35 years service, as Deputy CG for Materiel Development, Army Materiel Development and Readiness Command.

Recognized as a world leader in human factors engineering - the art of designing a compatible (agreeable) interrelationship of operating personnel with the equipment they use - HEL is directed by Dr. John D. Weisz, who accepted the honorary plaque in the presence of a large group of HEL employes.

LTG Sammet congratulated the HEL workforce on their long-continued record of excellence in performing their assigned mission, reviewed the progress of some major ongoing efforts, and urged them to maintain a proud tradition among Army in-house labs. HEL recently celebrated its 26th year.

TARADCOM Developing Multiplex Wiring System for Combat Vehicles

By Marquis W. Woody and Kenneth K. Lim

Engineers in the Armor and Components Division of TARADCOM's Tank-Automotive Research and Development Laboratory have begun efforts to develop a multiplex wiring system that will enable a tank crew to control, monitor and power most of the vehicle's electrical and electronic equipment through a single multiconductor cable.

Such a system would eliminate many of the complex wiring harnesses presently required, thereby resulting in improved reliability and maintainability, as well as reduced life-cycle costs.

The effort is part of a new TARADCOM program called ATEPS (Advanced Techniques for Electrical Management, Control and Distribution Systems). Objectives are to upgrade military ground vehicle electrical wiring, controls and displays to reflect the latest advances.

ATEPS employs a technique known as time-division multiplexing, a time-sharing method of communication. A single communication medium, such as a pair of shielded wires, carries a multitude of signals, each intended to serve a different purpose.

Major benefits which may be derived from ATEPS multiplexing techniques include: Significant reduction in wiring (bulk and weight); significant reduction in number of connectors; significant reduction in number of pins required per connector.

Other goals are potential improvement of Electromagnetic Interference and Electromagnetic Radiation (EMI/EMR) characteristics; improved reliability by the application of error checking and redundancy; better maintainability due to inherent self-test and built-in test features; upgraded interface compatibility with other multiplexed and computer-controlled subsystems; and increased flexibility for modification of the subsystems, resulting in lower life-cycle cost.

Multiplexing has been used extensively for years by the telephone industry to reduce congestion of phone lines. More recently, it has been employed in military aircraft, space vehicles and ships to lower the large volume of internal signal wires.

The automotive industry is also intensively researching possibilities of multiplexing and electronic displays for application to the commercial auto market.

Since January 1976, TARADCOM engineers have completed a conceptual design of such a system as applied to a main battle tank class vehicle. Fabrication of the first ATEPS breadboard demonstration hardware is expected to be completed during FY 1978.

The principal component of the concept is a central computer complex which will receive, process and regulate all of the data related to the operation of the vehicle. Each crew member will have a small integrated control and display unit that will reduce sharply the number of switches and gauges presently required to operate numerous combat vehicle systems.

Data signals and power needed for these systems will be carried by a single ATEPS multiconductor cable, first looped around the inside of the tank hull and then forming a similar loop around the inside of the turret.

The two loops will be connected by a hull-to-turret coupler (slip ring) which has only 16 signal electrical contacts instead of the more than 50 needed in present tank wiring systems - an improvement made possible by multiplexing.

MARQUIS W. WOODY is an electrical engineer in vehicular electrical power distribution systems, Armor and Components Division, U.S. Army Tank-Automotive R&D Command (TARADCOM), Warren, MI. Woody earned a BS degree in industrial engineering at West Virginia State College (1949) and a BS degree in electrical engineering at Lawrence Institute of Technology, Southfield, MI (1954). He has been with the command since 1952.

KENNETH K. LIM, born in Canton, China, emigrated when three years old to the United States. He attended Cass Technical High School near Detroit, MI, and earned a BS degree in electrical engineerng at Wayne State University (1971). He worked as a computer research assistant with the Surgical Research Group at Sinai Hospital while pursuing graduate studies, and received an MSEE degree from Wayne State in 1974. He became a TARADCOM predecessor organization employe in 1975.

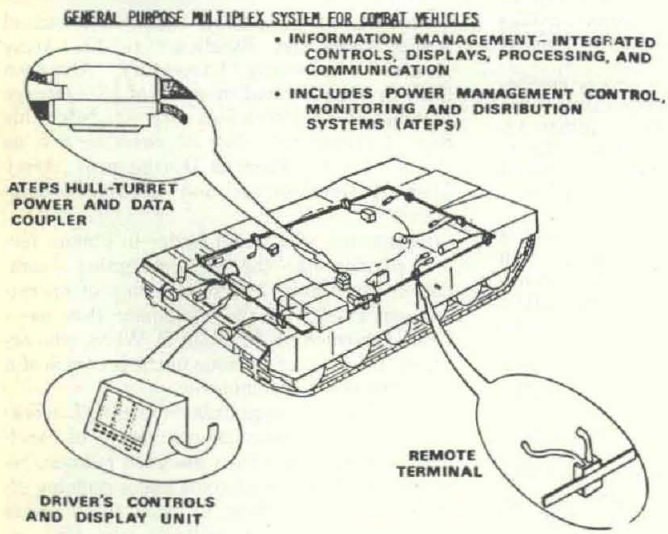
One set of conductors, known as the "data bus," will carry signals between the central computer, the control and display units, and each of the vehicle's electrical components. A second set, called the "power bus," will supply the electrical energy needed to operate the equipment. The data bus and the power bus will be molded together into a flat cable, with the shielded data bus in the center.

Remote terminals or electrical controllers located at points along the ATEPS cable will be used to connect the vehicle components and each control and display unit to the central computer and to the vehicle's main power source. The remote terminals will relay multiplexed data between the units.

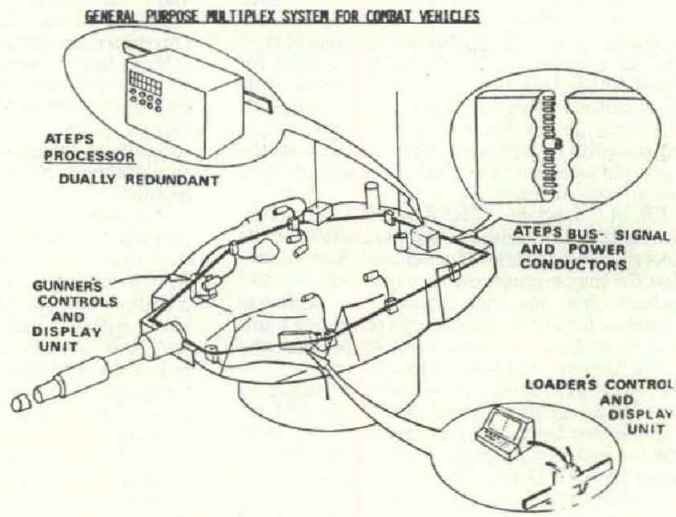
The crew will be able to control and monitor all of the tank's equipment through the use of integrated control and display units which have multipurpose displays and multipurpose controls. Each breadboard unit will have 20 push buttons and a gas plasma display screen of about 30 square inches.

Operation of these units will be similar to that of hand-held calculators. If, for example, a crew member wanted to rotate the turret, he would press the appropriate buttons on his control and display unit. This would transmit signals through the data bus to the master computer.

The computer would then interpret the order and signal a remote terminal to switch on the power control to the turret mechanism. The sequence of events would take only a fraction of a second.



ATEPS Concept for Hull



ATEPS Concept for Turret

If the driver wanted to check engine oil pressure, the computer could instantly relay the desired information to the display panel. The computer would periodically check all sensors and display the information when requested or when a malfunction occurred.

The computer processing system will operate at one million data bits of information a second. Depending on kinds and the number of sensors attached to the multiplex bus, the crew could obtain more vital information than ever before, at a much faster rate - thus enhancing their efficiency and vehicle survivability.

The computer will service signals from all current combat vehicles subsystems and components. Restructuring the computer program and adding additional remote terminals or electrical controllers where necessary will enable it to handle any future electronic systems and components.

The ATEPS potential appears to be limitless. For example, the computer could be programed to conduct on-board, in-operation vehicle diagnostics. It could provide a tank commander with rapid combat readiness status reports prior to combat operations, and be programed to carry out defensive measures against incoming enemy missiles.

Initial cost of such a multiplex system would be greater than that of a conventional wiring system but, as indicated before, the improved reliability and ease of maintenance will lower life-cycle costs. Envisioned is the possibility of eliminating the need to rebuild vehicles, as is now required, due to electrical wiring harness deterioration - resulting in tremendous cost savings.

A breadboard model planned for next year will be used to demonstrate the system and help engineers to make further refinements to the concept. If all goes well, the Army could be testing prototype models in vehicles in 1980.

Direct Logistical Support - New Eyes and Ears for DARCOM

By COL Carmine P. Giordano

Numerous sophisticated equipment systems are assigned to Army organizations. Does the soldier control those systems, or do the systems control the soldier?

This is the question posed by MG George S. Patton Jr., commander of the 2d Armored Division at Fort Hood, TX, and a solid supporter of a new Direct Logistical Support (DLS) concept.

MG Patton presented the challenge in remarks at a DLS Screening Committee meeting at Fort Hood in April, saying, in part: "We have many complex systems in the 2d Armored Division. Sometimes they control us, instead of the other way around. Sometimes we do not understand them or have the clout to make them work for us. DARCOM does understand them - and will make them work for us."

DARCOM, the United States Army Materiel Development and Readiness Command, has been assigned the task of making the DLS plan work worldwide. The program is being tested at Fort Hood, with prospects for full implementation for the U.S. Army in Europe this fall.

DARCOM Deputy CG for Materiel Readiness LTG Eugene J. D'Ambrosio considers the DLS program vital to the present-day Army. He notes: "It is essential to the combat readiness of the Army that the DLS achieves success. DARCOM intends to utilize DLS as our eyes and ears, keeping us continually aware of what is happening to our equipment in the field Army."

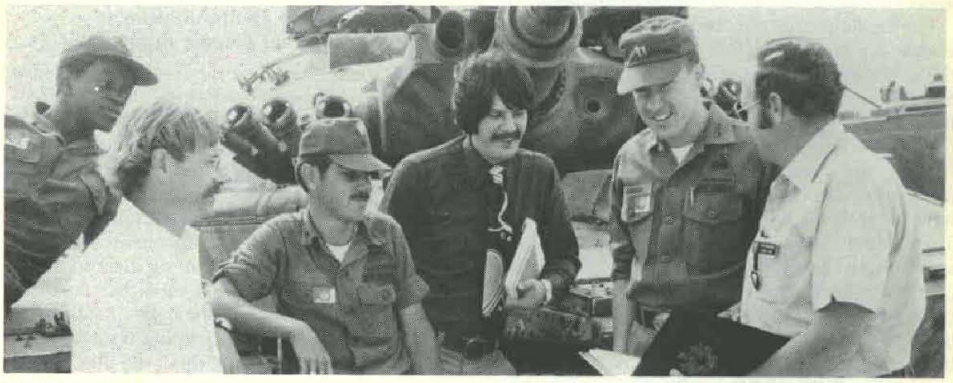
DLS test efforts at Fort Hood will help to establish the numbers of people needed at each logistic echelon, and will formalize the essential partnership between DARCOM equipment experts and the soldier in the field.

WHAT IS DLS? Simply, it is the Army's plan to enhance readiness and sustainability of the Army in the field and to improve the logistical support for weapons and equipment systems.

The DLS concept was developed at the direction of the Department of the Army when it was recognized that readiness and sustainability are frequently hampered by factors outside the traditional logistics functions of supply, maintenance, transportation and services.

Matters involving personnel, training, doctrine or funding are often the root causes of problems that have seemed due solely to a deficiency in the logistics sytem. DLS is programed to solve these problems. Hopefully, it will offer the ultimate solution to heretofore unanswerable questions posed by the field soldier.

DLS seeks to spot and find ways to clear up trouble spots. When deficiencies are not correctable due to lack of resources at a division level, DLS is designed to enable the user, the soldier in the field, to seek ways to solve any problem with help from outside resources.



DLS brings the experts to the soldier and equipment to help solve problems. The 2d Squadron, 1st Cavalry, 2d Armored Division, comes into focus as (l. to r.) SP4 John Savage; Pete Melsted, DARCOM; CPL Derrold Fortune; Phil Bare, MIRCOM; CPT Richard Gaughan, Squadron motor officer, and Phil Brooks, DARCOM, discuss M551 Sheridan maintenance.

"We want to get to the root of the problem" said BG John Bruen, chairman of the Direct Logistical Support Steering Committee - "clearly define a solution to the problem and pinpoint responsibility to correct it within a minimum time period.

"DLS is not a spy system. We want the user in the field to call it like it is and not be afraid to identify a problem area. DLS is based on a partnership between DARCOM and the user community. We want to help the user in any way we can to solve logistic support problems."

First evaluation of the plan was revealed at the DLS Steering Committee Meeting at Fort Hood, TX. The TRADOC Combined Arms Test Activity (TCATA), conducting the test of DLS, reported that it was destined to be a success worldwide in the Army.

DLS will provide technical channels of communication through all echelons of the Army - from the Army staff to the user. These channels will permit the free flow of logistics information and intelligence up and guidance and problem solutions down.

Particular emphasis is placed on communication channels between DARCOM materiel readiness commands and the soldiers in the field. DLS includes extensive use of logistics assistance officers, field maintenance technicians, and other field advisory personnel such as logistics management specialists. They will form the backbone of the technical channel.

NO NEW DATA SYSTEMS. Maximum use will be made of the information available through existing systems, management information and automatic data processing systems; no new DLS ADP systems are planned.

Finally, the DLS will not require major changes to the current Army organization and logistics system. Missions and responsibilities of the DARCOM commands, the Forces Command (FORSCOM), Training and Doctrine Command (TRADOC), and the Military Personnel Center will not be changed substantially.

DLS will fully use present resources but some additional resources may be needed to achieve the total objective. A precise estimate depends upon the weapons systems finally selected for intensive management.

If the Army is to achieve total readiness regardless of the environment in which it must operate it will succeed because of - not in spite of - logistics. Direct Logistical Support is aimed at making logistics support *work*, and thus insuring a combat-ready equipment posture for the field Army - anytime, anyplace, anywhere.

COL CARMINE P. GIORDANO is a Reserve officer and mobilization designee assigned to the DARCOM Office of the Chief of Public Affairs. A 32-year veteran of military service, he is a Navy veteran of World War II and was commissioned in Armor at the Fort Knox (KY) Officer Candidate School in 1952. In 1967, while serving as information officer with the 78th Division (Training), he was a recipient of the Public Relations Society of America's "Silver Anvil" award for achievement in the government information field, the first time an Army Reserve unit member achieved this honor. In civilian life he is a journalist, editor and a surrogate judge.

Transient Analysis, Electromagnetic Interference Studies

By Rudolph J. Prochazka

Pulsed graticule and optical trigger design modifications, installed in a Tektronix 485 oscilloscope, provide the operator with two desirable options for related work in high-speed transient waveform photography - transient analysis and electromagnetic interference (EMI) studies.

Pulsed Graticule. The photographic writing speed of an oscilloscope depends on three variables - the cathode ray tube (CRT), the film speed, and the lens/aperture combination of the camera. For this reason, high-speed single-shot photographic techniques require a large lens aperture to capture an oscilloscope signature.

The lens/aperture can be adjusted by the operator for specific sweep speeds. In addition, the scale illumination usually is adjusted manually to a predetermined intensity level and turned off.

However, the large aperture and high-speed film create a problem when the graticule is photographed. Consequently, several methods have been developed by oscilloscope operators. They include adjusting the aperture, the shutter speed, and the scale intensity each time the graticule is recorded.

These procedures often produce overexposed or underexposed graticules until the operator becomes proficient with "his" oscilloscope/camera combination. The problem can be eliminated by installing a syncronous-pulse graticule circuit.

Each time the oscilloscope is triggered, the graticule is "flashed on" for a predetermined time interval. The design modification takes advantage of internal oscilloscope circuitry in order to maintain the integrity of the instrument.

This allows full control of the graticule intensity by use of the Scale Illum control. The circuit is activated by pressing the Pulse Scale button (Fig. 1) and the variable pulse duration depends on a rear panel control.

Circuit design permits the graticule to be pulsed only at the end of each beam excursion across the CRT. The intensity level is adjusted only after the shutter speed and aperture setting are selected for proper exposure of the triggered event. The procedure chosen to trigger the oscilloscope is left to the operator's discretion.

External Optical Trigger. The oscilloscope is one of the most frequently used instruments in EMI studies. EMI-hardened inclosures are used to create shielded environments and minimize spurious signals on data channels.

Within this environment, the existence of a hard-wire cable could contaminate the enclosure with electromagnetic radiation. This problem can be eliminated by using a fiber-optic cable that terminates at a photodiode inside the oscilloscope, providing a light-activated electrically isolated trigger.

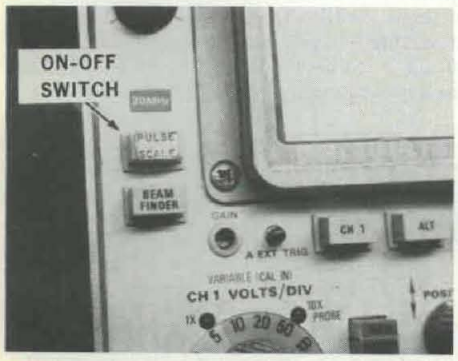


Fig. 1. Pulsed Graticule Switch

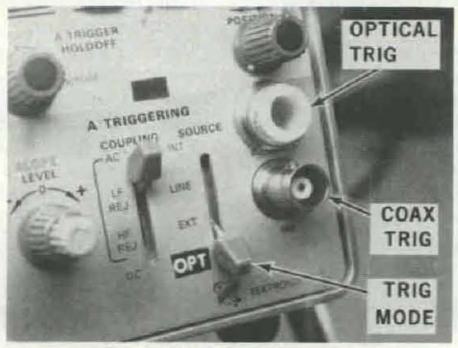


Fig. 2. Dual-Function External Trigger Inputs

To preserve the operational characteristics of the instrument and complement external triggering functions of the oscilloscope, the original coaxial input is not modified. Instead, optical triggering is achieved by installing a specifically designed nonmetallic fixture. When assembled, this fixture contains the photodiode and provides axial alignment between the diode and fiber- optic cable.

In most oscilloscopes, several modes of triggering are available, i.e., internal, line, and external, which usually are selected by a front panel control. On the Tektronic 485 oscilloscope, this control is identified as the A Trigger "source." In the external triggering mode, an internal 20-decibel attenuator can be selected by the source control for high-level external trigger signals.

If necessary, this option can be duplicated by installing an external 20-decibel attenuator at the input to the oscilloscope's external trigger. Consequently, the photodiode circuitry is connected to the source control in lieu of the attenuator circuit, and the position is annotated with OPT. The modification is shown in Fig. 2.

Conclusion. Optical triggering can eliminate the problem of contamination from spurious signals that can exist when triggering an oscilloscope with hard-wire cables during EMI testing and experiments.

A photo-sensitive device installed in the external trigger circuitry complements the original coaxial input and provides users with a dual- function external trigger for occasions when electrical isolation is not necessary.

The large aperture that is normally used to enhance writing speed creates a problem when photographing the graticule. Consequently, many techniques have been developed by operators, but all require some degree of adjustment each time the graticule is photographed. The Syncronous Pulsed Graticule modification replaces this methodical procedure with an automatic, less redundant technique.

These modifications provide the oscilloscope operator with a unique instrument for transient analysis and EMI experiments and evaluations.

RUDOLPH J. PROCHAZKA was engaged in electromagnetic pulse (EMP) technology at the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, VA, and the Ballistic Research Laboratories (BRL), Aberdeen Proving Ground (APG), MD, prior to 1971 when he joined the Harry Diamond Laboratories, where he has continued this research. He attended Fairleigh Dickinson University for 3½ years, holds two patents, and has authored several articles on specialized instrumentation and devices used in EMP hardening programs.

AutoMicrobic System Aids Infections Diagnosis

Faster and more accurate identification of microorganisms responsible for urinary tract infections is provided by a new "AutoMicrobic System" in use at the Bacteriology Laboratory of Brooke Army Medical Center, Fort Sam Houston, TX.

Chief of Microbiology MAJ James W. Higbee and Chief of Bacteriology CPT Joseph M. Madden term the computerized system "the best solid input into the field of automated microbiology."

The system can determine the number and types of organisms present within a maximum of 13 hours. Normally a minimum of 48 hours would be required to obtain this same information using the conventional manual method.

Designed initially for use by the National Aeronautics and Space Administration's Project Skylab, the unit can identify nine of the most common microorganisms, and determine how susceptible each is to various antibiotics, in less than 25 hours.

Identi-Pacs (clear plastic punch cards) are used as the vehicle for processing up to 120 specimens simultaneously. Thirty packs are placed into each of four trays which fit into an incubator reader. These trays rotate on a carousel every 15 minutes. Cards are scanned hourly by light-emitting diodes which report any changes from initial entries in a computer. Data recall is achieved by use of a cathode ray tube linked to a module.

A computer printout provides a specimen identification number, time expired since introduction of the specimen, microorganisms present and colony count. The system was unable to identify a specimen in fewer than 0.1% of 2500 clinical samples.

Operable 24 hours a day, the unit contains a built-in-battery capable of providing power for up to five hours before converting to a manual technique. An additional incubator module will permit handling of 240 specimens.

Believed to be the first military medical center to install the AutoMicrobic System, BAMC plans future investigations of biochemical Identi-Pacs; an antibiotic card for determining minimum drug dosage to inhibit microorganism growth; and rapid detection of microorganisms in blood or cerebrospinal fluid.

Speaking On . . . . Continued from inside front cover

Additional tasks planned for implementation are on a resource-available basis, including Reliability Engineering Data Requirements and Collection, a program ultimately directed to improved techniques in the collection of reliability field data.

Projected also are development of a Mission Profile Methodology; revision of MIL-STD-721 and MIL-STD-756; and development of Software Reliability concepts patterned after hardware reliability quantities.

With the signing of the October 1976 charter, the JTCG expanded its scope of activity from Electronic Systems Reliability to RAM. Ad- Hoc Subgroups have been organized to define recommended methodology programs to cover the areas of nonelectronic reliability test and analysis, nonelectronic reliability design, and maintainability. The Maintainability Subgroup will present findings later this month while the other two subgroups will define their programs by January 1978.

The JTCG-RAM Funding priority tasks from FY 76 - FY 78 is presented in Table 1. Note the relative inactivity in FY 76 and FY 7T because of lack of funds. However, the program was fully initiated in FY 77 in all Services and continues in FY 78.

The major funded thrust in the Army is the application of Computer Aided Design Techniques in the reliability design process. The Navy's major effort is in the area of development of Environmental Profiles and their Methodology. The Air Force major activity is in Combined Environmental Reliability Testing (CERT).

SUMMARY. A Joint Army, Navy, Air Force Electronic Systems Reliability program was developed as a result of the Airlie House Workshop in May 1975. Over the last two years, the program has been refined and prioritized because of funding limitations. In FY 77, the program was launched by all the Services.

The program is expected to impact on the reliability of materiel being acquired by the various Services. Previous endeavors of the group already have impacted broadly on Weapons Systems Reliability.

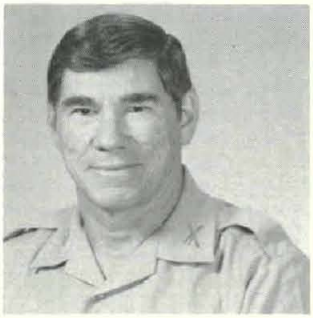
In particular, the efforts on Parts Control and Selection and the issuance of MIL-STD-965 are noteworthy. Current efforts on MIL-STD-781C will also impact on Weapons Systems Reliability in that laboratory test results and field reliability data will be closely allied, and that testing costs ultimately will be reduced.

People in Perspective...

USMA Gridiron Talent Scout . . .

Draws 2-Weeks R&D MOBDES Duty at HQ DARCOM

When R&D Mobilization Designee COL Richard Lindon Bowman recently served two weeks of active duty at HQ U.S. Army Materiel Development and Readiness Command, he received much more attention than the normal MOBDES officer on AD.



COL Richard L. Bowman

COL Bowman, who as a young man stacked in at 6' 2", 210 pounds during a year (1956) with the New York football Giants, is serving his fourth year as assistant coach of the U.S. Military Academy Black Knights football team.

How well the Black Knights fare this season will depend, in large measure, on how well he has done his basic duties rather than coaching.

Basically, he is a talent scout responsible for assuring that, in competition with representatives of powerhouse universities, he gets the kind of men who can meet USMA's strict entrance qualifications - and also perform outstandingly on the gridiron.

Each year he sends about 20,000 questionnaires to high school football coaches throughout the nation, with the goal of recruiting roughly 100 of the very best graduates through a highly selective screening process. Usually about 1,000 of the respondees are able to qualify academically as well as on the basis of exceptional athletic prowess.

One of those COL Bowman hopes will prove out well in training for the 1977 team is relatively important to him; his son Bill, his eldest, 6' 1" and 195 pounds, is a plebe trying out for the quarterback slot.

Prospective candidates for the team who survive the rigorous screening process then have to go through the normal USMA admissions procedure. That includes writing to their congressmen or senators for nomination. Then they must pass the ACT (American College academic test), followed by a physical examination.

Among recruitment inducements COL Bowman uses effectively to draw suitable talent from rival university recruiters are the USMA advanced education opportunities - free of charge to the ambitious ones. Some 70 percent of USMA graduates, he points out, are enabled to continue studies in fields of special interest at graduate schools such as Massachusetts Institute of Technology or California Institute of Technology as part of their development to prepare for top leadership posts.

Attrition of recruits for the football team is no higher at the USMA, despite the high scholastic standards and the rigorous schedule of activities comprising a plebe's life, than at other major universities, COL Bowman said. Many of those who fail to "hack it" as football players go into other athletics including track, basketball, baseball, wrestling and the intramural sports program.

COL Bowman's experience for the assistant coach duties began at the University of Oklahoma during the highly successful regime of Bud Wilkinson. As an ROTC student he was a 3-year regular at defensive end and upon graduation entered two years active duty with the Army. Then he played with the New York football Giants. Four knee operations cut his career short, but he left with an unforgettable impression of Coach Vince Lombardi.

During the next seven years he was an assistant on the University of Oklahoma football staff, followed by head coaching duties at four high schools in Oklahoma, Illinois and Indiana before he joined the USMA staff. What about his hopes for the Black Knights having a successful 1977 season?

"Well, I think we will have a substantially strengthened squad. I believe we have at least one bona fide All America candidate in Clennie Brundage, 6' 4" and 215 pounds as a tight end. He is also a starter on our basketball team and a very highly motivated young man. There are several others for whom I have high hopes. I expect a successful season."

USMA Graduate Enters 'Greener Pastures' . . .

Outstanding Young Officer Explains His Decision

Many of those who learned to know him well in a progression of challenging assignments are of the opinion that when MAJ Steven Caldwell left the service, the Army lost a man with high potential to advance to general officer rank.

MAJ Steven Caldwell
at Atlanta IV Seminar

Graduated in 1968 from the U.S. Military Academy with a bachelor's degree in science and from the Harvard University Graduate School with a master's degree in business administration, MAJ Caldwell bowed out of the Army just after he served as project officer for Atlanta IV - the Army/Industry Executive Seminar that attracted some 350 top management representatives.

During 1969, he served in Vietnam as a reconnaissance platoon leader with the 2/327 Infantry, 101st Airborne Division (Airmobile) and as an aerial operations officer (1970), followed by duty as an Infantry operations officer. He was awarded two Bronze Stars (one for valor), Vietnamese Cross of Gallantry with Bronze Star, and the Air Medal.

Assigned in 1970 to HQ U.S. Army Materiel Command (changed in 1975 to Army Materiel Development and Readiness Command - DARCOM), he served as aide-de-camp to AMC Commander GEN Henry A. Miley Jr.

During 1972 he was assigned as special staff assistant to the Chief of Procurement Policy, followed by duty as special assistant to the director of Procurement, MG Chester McKeen, where his duties included a trip to brief the Saudia Arabia Minister of Defense, and then as management specialist, Office of the Program Manager, Tank Acceleration Program when the U.S. Army's critical shortage of modern tanks was of serious national concern.

From September 1975 until he ended his active duty, MAJ Caldwell

(Continued on page 24)

Career Programs . . .

Perdue Selected for Alfred P. Sloan Fellowship

SLOAN FELLOW Thomas M. Perdue reads telegram to wife Linda, son, Michael, and daughter Kristin, informing him of selection for the 1977-78 Program at the Massachusetts Institute of Technology.

Selection as an Alfred P. Sloan Fellowship winner, involving a year of study with an opportunity for a master of science degree in management, is for Thomas M. Perdue part of a success story started in 1957.

While attending Virginia Polytechnic Institute, Perdue enrolled in the U.S. Army Missile Command's cooperative student-worked program. Acceleration up the career ladder picked up a head of steam for him in 1974.

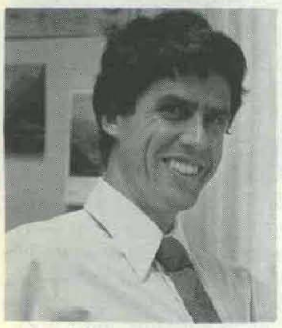
Sustained superior performance with the Army Ballistic Missile Defense Systems Command contributed to two honors - a U.S. Civil Service Commission Intergovernmental Affairs Fellowship, and the Safeguard ballistic missile defense system commander's Junior Executive Award.

Perdue is currently chief of Range Safety for the Army Ballistic Missile Defense Systems Command in Huntsville, AL. Since he became a full-time electronics engineer with the Missile Command in 1961, he has served progressively with the Nike Zeus Project Office and successor units.

He was a member of a 6-man team that developed plans for transfer of Kwajalein Missile Range from U.S. Navy control to the Army, and then developed plans for management of the range. Perdue was assigned safety responsibility for launches from Kwajalein and later Wake Island in 1967. He was then concerned with providing launch support for Johnson Island, Vandenberg Air Force Base, CA, and for Pacific-based ships.

Graduated from Virginia Polytechnic Institute with a BS degree in electrical engineering, he has done graduate work in operations research at the University of Alabama. One of his hobbies is diving, along with underwater photography and woodworking. He plans to make Shittum wood plaques for each of about 50 of his Sloan Fellows classmates at MIT.

ARO's Dr. Wittmann Receives SARS Fellowship



Dr. Horst Wittmann

Under a Secretary of the Army Research and Study (SARS) Fellowship Program, Dr. Horst Wittmann is devoting a year of investigative effort into theoretical and experimental means for optimization of IMPATT diodes at the Institute for Industrial Electronics, Technical University of Vienna, Austria.

Dr. Wittmann is associate director of the Electronics Division, U.S. Army Research Office, Research Triangle Park, NC. He has also accepted a Fulbright-Hays Scholarship in an honorary capacity from the Council for International Exchange of Scholars.

Employed at ARO since 1970, Dr. Wittmann shares responsibility for directing a broad program of research in the fields of electronics, information, and computer science. He is an adviser to the Joint Services Electronics Program and the Advisory Group on Electron Devices.

Dr. Wittmann's academic credentials include a BA degree from Melanchthon Gymnasium, Nurnberg, Germany, an MS degree from the University of Erlangen, Germany, and PhD in experimental physics and physical chemistry from the University of Graz, Austria.

Prior to joining the ARO professional staff, he was a research physicist at the U.S. Army Missile Command. There he received a patent for the first application of a laser light source in the spectroscopic field, and developed a theoretical model for low-temperature electroluminescence.

Listed in *American Men and Women of Science,* Dr. Wittmann has authored or coauthored an extensive list of scientific and technical articles. He is a member of the Institute of Electrical and Electronics Engineers and the American Physical Society.

He has also served as a research associate in the Electrical Engineering Department at Duke University and as an adjunct assistant professor in the Electrical Engineering Department, North Carolina State University.

Physicians Earn APA Administrative Certification

LTC Armitage & COL Nelson

Two officers at the Dwight David Eisenhower Army Medical Center, Fort Gordon, GA, are believed the first active duty military physicians certified in administrative psychiatry by the American Psychiatric Association.

COL (Dr.) Eric Nelson, chief of Psychiatry and Neurology, and LTC (Dr.) David Armitage, director of Residency Training, have joined only 523 active members within the ranks of more than 23,000 APA members.

The Joint Commission on Accreditation for Hospitals requires that administrators of a psychiatric facility (at least 100 beds) be certified in psychiatric administration. Accreditation by the APA's 26-year-old Commission on Certification is important to Drs. Nelson and Armitage because the Department of Psychiatry and Neurology plans to make administrative psychiatry part of the residency curriculum at the Eisenhower Center. APA prerequisites include certification by the American Board of Psychiatry and Neurology, and completion of three years service while psychiatric administration has been a major concern.

An applicant must then pass a stiff 6-hour oral exam covering administration and organizational theory, administrative and community psychiatry practice, medical care administration, budget and finance, personnel administration, and law and psychiatry. Although no formal course work precedes the exam, the Certification Commission provides all candidates with an extensive reading list upon which the test is based.

Dr. Nelson earned his BA degree from Harvard University and his MD from Rochester (NY) Medical School. His internship and residency were served at Letterman Army Medical Center, San Francisco, CA.

Dr. Armitage has a bachelor's degree from Muskingum College and an MD from the College of Medicine of the State University of New York at Syracuse. He interned at Tripler Army Medical Center, HI, and served his residency at Walter Reed Army Medical Center, Washington, DC.

Outstanding Young Officer Explains His Decision

(Continued from page 23)

was a consultant and special assistant with the Office of the Deputy Commander for Materiel Acquisition (changed under DARCOM to Deputy CG for Materiel Development), working with LTG George Sammet Jr. under the guidance of assistant deputy John D. Blanchard.

During his military career, MAJ Caldwell had his share of opportunities to "see the world," as Army recruitment posters suggest, with trips to Australia, Taiwan, Spain, Italy, Saudi Arabia and Morocco.

Considering the unusual succession of highly interesting assignments, plus travel to foreign lands during a 9-year military career, why would a young man like MAJ Caldwell leave to enter the business world?

Everything had been going exceptionally well - a beautiful wife he met while attending Harvard, a first child born Mar. 30, 1977 (Steven J. Jr.) . . . all 'the goodies.' "I left the Army," he explains, "because I felt that the Army forces its personnel to be 'generalists' in an era when specialization is essential due to the complexity and sophistication of the Army's role of national defense - of constant readiness for any type of combat.

"Unfortunately, I believe the generalists are often handicapped to compete in specific areas (like materiel acquisition). I did not want to be put in a position where I was a highly qualified generalist - not capable of qualifying as an expert in a specific field.

"With Grace (W. R. Grace Co. in New York City, Grace Plaza on the Avenue of the Americas), I am a financial projects supervisor working on assorted financial projects requiring Grace capital . . . (such as) the acquisition of a chain of 350 retail stores. With some of the good luck I had in the Army, I may progress. Still, I may have some regrets. The many highly dedicated and exceptionally competent people with whom I was privileged to work made me feel that the Army is a fine career."

Sturdivan Goes Into Executive Development Program

Larry Sturdivan

Selection of Larry Sturdivan for six months of training under the technical director's executive development program has been announced by the Army Chemical Systems Laboratory (CSL), Aberdeen Proving Ground, MD.

Federally employed since 1964, when he joined the professional staff at the Army Ballistic Research Laboratory at APG, Sturdivan is the 23d employe selected for this training since it was initiated in 1970.

Following three months of varied training assignments in the CSL, he will receive three months of managerial training at HQ Army Materiel Development and Readiness Command.

Graduated from Oklahoma State University with a BS degree in physics and from the University of Delaware with an MS degree in statistics, he is the U.S. representative to the Group of Terminal Ballistics Experts for the North Atlantic Treaty Organization Small Arms Tests.

Sturdivan has authored numerous technical publications on human vulnerability, has presented papers at various national and international conferences, and is a member of Sigma Xi Scientific Research Society of North America. A 1975 recipient of a Department of the Army Sustained Superior Performance Award, he received a 1976 Special Act Award for achievements in the soft body armor program.

Reader's Guide

Corps of Engineers' Pestiferous Problem . . .

Aquatic Plant Control Book, Film Report Progress

Difficulties of the U.S. Army Corps of Engineers in continuing efforts to keep navigable waterways as well as recreation lakes passably free from tangled masses of water hyacinths and other noxious weeds date back more than 75 years, and have been discussed in hundreds of articles and reports.

Dr. Edward O. Gangstad

Progress during the past decade in the Corps' aquatic plant control research will be detailed by one of its leading authorities in this field in a forthcoming book authored by Dr. Edward O. Gangstad.

Complementing this report is a new 30-minute, 16mm film titled Waterhyacinth: The Silent Aggressor, available from Department of Agriculture.

Part of the material that will appear in the book to be published by CRC Press Inc., Cleveland, OH, was prepared by Dr. Gangstad for presentation at the 1975 Research Planning Conference on the Aquatic Plant Control Program, and is included in the proceedings of that meeting.

Dr. Gangstad is of the opinion that the most dramatic advances in techniques currently applicable to control problems have been made during the past decade. His book will report on experiments with laser beams; import of the white amur fish from Russia and its development as a monosex (to control propagation) at the Fisheries Research Station, Stuttgart, AR; and use of weed-eating beetles along with controlled-release chemical weed killers.

Currently, the Corps of Engineers control program is limited to $5 million annually and for the past five years has averaged about $3 million. Dr. Gangstad has categorized, in order of magnitude, the problem weeds: water hyacinth, alligator weed, hydrilla, water lettuce, and pond weeds.

The U.S. Department of the Interior, Department of Agriculture and numerous states have their own control programs. Dr. Gangstad estimates the over-all expenditure is averaging about $75 million annually. The Bureau of Reclamation is involved with the problem as related to water conveyance systems such as canals, dams, etc. Research also is conducted by numerous academic institutions.

Dr. Gangstad entered U.S. Government service in 1950, shortly after receiving his doctorate in biochemistry from Rutgers University. He earned BS and MS degrees in this field from the University of Wisconsin. Since 1969 he has been engaged in the Corps of Engineers aquatic week control program. Four years work with the Department of Agriculture on weed control was related to strategic fiber crops. Twelve years with the Texas Research Foundation at Dallas were devoted primarily to research on problems related to the forage crops.

ARI Publications Include Guidebook for Writers

U.S. Army Research Institute for the Behavioral and Social Sciences publications announced recently include two technical papers, a technical report and a guidebook for writing training literature.

Technical Paper 278, *The Perception of Tactical Intelligence Indications by Intelligence Officers*, provides information on improved techniques for intelligence collection planning and analysis, and how to assess effectiveness of traditional indicators.

Analyses are based on responses from 44 captains enrolled in the Intelligence Officers Advanced Course who served as staff officers in an infantry division conducting a mobile defense in north-central West Germany.

Findings reveal that traditional indications of conventional operations are poorly understood and/or intrinsically inadequate for contemporary intelligence operations. Suggestions call for an improved indications structure and better baseline data.

Technical Paper 281, *Comparison of Four Unattended Ground Sensor Displays*, reports on the RO-376 X-T plotter and three variations of the situation map display, in terms of effect on monitor performance.

Sixteen U.S. Navy personnel received training on the various displays and operators, and then monitored each display for two hours to report target information. Results were reported on prepared forms and compared to known ground truths. Operator performance was unaffected generally by the type of display used. Detection of a higher percentage of targets occurred during low rather than high periods of target activity.

Technical Report 76-A3, *Transfer of Training and Skill Retention*, is the result of a 17-week experiment with 106 enlisted personnel to explore the relationship between the retention of training course content and recall during a performance test.

Instruction was provided by the Training Extension Course (TEC) materials on selection, maintenance and use of hand grenades. Retention of training content was measured by a written exam.

How well training was transferred to actual operating conditions was measured by a criterion performance test (CRT). Increased delay between training and administration of the CRT revealed decline in performance.

Guidebook for the Development of Army Training Literature is a 185-page illustrated document that serves as a complete job aid for writers of performance-oriented training literature such as field manuals, training circulars and special texts.

The guidebook emphasizes principles of good writing, at the comprehension level for the intended audience, through extensive use of examples rather than lectures on format and style.

Information was obtained from interview with Army writers and editors in five Army Service School Centers where training literature supporting high-density Military Occupational Specialty areas is produced.

Guidebook topics are presented in a "before and after" format (former writing style and as revised for better comprehension) include field artillery, air defense (technical, combat and administrative), ordnance (technical and combat), quartermaster, medic, armor, transportation, and MPs.

Correspondence relative to distribution of any of these publications may be addressed to: U.S. Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-PP, 5001 Eisenhower Ave., Alexandria, VA 22333.

AMMRC Publishes Fracture Mechanics Monograph

Intended for immediate use by persons engaged in hardware design and failure analysis, a new 500-page monograph titled *Case Studies in Fracture Mechanics* has been announced by the U.S. Army Materials and Mechanics Research Center, Watertown, MA.

AMMRC MS 77-5 contains more than 30 case histories of practical engineering applications relative to design, inspection, maintenance and failure analysis. It was compiled by Dr. Thomas P. Rich and Dr. David J. Cartwright of AMMRC's Mechanics Research Laboratory.

Dr. Rich has conducted mechanics research into deformation and fracture of materials for the past seven years and is leader of AMMRC's Life Prediction and Reliability Mechanics Team.

Dr. Cartwright recently completed a year of work at AMMRC as a visiting North Atlantic Treaty Organization Fellow. He is a mechanical engineering professor at the University of Southampton, England.

Authored by industrial, government and academic specialists from the U.S. and Great Britain, the case studies are listed by major subject areas of aerospace, joints and mountings, pressure vessels and rotating machinery, surface vehicles and materials.

Hardware case studies include helicopter components, aircraft structures, rocket motors, gun tubes and military bridges. Most studies are 12 to 15 pages in length and composed in standard format.

Additional information relative to this document may be obtained from Dr. Thomas Rich, Autovon 955-3418.

Conferences & Symposia . . .

MIRADCOM Hosting Shock and Vibration Symposium

Discussion of state-of-the-art developments and potential problems is programed for the 48th Shock and Vibration Symposium, Oct. 18-20, at HQ U.S. Army Missile R&D Command, Redstone Arsenal, AL.

Sponsored by the Shock and Vibration Information Center (SVIC), Naval Research Laboratory, Washington, DC, the symposium is hosted annually on a rotational basis by the U.S. Army, Navy, Air Force and the National Aeronautics and Space Administration. About 400 participants are expected this year.

The SVIC operates under authority of the Director of Defense Research and Engineering. The staff includes a director, two technically skilled coordinators and two secretaries.

Annual symposia constitute one of the largest single sources of information in the shock and vibration technological area. Attendees are primarily government and industrial working scientists and engineers.

MIRADCOM Commander MG Charles F. Means will offer the welcoming remarks, followed by a keynote address by Dr. John L. McDaniel, deputy/technical director of MIRADCOM. Chairmen are James Daniel of MIRADCOM and SVIC Director Henry C. Pusey.

Invited Speakers are Commander/Director COL John L. Cannon of the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, whose topic is Shock Response Research at WES; Dr. Robert M. Hamilton, chief, Office of Earthquake Studies, U.S. Geological Survey, Reston, VA, whose subject is Earthquakes: Their Causes and Effects; and Edward J. Kolb, technical information officer, HQ U.S. Army Materiel Development and Readiness Command, Alexandria, VA, who will discuss Technical Information Resources for Shock and Vibration Community.

Numerous Army representatives will present papers or preside as chairman or cochairman at sessions during which more than 50 papers are programed, along with two panel discussions. Navy, Air Force, NASA, academic and industrial experts from all parts of the U.S. will have similar roles as chairmen, panelists or presenters of technical papers.

Scheduled topics of unclassified general sessions and panel discussions will include: Model Test Analysis, Tracked Vehicles, Instrumentation, Structural Analysis, Special Topics, Software Evaluation (panel discussion), Data Management (panel discussion), Vibration Testing, and Isolation and Damping. One classified session has been programed with attendance contingent upon establishment of a valid SECRET clearance and a need-to-know.

Attendees remaining in the Huntsville area Oct. 21 may wish to take advantage of a special tour of MIRADCOM facilities, including a missile firing range and an excursion of NASA's Marshall Space Flight Center.

Additional information relative to registration, attendance, fees and lodging may be obtained from the Shock and Vibration Information Center, Naval Research Laboratory, Code 8404, Washington, DC, Commercial Phone: 202-767-2220 or Autovon: 297-2220.

WES Hosts 4-Day Subsurface Cavities Symposium

Detection of Subsurface Cavities Symposium dignitaries (from left) J. P. Sale, chief, WES Soils and Pavements Laboratory; COL John L. Cannon, WES commander and director; William E. Davies, U.S. Geological Survey; Paul Fisher, Office, Chief of Engineers; Dwain K. Butler and R. F. Ballard, WES Soils and Pavements Laboratory.

Dangers of collapse of ground above subterranean caverns, with possible calamitous results in loss of life and property, were discussed at a 4-day Detection of Subsurface Cavities Symposium in Vicksburg, MS.

Keynote speaker William E. Davies of the U.S. Geological Survey said the caverns - caused by chemical weathering that converts rock material into the liquid state - are not easily detectable, and that collapse of ground above them has occurred even in preferred construction sites.

Sponsored by the Office of the Army Chief of Engineers and the Soils and Pavements Laboratory of its Waterways Experiment Station (WES), the symposium attracted geologists, geophysicists, geotechnical engineers, administrators and planners from all parts of the United States.

Speakers included experts from the WES, district and division offices of the Corps of Engineers, the Tennessee Valley Authority, Southwest Research Institute, Colorado School of Mines, Lawrence Livermore Laboratory, Texas A&M University, the University of Missouri at Rolla, and a professor from the Compagnie Generale de Geophysique in France.

Many of the preferred construction sites have been used, speakers reported, making more urgent the development of reliable detection of subterranean cavities, including treatment to make possible the use of land above the cavities.

Methods of cavity detection discussed at the symposium fall into three categories: remote sensing, ground surface, and direct contact.

Remote sensing methods have the advantage of covering large areas quickly and economically. Although these methods are not capable of locating or delineating specific cavities, they can be used to select problem areas for more intensive study by other methods.

Ground surface methods include, among others, seismic, electrical resistivity, self-potential, acoustic subbottom profiling and gravity surveying. These methods of surface geophysical exploration vary greatly in their ability to reveal specific cavities, but some have potential as valuable subsurface cavity location tools.

Direct contact methods are considered the only means of definitely establishing the existence of a cavity. Borings and excavation may be used to prove out potential cavities indicated by remote sensing or surface geophysical methods. The high cost of drilling and the time involved limit application of this method.

Emphasis of the symposium was on presentation and state-of-the-art review of geophysical cavity detection as the most promising method.

Conferees Report on Pressure, Temperature Research

High-pressure, low-temperature research, during which pressures of 400,000 atmospheres (about 6 million pounds per square inch) have been achieved at temperatures down to 10° above absolute zero (−459.6° F.) was the topic of three papers presented recently by Watervliet (NY) Arsenal investigators.

"Bismuth Phase Transition Below 30° K. at 150 K-bars in an Argon Pressure Medium" was presented by Clarke G. Homan during the International Conference on High-Pressure and Low-Temperature Physics at Cleveland (OH) State University. Julius Frankel and David P. Kendall coauthored the paper.

Homan also delivered a paper on "Acoustic Velocity Ratios in Solid Argon at 75° K. Up to Static Pressures of 150 K-bars" at the Sixth International High-Pressure Conference conducted by the University of Colorado at Boulder. Coauthors are Frankel, Kendall, John P. Barrett and Dr. Thomas E. Davidson, who chaired a session on "High-Pressure Vessel and Pipeline Material Behavior."

Frankel also delivered a paper at the Boulder meeting, "The Use of Isotropic Sodium Chloride Acoustic Velocity Rations in Ultra-High-Pressure Physics," coauthored by Fred J. Rich, Homan, Dr. M. A. Hussain and R. D. Scanlon.

TECOM Workshop Reviews Disaster Contingency Plans

Contingency plans for effective response to natural disaster and emergency situations were discussed in depth by U.S. Army Test and Evaluation Command subordinate command representatives and guests at an August Military Planning Workshop.

Hosted at HQ TECOM, Aberdeen (MD) Proving Ground, the meeting was opened by TECOM Deputy Commander BG Philip L. Bolte who emphasized the continuing need for preparedness. A 1974 tornado at Jefferson Proving Ground was cited as an example.

"Emergency and disaster situations," BG Bolte said, "involve assistance to civilian authorities which requires detailed advance coordination and planning by TECOM installations and field activities."

TECOM Director for Plans and Programs COL George F. Carroll explained detailed requirements for plans to cope with civil disturbances, environmental disasters, rapid mobilization of forces for war emergencies, and related programs.

COL Frederick C. Turner of the Army War College assessed "The Soviet Threat" and Douglas Byard of the 902d Military Intelligence Detachment discussed communist block intelligence-gathering activities.

Other presentations included Terrorism and Hostage Situations, by Darol E. Fry, FBI special agent; Shelter Management, by Larry Sunday, HQ Army Materiel Development and Readiness Command; and Joint Resource Damage and Capability Assessment System, by James Kilker of the Logistics Systems Support Agency, Tobyhanna Army Depot, PA.

Workshop representatives included Ivan L. Stadjuhar, White Sands Missile Range, NM; MAJ George R. McAlpin, Dugway Proving Ground, UT; SFC Robert Walker and Barbara C. Campbell, Yuma Proving Ground, AZ; Luther D. Schultz, Jefferson Proving Ground, IN; William H. Allbritten and Eleanor F. Stokes, APG, MD; Roy L. Miller, Aircraft Development Test Activity, Fort Rucker, AL; CPT Donald R. Pawlowski, Cold Regions Test Center, Fort Greeley, AK; Donald L. Miller and Felix R. Smith; Electronic Proving Ground, Fort Huachuca, AZ; and SGM Billy J. Barber, Tropic Test Center, Fort Clayton, CZ.

MOBA Conference Themes Urban Warfare Environment

Improved equipment, training and doctrine for soldiers in the urban warfare environment themed a recent 2-day MOBA (Military Operations in Built-Up Areas) conference at the U.S. Army Human Engineering Laboratory (HEL), Aberdeen (MD) Proving Ground.

Attended by more than 75 high-ranking military and civilian DoD personnel, this second meeting in a planned series included discussion of firepower, weapons, communications, mobility, camouflage, munitions, target acquisition and support tasks.

Participants were from HQ Department of the Army, U.S. Marine Corps, U.S. Air Force, the U.S. Army Materiel Development and Readiness Command (DARCOM), and the U.S. Army Training and Doctrine Command (TRADOC).

Designated as the DARCOM/TRADOC point of contact for all MOBA-related activities, the HEL initiated the meeting to provide an exchange for the growing bank of knowledge relative to urban military operations.

HEL Director Dr. John D. Weisz credited the MOBA team with "an outstanding job in bringing the MOBA research and development program into being and for providing the first hard data in a number of critical areas." He predicted that the MOBA will be one of the top-priority R&D programs in the Army in four to five years.

Don Egner heads the HEL MOBA team which has conducted research on the most suitable weapons for close-quarter fighting in cities and towns. He said that MOBA is now a recognized concern in the new Army field manuals. Another conference may be held within 9 months.

Awards...

DUAL AWARDS honored Ballistic Research Laboratory (BRL) personnel recently when Director Robert J. Eichelberger (center) accepted the Laboratory of the Year Award from Assistant Secretary of the Army (RDA) Dr. Percy Pierre, and the DARCOM Award for Excellence from Director of Development and Engineering BG Alan Nord. The DARCOM Award recognized technical achievements, quality of technical management and effective use of available personnel and financial resources. Initiated in 1975 to recognize and upgrade performance of Army in-house laboratories, the Laboratory of the Year Award was presented to the Night Vision Laboratory, Fort Belvoir, VA. Walter Reed Army Institute of Research (WRAIR) received the second award for "numerous significant achievements," particularly introduction of Meningoccal Vaccine Type C for military use. The basis of the BRL award for 1976 was reported in the March-April *Army R&D Newsmagazine*, p. 4.

3 Aberdeen MTD Personnel Receive Awards

Three personnel assigned to the Materiel Testing Directorate (MTD) at Aberdeen Proving Ground (APG), MD, received awards recognizing outstanding contributions to the MTD mission.

Kenneth I. Ruff, a mechanical engineering technician in the Artillery and Armor Division, received the Director's Award for ". . . improvements to test sites, target setups, velocity measurements, and fixtures," which have been "invaluable assets to the Army."

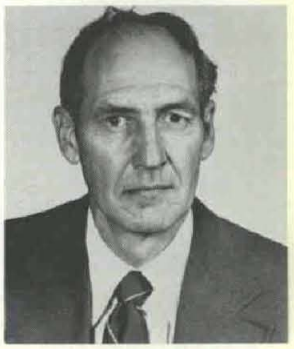
CPT C. David Brown received the Crozier Award, presented annually to a military member of MTD in memory of former (1901-18) Chief of Ordnance MG William Crozier, for his work on varied projects including a video instrumentation system for testing and analysis, a laser target simulator, and an automatic video target-scoring system.

Walter M. Powers, an artillery repair leader, won the Groak Award for his "exceptional competence and skill in directing the repair and maintenance of ordnance items used by MTD." Established in 1969, it honors the late George Groak, former MTD employe credited with enhancing the reputation of APG's technicians.

MTD Director COL E. P. Davis presented the awards during a ceremony attended by supervisors and branch chiefs of the directorate.

ARRADCOM Man Wins ADPA's Harvey Knowles Award

Achievements in development of anti-tank ammunition have earned the American Defense Preparedness Association's Harvey C. Knowles Award for Earl Buchanan of the U.S. Army Armament R&D Command, Dover, NJ.



Earl Buchanan

Chief of ARRADCOM's Tank Ammunition Section, Buchanan received a $1,000 honorarium and a Certificate of Achievement. He is the 11th recipient of the award and the Armament Command's second winner.

The citation acclaims his technical direction and leadership leading to development of the armor-piercing, fin-stablized, discarding-sabot, kinetic-energy round, believed capable of defeating armor at greater ranges than any other ammunition.

Memorializing the founder of the ADPA's technical and management divisions, the Knowles Award is presented annually to an American citizen for a major technical contribution to armament progress.

4 Natick Employes Get Research Achievement Awards

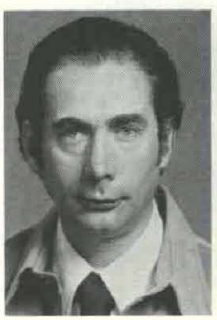
Outstanding contributions in the physical, engineering, food and life sciences by four Natick (MA) Research and Development Command employes have earned Research Achievement Awards from NARADCOM's chapter of Sigma Xi, a national scientific honorary society.

J. W. Halliday

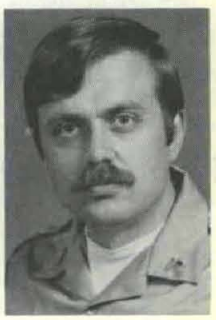
W. E. Nykvist

John W. Halliday, a chemist in the Food Engineering Laboratory, is cited for studies dealing with effects of ionized radiation on beef muscle protein. His work is expected to demonstrate wholesomeness of irradiated beef, leading to Food and Drug Administration approval for general consumption.

William E. Nykvist, Aeromechanical Engineering Laboratory, analyzed the heat trans-



R. W. Segars



CPT D. L. Wolfe

(Continued on page 28)

fer process of roasting beef with the intent of developing improved methods for maximum yield and quality. He computed effects of temperature, roast size and oven power.

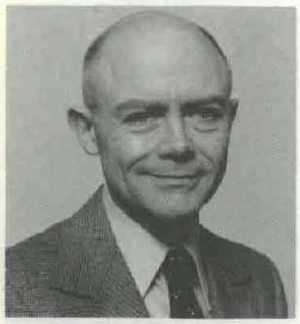
Ronald W. Segars, a physicist in the Food Sciences Laboratory, tested stress and strain characteristics of beef muscle tissue by constructing a mathematical meat model and an original testing device.

The device enables researchers to gather data previously obtained from costly consumer acceptance panels. Results of this work were presented in a technical report at a National Science Foundation symposium at Rutgers University.

CPT Danney L. Wolfe, a veterinarian with the U.S. Army Research Institute of Environmental Medicine, implanted monitoring devices in the heart, lungs and skull base of goats, relative to a study of altitude acclimatization. His work is expected to have far-reaching impact on altitude research which cannot be conducted on humans.

NARADCOM Radiation Chemist and Awards Committee Chairman Dr. Irwin A. Taub cited all of the "junior researchers" for exhibiting a high degree of innovation and resourcefulness in studying pressing problems.

Dr. Eichelberger Wins Distinguished CS Award



Dr. Robert J. Eichelberger

Dr. Robert J. Eichelberger, director of the U.S. Army Ballistic Research Laboratory, Aberdeen (MD) Proving Ground since 1967, is one of six Department of Defense employes honored recently with DoD Distinguished Civilian Service Awards.

Employed at BRL since 1955, Dr. Eichelberger received the DoD highest award for civilians for "outstanding contributions to detonation physics, hypervelocity impact and penetration mechanics and shaped charges, all resulting in major improvements and innovations in the Army's offensive firepower, effectiveness and survivability."

The award citation acclaims his "exceptional ability to plan research programs and to identify and implement specific fundamental studies needed to provide a sound basis for subsequent applied R&D."

Dr. Eichelberger was recognized also for achievements leading to BRL's selection in 1976 as the "U.S. Army Laboratory of the Year," and for earlier "excellence" awards from the American Defense Preparedness Association.

An internationally renowned ballistics authority, he is a member of nine professional and three honorary societies, more than 30 technical panels and committees, and has received seven major civilian service awards, including the Decoration for Exceptional Civilian Service.

Other award recipients are *Charles H. Andregg,* deputy director for Management and Technology, Defense Mapping Agency, for charting and geodesy; *William J. Cassell,* comptroller, Defense Logistics Agency, for financial management support of U.S. logistics programs; and

Dr. Thomas M. Davis, head, Mathematical Modeling Project, Naval Oceanographic Office, for collection and analysis of oceanographic data in support of Fleet operations; *Robert E. Drake,* deputy director for Operations, National Security Agency, for cryptologic management; and *Conrad P. Peterson,* deputy director, Directorate of Accounting and Finance, Department of the Air Force, for leadership of government financial management operations.

Initiated in 1955, DoD Distinguished Civilian Service Awards are presented annually to six employes whose careers reflect exceptional devotion to duty and significant contributions to DoD efficiency, economy or other operational requirements.

Nominations for scientific and nonscientific achievements are normally made from among those employes who have previously been awarded the Decoration for Exceptional Civilian Service. Winners receive a gold medal and citation certificate.

Patents Granted for Flash Suppressor, Sighting System

Patents for invention of a flash suppressor for the M219 machinegun and a sighting system for hand-held grenade launchers were awarded recently to Urban (Fred) Stratman, U.S. Army Armament Materiel Readiness Command, Rock Island, IL.

The suppressor, a product improvement effort, reduces or eliminates bright flashes created by ignition of hot, unburned gases exiting the gun muzzle. Vent holes confine most of the burning inside the suppressor.

The sighting system for grenade launchers incorporates full-range

sighting into a single unit. Earlier designs required two separate sights to cover the complete ballistic range of the projectile.

Assigned to ARRCOM's Product Assurance Directorate as a mechanical engineer, Stratman is credited with initiating development of hardware for testing caseless grenade ammunition. He has served as Rock Island Arsenal representative to NATO/Brussels on small-caliber linked grenade ammunition, and was employed in the former Rodman Laboratory.

Dr. Anderson Elected as Food Technologists Fellow

Dr. Edward E. Anderson, special assistant for the DoD Food Research, Development, Testing and Engineering Program at the U.S. Army Natick (MA) R&D Command, is a new Fellow of the Institute of Food Technologists.

Dr. Edward E. Anderson

Dr. Anderson is one of two U.S. food scientists elected this year by IFT members. He is the only active DoD employe and is one of only seven U.S. Government food scientists holding this title among more than 15,000 U.S. members.

As principal NARADCOM authority for over-all DoD Food Programs, Dr. Anderson coordinates services and equipment for the Tri-Services and the Defense Logistics Agency.

Author or coauthor of 45 technical papers, he holds 10 U.S. and Canadian patents. He is a member of the Society for Nutrition Education, American Defense Preparedness Association, American Society of Military Comptrollers, Sigma Xi, American Association for the Advancement of Science, and the American Public Health Association.

BWL Man Patents Process for Coating Gun Barrels

A new process for applying multiple coatings to interiors of artillery gun barrels has earned a U.S. patent award for Harold Goodheim, a mechanical engineer with the Benet Weapons Laboratory Advanced Engineering Group, Watervliet Arsenal, NY.

Five or more types of coating fluid can be passed, in sequence, through gun barrel interiors without mixing with or contaminating each other. After coating the barrel, each fluid is completely expelled and the fluid flow control valves are purged by a high-speed jet of air.

A veteran government employe and graduate of Massachusetts Institute of Technology, Goodheim will receive no royalties since his invention is certified as being in the public domain. The Army will award him a small honorarium for the effort he devoted to perfecting his process.

Personnel Actions . .

Dr. Davis Takes Over as Deputy DDR&E (R&AT)

Dr. Ruth M. Davis

Responsibility for the technology base portion of the Department of Defense research, development, test and evaluation program was assumed recently by Dr. Ruth M. Davis.

Appointed Deputy Director of Defense Research and Engineering (Research and Advanced Technology), Dr. Davis was, until she transferred to DoD, the director of the Institute for Computer Sciences and Technology, National Bureau of Standards. She has been engaged since 1962 in various areas of computer information technology.

During 1976 she was an adjunct professor at the Morre School of Engineering, University of Pennsylvania. She has taught in graduate schools of American University and the University of Maryland, and was a visiting professor for three years at

the University of Pittsburgh.

Other key career assignments have included staff assistant for Intelligence and Reconnaissance, Office, Director of Defense Research and Engineering, OSD; associate director for R&D and director, Lister Hill National Center for Biomedical Communications, National Library of Medicine, National Institutes of Health.

Dr. Davis has a BA degree in mathematics from American University and MA and PhD degrees from the University of Maryland, (all SCL).

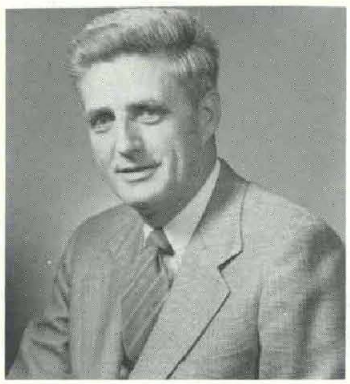
Elected to the National Academy of Engineering in 1976, and the National Academy of Public Administration in 1974, she is on the Advisory Council of the Electric Power Research Institute, and was on the Maryland Governor's Science Advisory Council (1972-77).

Listed in *Who's Who in America, American Men and Women of Science,* and *Who's Who of American Women,* she received the National Civil Service League Award in 1976, a Federal Women of the Year Award in 1972, and a Rockefeller Public Service Award in 1973.

Dr. Davis has published more than 100 articles in professional media. She is a member of the Operations Research Society of America, Mathematical Society of America, and Association for Computing Machinery.

LaBerge Assumes Army Under Secretary Duties

Dr. Walter B. LaBerge, former assistant secretary general for Defense Support, North Atlantic Treaty Organization, has been sworn in as Under Secretary of the Army, succeeding Norman R. Augustine, who resigned in January to return to industry.



Dr. Walter B. LaBerge

Dr. LaBerge served during 1973-76 as assistant secretary of the Air Force (Research and Development), following assignments with the U.S. Naval Weapons Center, CA, as deputy TD and later as technical director.

Assignments with Philco-Ford Corp. included vice president, Electronics Group; division vice president, Western Development Laboratories (WDL); vice president, R&D Corporate Staff; director, Houston Operation; and director of Engineering, WDL.

His academic credentials include a 1944 BS degree in naval science, a 1947 BS degree in physics and PhD degree in physics, all from the University of Notre Dame. Memberships have included Air Force Scientific Advisory Board, and Naval Operations Industry Advisory Committee.

Shoemaker Assigned as FORSCOM Deputy Commander

LTG Robert M. Shoemaker

LTG Robert M. Shoemaker, commander since 1975 of III Corps and Fort Hood, TX, has been selected as deputy commander, U.S. Army Forces Command, Fort McPherson, GA.

Graduated from the U.S. Military Academy in 1946 with a BS degree in military science, he has completed requirements at the Army Command and General Staff College, Army War College and the Army Infantry School (basic and advanced courses).

During 1970-75, LTG Shoemaker served consecutive assignments at Fort Hood as deputy commander and chief of staff, III Corps; deputy commander, MASSTER (since redesignated TCATA-TRADOC Combined Arms Test Activity); and commander, 1st Cavalry Division, Airmobile (TRICAP).

Other assignments have included assistant division commander and chief of staff, 1st Cavalry Division (Airmobile), Vietnam; assistant and later chief, Plans and Programs Division, Office of the Director of Army Aviation, Office of the Assistant Chief of Staff for Force Development.

LTG Shoemaker wears the Distinguished Service Medal, Silver Star with Oak Leaf Cluster (OLC), Legion of Merit, Distinguished Flying Cross, Bronze Star Medal, Air Medal, Army Commendation Medal with OLC and Combat Infantryman Badge (2d award).

Dickinson Selected as CORADCOM Commander

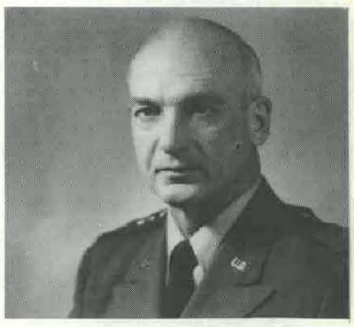
MG Hillman Dickinson, assigned since 1974 to the Office, Deputy Chief of Staff for Research, Development, and Acquisition, Department of the Army, is the new commander of the U.S. Army Communications R&D Command (CORADCOM), Fort Monmouth, NJ.

Graduated in 1949 from the U.S. Military Academy, MG Dickinson has an MS degree in physics from Columbia University and a PhD in physics from Stevens Institute of Technology. His military schooling includes the Command and General Staff College, Army War College, and Armor School Basic and Advanced Courses.

During 1973-74, MG Dickinson was deputy commander, U.S. Army Training Center, Fort Knox, KY, following an assignment as senior adviser with the 1st Regional Assistance Command, MACV.

Other key assignments have included deputy director, Defense Communications Planning Group, Joint Task Force 728, Washington, DC; plans officer, U.S. Military Systems Command, Vietnam; and squadron commander, 11th Armored Cavalry Regiment, Vietnam.

Among his military honors are the Legion of Merit with three Oak Leaf Clusters, Bronze Star Medal with "V" Device and OLC, Meritorious Service Medal and Air Medals with "V" device.



MG Hillman Dickinson

Stevens Commands New Aviation R&D Command

MG Story C. Stevens

MG Story C. Stevens, deputy commander of the U.S. Army Aviation Systems Command, St. Louis, MO, since 1976, is commander of the recently established U.S. Army Aviation Research and Development Command (AVRADCOM).

MG Stevens has a BS degree in chemical engineering from Purdue University and BS and MS degrees in aeronautical engineering from Georgia Institute of Technology. He is also a graduate of the Command and General Staff College, and National War College.

MG Stevens has served duty tours as commander, Kaiserslautern (Germany) Army Depot; commander, 1st Support Brigade and community commander, Mannheim, Germany; and comptroller, HQ Military Traffic Management and Terminal Service, Washington, DC.

Other assignments have included chief, Airmobility Division, Directorate for Research, Development and Engineering, HQ Army Materiel Command; commander, 58th Transportation Battalion and deputy group commander, 34th Group, Vietnam; and systems analyst and chief of Aviation, Weapons Systems Analysis Directorate, Office, Army C of S.

MG Stevens is a recipient of the Distinguished Flying Cross, Legion of Merit with two Oak Leaf Clusters (OLC), Bronze Star Medal with OLC, Air Medal (13 awards), Meritorious Service Medal and the ACM.

Thurman Gets 3d Star, TRADOC DC Assignment

MG John R. Thurman III

MG John R. Thurman, a veteran of more than 31 years of military service, has been approved by Secretary of Defense Harold Brown for promotion to 3-star rank and assignment as deputy commander, U.S. Army Training and Doctrine Command.

MG Thurman currently wears five hats as commander, U.S. Army Combined Arms Center; commander, U.S. Army Combined Arms Combat Developments Activity; commandant, Army Command and General Staff College; commander, Com-

(Continued on page 30)

bined Arms Training Development Activity; and commander, Army Disciplinary Barracks, Fort Leavenworth, KS.

Graduated from the U.S. Military Academy, he also has a BS degree in international affairs from George Washington University. He has completed requirements at the Command and General Staff College, Armed Forces Staff College, Naval War College and Artillery and Guided Missile School.

MG Thurman served during 1975-76 as commander, 2d Infantry Division, Eighth U.S. Army, Korea, following assignments in the Office of the Chief of Staff and Office of the Assistant Vice Chief of Staff, U.S. Army, Pentagon, Washington, DC.

Foreign duty tours have included assistant division commander, 8th Infantry Division, U.S. Army, Europe; assistant commander, 25th Infantry Division, Vietnam; and deputy chief of staff, Plans, III Marine Amphibious Force, MAC, Vietnam.

Among his military honors are the Legion of Merit with five Oak Leaf Clusters (OLC), Distinguished Flying Cross with OLC, Bronze Star Medal with "V" device and four OLC, the Air Medal, Army Commendation Medal and Purple Heart.

Lunn Directs DARCOM Development and Engineering

MG Robert J. Lunn

Director of Development and Engineering, HQ U.S. Army Materiel Development and Readiness Command, is the new title of MG Robert J. Lunn, who took over duties of that office Sept. 28.

MG Lunn completed a 3-year tour of duty at Fort Bliss, TX, serving first as assistant commandant, U.S. Army Air Defense School, and was promoted to 2-star rank June 11, 1976. He assumed command of the Air Defense Center and Fort Bliss, TX, June 14.

Immediately prior to assignment to Fort Bliss, MG Lunn was deputy commander, 32d Army Air Defense Command, Kaiserslautern, Federal Republic of Germany. An assignment as assistant to the Secretary of the Army preceded assumption of command of the 94th Air Defense Artillery Group in August 1971.

Another key assignment, following graduation from the Army War College in 1968, was chief of the Air Defense and Missile Division, Office of the Chief of Research and Development, Department of the Army.

Similarly, he took command of the 4th Missile Battalion, 44th Artillery in Korea, after graduating in 1965 from the U.S. Army Command and General Staff College, Fort Leavenworth, KS.

Graduation from the University of Arizona in 1961, with a master's degree in aerospace engineering, was followed by assignment as project officer, Lance Missile Development Program, Artillery Board, Fort Sill, OK.

After graduating from the United States Military Academy in 1950 with a BS degree, MG Lunn was assigned to the 8th Antiaircraft Artillery Battalion at Sault Saint Marie, MI, until April 1951.

MG Lunn then commanded B Battery, 44th Antiaircraft Artillery Battalion, Camp Stewart, GA, followed by command of batteries in Japan and Colorado. Graduated from the British School of Antiaircraft Artillery, Wales, in 1956, he then served with the 32d Antiaircraft Artillery Brigade in England and Germany.

Among his military honors are the Legion of Merit with OLC, Meritorious Service Medal and Army Commendation Medal w/OLC.

Dr. Hermann Takes Over as Principal DASD (CCC&I)

Newly appointed as Principal Deputy Assistant Secretary of Defense (Communications, Command Control and Intelligence), Dr. Robert J. Hermann accepted that duty after serving since 1975 as special assistant to GEN Alexander Haig, Supreme Allied Commander and Commander-in-Chief, Europe, with NATO.

Identified in progressively responsible positions with the National Security Agency for 20 years until 1975, Dr. Hermann served GEN Haig in the area of Strategic Warning and Combat Information Systems.

Assignments with NSA have included chief, Office of Systems Engineering; deputy assistant director for Science and Technology; acting chief, Office of Systems Management; and assistant to NSA Director.

During 1955-57, Dr. Hermann was a U.S. Air Force electrical engineer assigned to the NSA. Following completion of active duty, he was retained as an NSA consultant while serving as a professor at Iowa State University.

Returned to NSA in 1962 under a Fellowship, he served on the Technical Planning staff and during 1964-65 on the Research and Engineering staff, including a detail in the Office, Director of Defense Research and Engineering.

Dr. Hermann's academic credentials include BS and MS degrees and a doctorate in philosophy, all from Iowa State U.

Dr. Robert J. Hermann

Babers Succeeds Baer as XM1 Project Manager

BG Donald M. Babers

BG Donald M. Babers, deputy commander since 1976 of the U.S. Army Tank-Automotive Materiel Readiness Command, Warren, MI, has succeeded MG (P) Robert J. Baer as project manager of the XM1 main battle tank. MG Baer is now deputy CG for Materiel Development, U.S. Army Materiel Development and Readiness Command (DARCOM).

BG Babers was director, Procurement and Production, during 1975-76 and project manager, M60 Tank Production at the Tank-Automotive Command. That duty followed an assignment as commander, 46th Support Group, 1st Corps Support Command, XVIII Airborne Corps, Fort Bragg, NC.

Assignments at the Tank-Automotive Command included project manager, M561/XM705 Truck Vehicle Programs; director of Procurement and Production; and deputy for Logistical Support.

BG Babers has a BA degree in secondary education from Oklahoma A&M College and an MBA degree from Syracuse University. He has completed requirements at the Command and General Staff College, Industrial College of the Armed Forces, Artillery and Missile School (Basic Course) and Ordnance School (Basic and Advanced Courses).

BG Babers wears the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal, Meritorious Service Medal, Army Commendation Medal with two OLC and the Purple Heart.

Watts Departs MIRCOM for 21st Support Command

BG David E. Watts

BG David E. Watts, former deputy commander of the U.S. Army Missile Materiel Readiness Command, Redstone Arsenal, AL, reported in August for new duties as deputy commander, 21st Support Command, Germany. His successor at MIRCOM has not been designated.

Assigned to Redstone in 1976 following a tour as chief of staff, U.S. Army Japan, BG Watts commanded the 1st Infantry Division Supply and Transportation Battalion in Vietnam during 1967-68. He later commanded the Support Command of the 1st Cavalry Division at Fort Hood, TX.

A twice wounded combat veteran, he is a graduate of the University of Connecticut and has a master's degree in logistics management from the U.S. Air Force Institute of Technology. He is a graduate of the Command and General Staff College and the Army War College.

BG Watts wears the Legion of Merit, Bronze Star Medal with Oak Leaf Cluster (OLC), Meritorious Service Medal, Air Medal (3 awards), Purple Heart with OLC and Combat Infantryman Badge.

Dr. Dobbins Joins Test and Evaluation Command

Dr. Delaney A. Dobbins

Dr. Delaney A. Dobbins was awarded the Decoration for Exceptional Civilian Service with the U.S. Army Tropic Test Center, Panama Canal Zone, when he left recently for a new position at HQ U.S. Army Test and Evaluation Command, APG, MD.

The award recognized him for his achievements during more than a decade of service with the USATTC on two tours of duty, the latter since 1970 after a 3-year absence.

Dr. Dobbins is now serving in a dual role as acting deputy for analysis (and also assistant deputy for analysis) to TECOM Commander MG Patrick W. Powers. He was chief, Technical Division, USATTC, when he departed from Fort Clayton, CZ.

Preceding his initial assignment to Panama in 1963, he served with the U.S. Army Behavioral Sciences Research Laboratory (BESRL), Washington, DC; with a private consultant firm in Florida; and as research director at the Louisiana State Department of Institutions. He has BA, MA and PhD degrees from Louisiana State University.

During 1967-70, Dr. Dobbins was a staff scientist with the Army Research Office, Office of the Chief of Research and Development, Department of the Army. Key areas of study with the USATTC have included tropic materiel deterioration, jungle sound propagation and visibility, mass data collection, and drug evaluation.

He earned a DA Meritorious Civilian Service Award, three Outstanding Performance Awards and a Sustained Superior Performance Award.

Leszczynski Gets Training Devices PM Assignment

COL J. J. Leszczynski

COL Joseph J. Leszczynski, commander of the U.S. Army Training Device Agency (USATDA) at the Naval Training Center, Orlando, FL, in 1975, until he went to Korea as Division Artillery commander, 2d Infantry Division, returned in July as project manager, Training Devices.

Commissioned in 1953 upon graduating from OCS at Fort Sill, OK, he is also a graduate from the U.S. Army Command and General Staff College, and the Army War College. He holds a BA degree from Park College, Parkville, MO, and MS degree from Shippensburg State College.

COL Leszczynski held R&D assignments in the Office of the Chief of R&D (OCRD) and at the U.S. Army Materiel Command (AMC) as special assistant to the deputy commander for Materiel Acquisition.

An airborne-qualified artillery officer, the colonel has commanded troops at every level through Division Artillery, including the 1st Airborne Artillery Battalion, 320th Artillery, 82d Airborne Division, Fort Bragg, NC (1969-70); and the 3d Battalion, 319th Airborne Artillery, 173d Airborne Brigade in Vietnam (1968-69).

Among his awards and decorations are the Legion of Merit, Soldier's Medal, Bronze Star Medal with "V" device and two Oak Leaf Clusters (OLC), Air Medal w/9 OLC, Army Commendation Medal, Military Service Medal, and the Vietnamese Cross of Gallantry w/Silver Star.

MIRADCOM Establishes Antitank Missile System PO

COL Joseph O. Lax Jr.

Development of the new Advanced Heavy Antitank Missile System is now under a new provisional project office established at HQ U.S. Army Missile R&D Command, Redstone Arsenal, AL.

COL Joseph O. Lax Jr. is project manager and Clarence Tidwell, former chief, Pershing Program Management Office, is his civilian deputy. A provisional office means formal acceptance and approval by Army is pending.

MIRADCOM is looking at a variety of concepts for the AHAMS role with new and improved capabilities in countermeasure and smoke environments, and featuring a faster, longer-range missile that will have a secondary self-defense capability against aircraft.

The system is to be fired from a ground tripod or mounted on vehicles such as helicopters, M-113 APC and the Infantry Fighting Vehicle.

MIRADCOM has conducted extensive research at Redstone exploring new antitank technology and currently is managing a contract with Northrop Corp. for a concept definition study on AHAMS and development of basic guidance link hardware. The command plans to award several contracts next year to get ideas on developing the new tank killer.

COL Lax was until assigned to his new duties commander of the 7th Infantry Division Support Command, Fort Ord, CA. He graduated from the Citadel with a BS in chemistry and has a master's degree in industrial management from Babson Institute. He is a graduate of the Command and General Staff College (C&GSC) and the Army War College (AWC). He has served in Germany and Vietnam. Honors include the Bronze Star Medal, Legion of Merit, and Army Commendation Medal w/OLC.

Hoge Becomes 10th ETL Commander/Director

COL Philip R. Hoge

COL Philip R. Hoge, a former commander of the 10th Engineer Battalion, 3d Infantry Division, has assumed duties as the tenth commander and director of the U.S. Army Engineer Topographic Laboratories (ETL), Fort Belvoir, VA. He succeeds COL Maurice K. Kurtz Jr., who retired July 31, with 28 years service.

COL Hoge has served as deputy community commander, Kitzingen, Germany; chief, Mapping and Charting Branch, Military Operations Division, USAREUR, and Seventh Army; and executive, 1st Engineer Battalion, 1st Infantry Division, Vietnam.

Assigned to the Department of Army Staff from 1966-68, COL Hoge was chief of the Budget Branch, Office, Deputy Chief of Staff for Communications-Electronics. He later participated in special study groups for the Chief of Staff, Army, and the Deputy Chief of Staff for Personnel.

A graduate of the University of Missouri, COL Hoge has a master's degree in geodetic science from Ohio State University. He is also a graduate of the C&GSC and AWC.

Among his military awards are the Distinguished Flying Cross, Bronze Star with "V" device and two oak Leaf Clusters (OLC), Air Medal with four OLC, and the Army Commendation Medal (ARCOM) with OLC.

Klugh Takes Command of Dugway Proving Ground

COL James R. Klugh

COL James R. Klugh, Dugway Proving Ground's new commander, assumed that title following a tour of duty as chief of staff, U.S. Army Tank-Automotive Materiel Readiness Command, Warren, MI.

Commissioned through the Reserve Officer Training Corps in 1953, COL Klugh has a bachelor's degree from South Carolina State College and a master's degree in public administration from Shippensburg (PA) State College. He is a graduate of the C&GSC and AWC.

COL Klugh has served assignments in Korea, Europe and Vietnam. He wears the Legion of Merit with Oak Leaf Cluster (OLC), Meritorious Service Medal, ARCOM w/2 OLC and the Air Medal w/"V"

Petersen Assigned as APG Deputy Commander

COL Donald F. Petersen

COL Donald F. Petersen assumed duties recently as deputy commander of Aberdeen (MD) Proving Ground, folowing a one-year tour in Korea as director of Plans, Training and Security for the Yongsan Garrison.

COL Petersen served with the 31st Infantry Regiment in Korea and two tours in Vietnam with the 101st Airborne Division and the 24th Corps. Tours at Fort Bragg, NC, were with the 325th Airborne Infantry Regiment and the Institute for Military Assistance.

Other key assignments have in-

cluded the 25th Infantry Division, Hawaii; Continental Army Command, Fort Monroe, VA; HQ First Army, Governor's Island, NY; and Basic Combat Training Brigade, Fort Leonard Wood, MO.

In 1952 he graduated with a BS degree in forest management from North Carolina State University. He is a qualified Army aviator and has completed requirements of the Army Command and General Staff College, and the Infantry Advanced Course.

COL Petersen is a recipient of the Legion of Merit, Distinguished Flying Cross, Bronze Star Medal, Meritorious Service Medal (three awards), Air Medal (four awards) and the Army Commendation Medal (two awards).

Rawlinson Heads Atmospheric Sciences Laboratory

COL William E. Rawlinson Jr., former director, Command and Executive Development Studies, Army War College, has assumed new duties as commander/director of the Atmospheric Sciences Laboratory, the largest tenant organization at White Sands Missile Range, NM, and an element of the U.S. Army Electronics R&D Command, Adelphi, MD.

Graduated from the U.S. Military Academy in 1953, he has a master's degree in business administration from George Washington University and has finished the Industrial College of the Armed Forces course.

COL Rawlinson enlisted in the U.S. Marine Corps during World War II and served two years. After graduating from the USMA, he served in nine campaigns in Vietnam, including command of an artillery unit during the 1968 TET offensive.

His military decorations include the Silver Star, Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal with OLC, Purple Heart, Meritorious Service Medal with OLC and Army Commendation Medal.

Brown Manages Tilt Rotor Aircraft Project Office

LTC James H. Brown has been appointed manager, Tilt Rotor Research Aircraft Project Office, Army Air Mobility R&D Laboratory (AMRDL), NASA-Ames Research Center, Moffett Field, CA.

LTC James H. Brown

Dr. Hans Mark, AMRDL, head of the Ames Directorate, announced the appointment. LTC Brown, project deputy manager of the project for almost two years, succeeds David D. Few, NASA-Ames Research Center, promoted to assistant chief, V/STOL Technology Division.

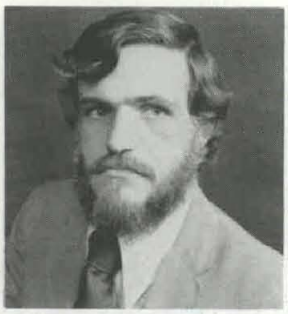
The XV-15 Tilt Rotor Research Aircraft is a joint Army-NASA project being built by Bell Helicopter Textron Corp. The 42-foot long, 32-foot wing span aircraft incorporates wingtip-mounted engines and transmissions. The 25-foot prop rotors tilt from a helicopter position for hover, vertical takeoffs and landings to a horizontal position for forward flight.

In the airplane mode, the aircraft is capable of forward speeds in excess of 300 miles per hour. The tilt rotor is expected to operate with less noise than conventional helicopters or turboprop aircraft of comparable size.

Two aircraft will be built and tested under the contract. The No. 1 aircraft made its first initial hover flight May 3 at Arlington, TX.

Crawford Gets TILO Post at Chemical System Lab

Charles R. Crawford, an operations research analyst, is the new technical industrial liaison officer (TILO), Plans and Programs Office, U.S. Army Chemical Systems Laboratory, Aberdeen (MD) Proving Ground.



Charles R. Crawford

Formerly assigned to CSL's Systems Analysis Office, Development and Engineering Directorate, he has a BS degree in mathematics from California State College and has done graduate work at George Washington University and the University of Delaware.

Crawford served as an Army mathematical assistant from 1965 until he joined the civilian staff at Edgewood Arsenal in 1968.

Army R&D — 15 Years Ago

Materiel Command Activation Merges Tech Services

U.S. Army Materiel Command (AMC) assumption of operational responsibility merged most of the traditional roles of 5 of the 7 Technical Services, in the "interest of research and development acceleration essential to a modern Army."

From headquarters in Washington, DC (Bldg. T-7 at Gravelly Point), AMC Commander LTG Frank M. Besson Jr. exercises control over a network of military installations involving about 166,000 civilian employes and 20,000 officers, with a total inventory of $23.5 billion and estimated annual expenditures of $7.5 billion.

Empowered as no other command in U.S. Army history, AMC directs activities of laboratories, arsenals, depots, proving grounds, test ranges, procurement offices and transportation terminals throughout the U.S.

CRD Message Urges In-House 'Pursuit of Excellence'

Army Chief of R&D LTG Dwight E. Beach, in a letter addressed to the chiefs of all Department of the Army R&D in-house laboratories and arsenals, stated in part:

"The President and the Secretary of Defense have vigorously acknowledged the importance of federal laboratories such as yours. They have placed new emphasis on in-house establishments as the focal points for Defense Department research and development. Realizing the great value of the laboratories, yet sensing weaknesses in them, the Secretary of Defense has directed that positive actions be taken to augment their effectiveness . . . . I am sure that the renewed appreciation of our laboratories by the highest authorities is as heartening to you as it is to me. I have long considered that the in-house labs are the spearhead of the entire R&D organization.

"However, I have also felt that our pursuit of excellence for these facilities has not been as unrelenting as it might be. Unquestionably, the quality of our R&D depends upon the quality of our laboratories and their competence remains largely in your hands, no matter what program is prescribed . . . . You must attain the highest standards or we will fail."

Army Initiating Program Based on Bell Report

Recommendations in the Bell Report, a penetrating study of Government R&D contracting procedures and in-house laboratory capabilities, prepared at the request of President Kennedy, are getting high-priority treatment by Army R&D top management.

Army Regulation 705-55, Management of U.S. Army Research, Development, Testing and Evaluation Laboratories or Activities, emphasized the importance of top-quality management at the laboratory level to utilize properly, highly motivate and retain the most competent scientists, engineers and technicians obtainable.

One of the most difficult bottlenecks to solution of this problem of retaining superior personnel thoroughly trained in Army R&D methodology gave a prospect of opening up late in August. Congress appeared almost certain to approve a modified version of President Kennedy's plan to raise salaries of government scientific and engineering personnel to a level more commensurate with private industry salaries.

The Bell Report stressed the need for improved in-house capabilities of planning, supervising, coordinating, controlling and evaluating all phases of the U.S. Government R&D program. It recommended that constant attention be given to improve Government-industry R&D partnership relations in making R&D dollars return a maximum in defense systems.

The Bell Report was prepared by a committee headed by David E. Bell, director of the Bureau of the Budget, and consisted of: Robert S. McNamara, Secretary of Defense; Dr. Glenn T. Seaborg, chairman of the Atomic Energy Commission; James E. Webb, administrator, National Aeronautics and Space Administration; Dr. Alan T. Waterman, director, National Science Foundation; Dr. Jerome B. Wiesner, special assistant to the President for Science and Technology; and John W. Macy Jr., chairman, U.S. Civil Service Commission.

WRAIR Dedicates Wing, Biomedical Research Reactor

Walter Reed Army Institute of Research, Washington, DC, commemorated one of the epochal advances in its 69-year history as one of the world's great medical research centers with dedication of a new wing to the headquarters building and a 50,000-watt nuclear reactor designed for biological research.

In line with the U.S. Army Medical Service research program, intended to establish a medical capability for U.S. forces to fight under all environmental conditions, the 5-story wing provides about 80,000 feet of floor space. In addition, it has two subterranean levels for the reactor.

Commercial Construction Equipment in Noncombat Support Roles

By Billy J. Slinger

Using many of the procedures developed in the Army's Commercial Construction Equipment (CCE) program, the Department of Defense is launching a new program to provide commercial equipment to noncombat troops.

The DoD program is still in its initial planning phase, but the Army's CCE effort has been under way since 1969 and is currently a special program effort with its own project leader. Since its inception, CCE has been closely associated with the mechanical and construction equipment efforts of the U.S. Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA.

The Department of the Army directed in 1969 that commercial construction equipment be utilized by combat service support units. Objectives were: to reduce the acquisition time; insure fielding of equipment current with the latest technology; reduce diversification of end items and repair parts in the inventory; and to procure and support equipment at the lowest life-cycle cost.

MERADCOM contributed to development of CCE methodology. The basic concept is to survey commercial users and document their experience with a data report - used to formulate a performance-type specification that serves to reduce government testing.

A 2-step formally advertised solicitation for an unmodified end item is issued to any manufacturer who has a product fielded successfully for more than a year. The contract is awarded on lowest bid price. Fielding criteria, training, warranties, commercial manuals, and parts support for 45 days are included.

Through the CCE program, the Army has purchased and fielded 12 different commercial items for noncombat construction support uses, and is considering quantity procurement of five additional items during FY77.

Included in the equipment already fielded are three items that served as the pilot program - a 25-ton truck-mounted hydraulic crane, a 1,500-gallon tank-type truck mounted distributor for bituminous material, and a 20- ton, 71,000 GVWR, on- and off-highway dump truck.

All of the pilot item contracts were to be multi-year (3 to 5) awards using the 2-step formal advertising method of procurement. In addition, the crane contract was to be awarded on a life-cycle cost basis.

Each choice proved excellent in that it presented a unique example or experience. However, the six crane manufacturers who submitted proposals did not have sufficient records for an award based on life-cycle cost factors.

Manufacturers normally install the distributor (tank and distribution system) on a truck chassis furnished by the buyer. The Army opted for the M809 series, 5-ton military designed truck chassis as government-furnished equipment, and the distributor was mounted on the M809 series chassis for standardization.

25-Ton Hydraulic Crane

10-14-Ton Steel-Wheeled Roller

In the case of the dump truck, the Army specified the available component options for the engine, transmissions, axles, suspension, tires and dump body, which is akin to the same procedures used by other truck purchasers in the commercial marketplace.

A 4-year contract was awarded to Harnischfeger Corp. for 560 units of the commercial model MT-250 crane. A 5-year contract was awarded to E.D. Etnyre for 150 units of the Model D-60 distributor mounted on an M809 series truck chassis. A 5-year contract was awarded to International Harvester Co. for 700 units of the model F5070 dump truck.

These pilot items have been fielded in the United States and overseas. Reports indicate that the troops are well pleased with them. After the pilot items proved practicability of the CCE plan, the Department of the Army issued a letter providing guidance for future acquisition of Commercial Construction Equipment, based on lessons learned during the pilot program.

In considering the future of CCE and the use of its procedures in establishing the new Department of Defense program, the logical question is: Does the CCE procurements fulfill needs of troop users? Also, is the best equipment being fielded in the least amount of time and at the lowest possible cost?

MERADCOM is dedicated to the CCE program and has appointed a project officer for Commercial Equipment to insure that it continues to thrive. User's reports are laudatory regarding the fulfillment of mission needs.

Equipment procured is modern, highly productive, is under a warranty for a one-year period, and availability has been outstanding. Kits are being developed by MERADCOM for such things as towing capabilities, blackout lights, lifting and tiedown eyes, and winterization to increase versatility.

With respect to acquiring the best equipment, in the least time, at the lowest cost, here again the Army gets high marks. Equipment represents the latest state-of-the-art and is being produced by large corporations for vast commercial enterprises in the United States and overseas. Parts support, training and manuals are available from the manufacturing plants, franchised dealers, distributors and warehouses in the United States and overseas.

Since the Army is relying on the commercial equipment manufacturer's R&D efforts, the time required to field an end item is 31 months - as compared with 44 months required when an end item is *modified* by the Army for a military peculiar requirement, or 72 months required for Army to design, produce and field an end item.

Manufacturers compete for the Army's business and reductions of 30 to 40 percent off list prices are not uncommon for large Army quantities since there are no "military peculiar" items.

We learn as we go along and it certainly appears we have learned that there is a valid place for commercial equipment in the Army's noncombat support role. Evident also is that commercial equipment can be fielded faster, at less cost, is modern, highly productive, and effective. The Department of Defense is wise to follow the furrows plowed by the CCE program and save the nation's defense dollars.

ITEMS UNDER CONSIDERATION include 750-cubic feet a minute (CFM) air compressors; a 150- ton an hour (TPH) crushing, screening and washing plant; 15-ton engineer equipment transporter trailers; 25-ton crawler cranes; and 8-cubic-yard concrete mobile trucks.

CCE ITEMS PROCURED AND FIELDED

Description	Contract	Contractor	Model	Quantity
Roller, steel wheel, 10-14-ton	Jun. 74	Hyster Co.	C350B	66
Loader, scoop, 4½-5 cu. yd.	Jun. 74	Clark Equipment Co.	175B	258
Tractor, crawler	Jun. 74	Caterpillar Tractor Co.	D-8K	496
Tractor, w/loader, backhoe	Jun. 74	Deere and Co.	JD410	214
Roller, vibratory	Feb. 75	Tampo Manufacturing Co.	RS 28	176
Roller, pneumatic	Jun. 75	Hyster Co.	C530	103
Tamper, backfill, hand-operated	Jun. 75	Stone Construction Equipment Co.	VR-11	260
Compactor, high-speed	Sep. 75	Koehring Road Div.	K300	205
Tester, density and moisture, nuclear method	Jul. 76	Campbell Pacific Nuclear Corp.	BRC-M82B114	103

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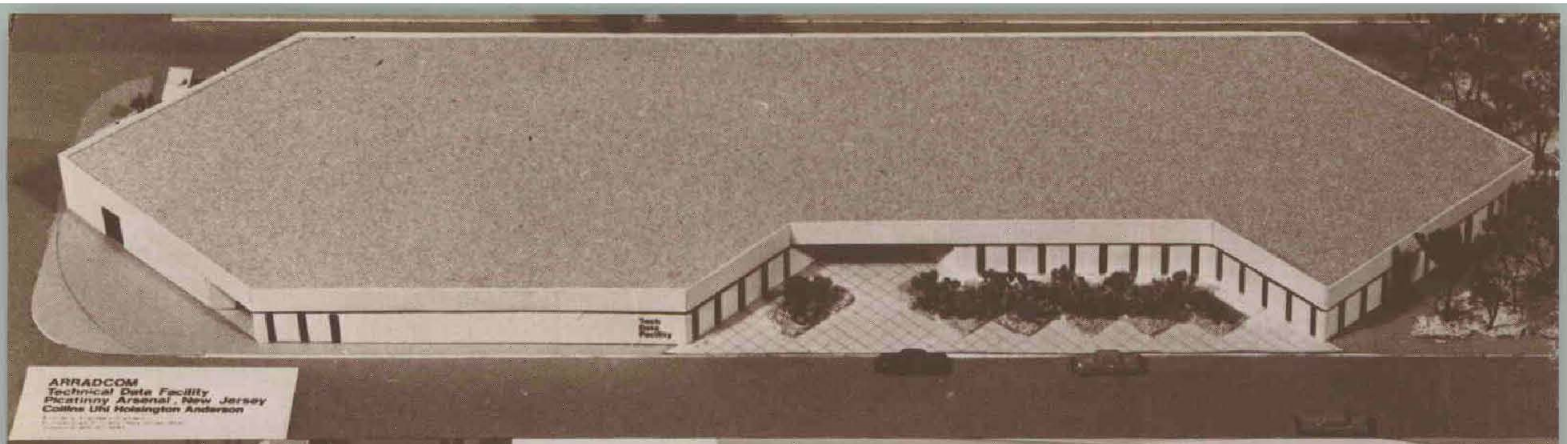
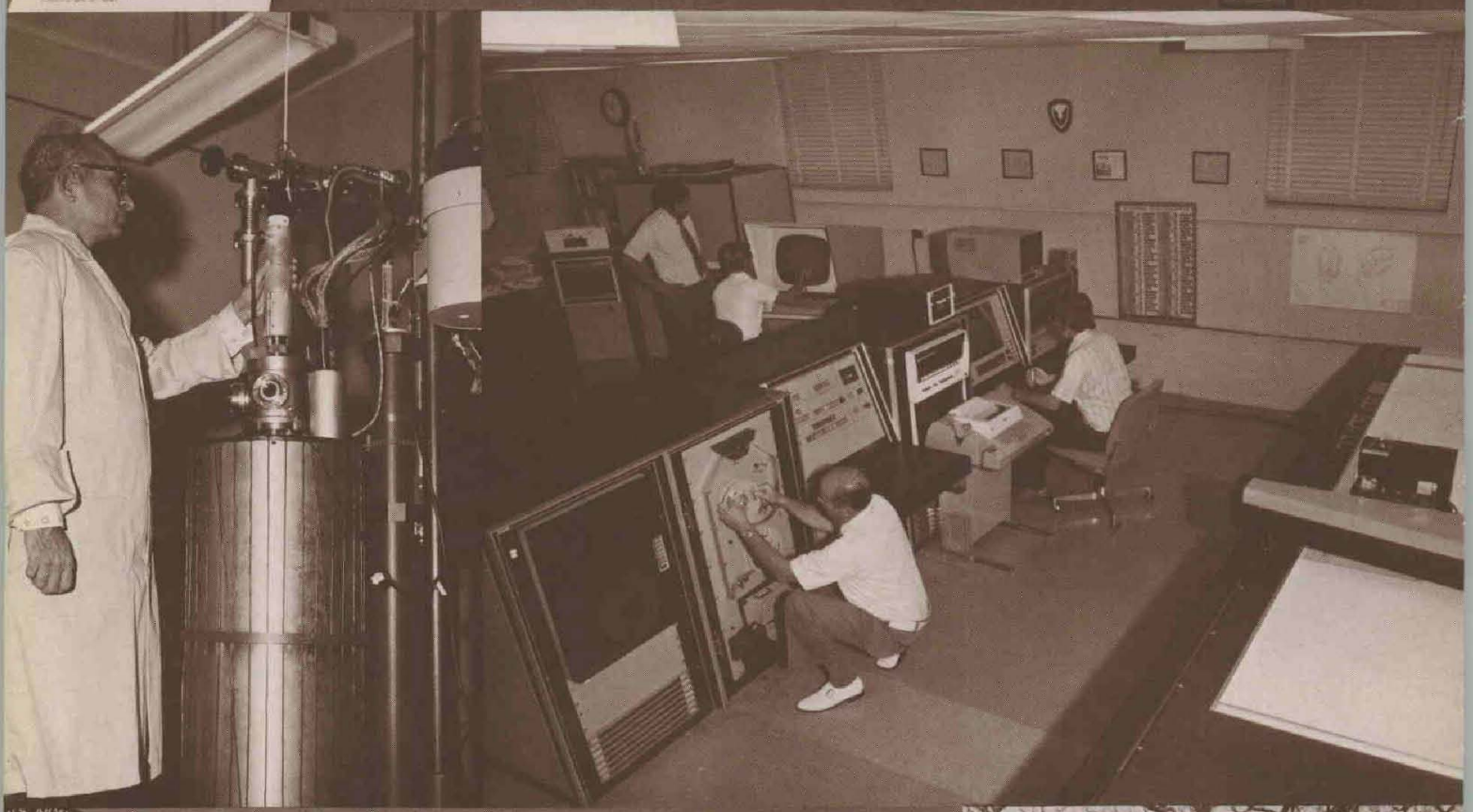
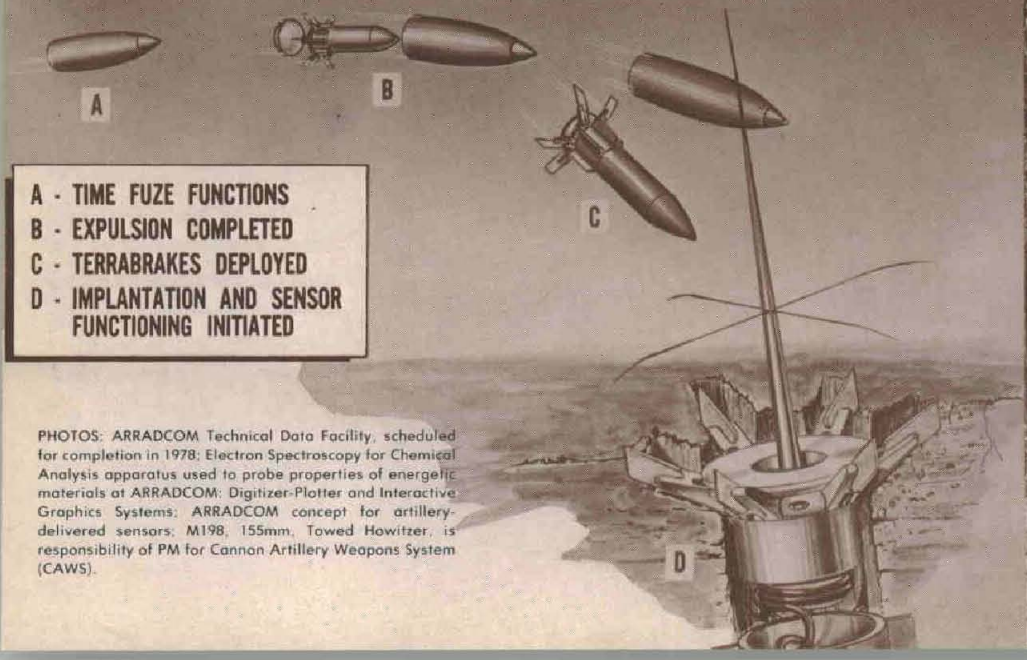


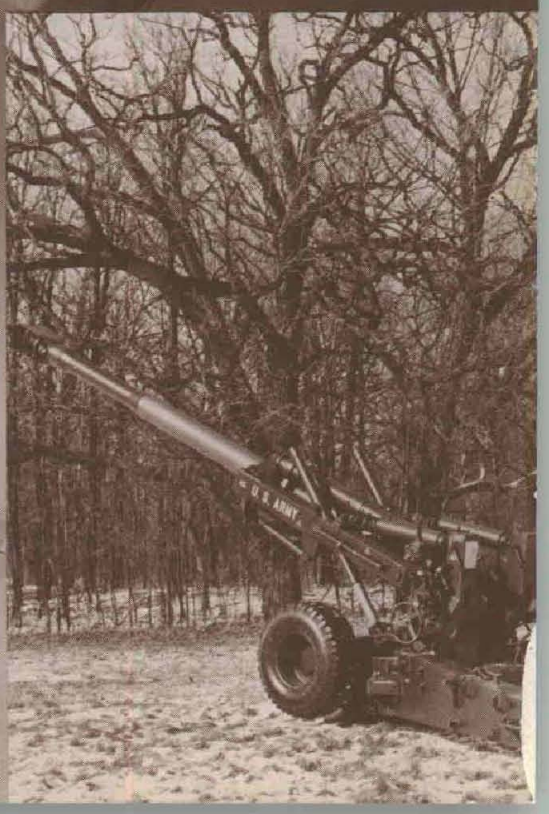
ARRADCOM
Technical Data Facility
Picatinny Arsenal, New Jersey
Collins Uhl Holsington Anderson



ARTILLERY DELIVERED SENSORS
EJECTION AND IMPLANTATION



A - TIME FUZE FUNCTIONS
B - EXPULSION COMPLETED
C - TERRABRAKES DEPLOYED
D - IMPLANTATION AND SENSOR FUNCTIONING INITIATED



PHOTOS: ARRADCOM Technical Data Facility, scheduled for completion in 1978; Electron Spectroscopy for Chemical Analysis apparatus used to probe properties of energetic materials at ARRADCOM: Digitizer-Plotter and Interactive Graphics Systems; ARRADCOM concept for artillery-delivered sensors; M198, 155mm, Towed Howitzer, is responsibility of PM for Cannon Artillery Weapons System (CAWS).