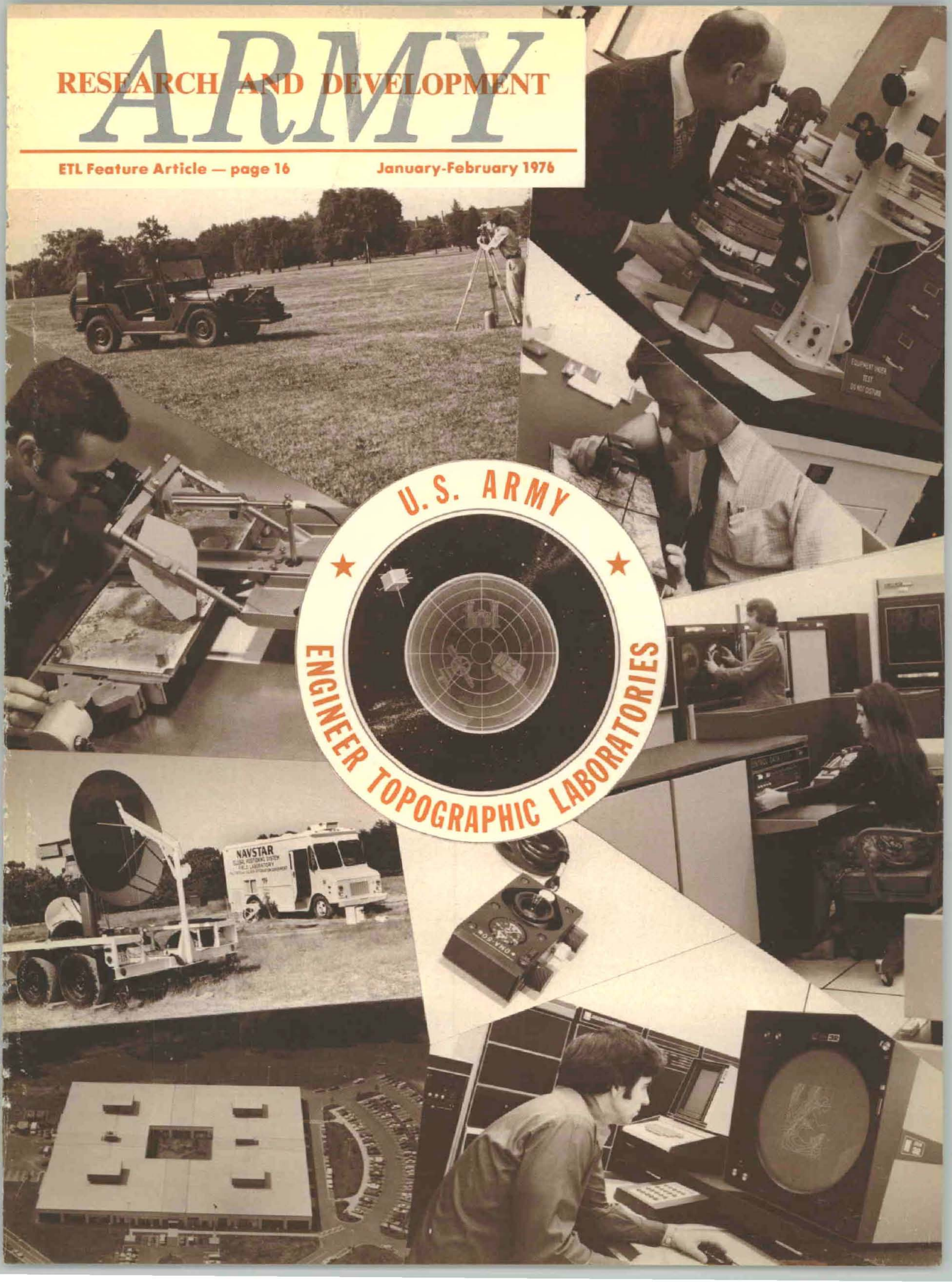
ARMY RESEARCH AND DEVELOPMENT

ETL Feature Article — page 16

January-February 1976



SPEAKING ON . . .

Budget Problems, Materiel Acquisition Cost Reduction

Deputy Chief of Staff for Research, Development, and Acquisition LTG Howard H. Cooksey addressed about 250 attendees at a mid-January luncheon meeting of the National Security Industrial Association in Washington, DC. He emphasized that his most important and consistent problem is that of cost-cutting methods, including technological advances, to reduce materiel costs without sacrificing operational essentials during inflation. The address follows.

LTG Howard H. Cooksey

There are two sayings that apply to my Army-wide responsibility for research, development, and acquisition of military materiel and weapon systems. The first is that if anything can go wrong, it will. The second is that things are seldom as bad or as good as they may seem. This sort of remark is almost always the forerunner of bad news, and the passing of time seldom seems to make bad news go away or become better as rapidly as may be desired.

Time can be a double-edged thing. Sonny Jurgenson is reported to have said one time that he never lost a football game, that he just ran out of time. Time can be both an enemy and a friend. In your business and in mine, this is certainly true. It can provide us a needed breathing space to solve a technical problem or to correct a deficiency. It can be an enemy if we take too much time to develop a system. The result then is that we may have our problems solved by others, in ways we may not like.

Since 1968 there has been a steady series of changes in the materiel acquisition system. Both internal and external influences have caused these changes. There is a steady criticism in news media of defense research and development, our failures and indecisions.

When he was Assistant Secretary of the Army for R&D, Norman Augustine decided to find out if the allegations about nonproductiveness of R&D were true. He undertook a study to find a substantive means of measuring a payoff in R&D. He took a corps of today's Europe-based United States Army forces and first equipped it with 1964 vintage materiel and equipment. Then he augmented it with additional 1964 equipment purchased with the money spent on R&D between 1964 and 1974. Against this augmented force he remeasured that Europe-based corps with our new equipment, the TOW and the Dragon missiles, new helicopters, etc.

The study showed a 25 percent improvement in fighting capability as well as life-cycle cost savings — a clear, demonstratable payoff. But we must make it better. To do this, we have to improve further some of our practices. We must recognize early some of the hurdles that stand in our way and learn how to clear them. What are some of these hurdles, as I now see them?

The first is the Congress whose support is vital to us, critical in fact, to the whole acquisition process. We can design the most cost-effective, deadly weapon system ever conceived, but if Congress does not see fit to support it, the troops will never receive it. We are keenly conscious of this as we begin the FY 1977 budget cycle.

In our associations last year, and in our early contracts this year, we have found a Congress anxious to assert itself and faced with many conflicting problems — a Congress determined to look at the defense budget as a source of funds for solving these problems, a Congress determined to take control of defense spending.

The Budget Control Act is a good example. Committee recommendations are no longer sacred. We saw a Senate authorization bill defeated on the floor. Despite these forces, I believe the Department of Defense had a relatively good year. The liberalism we heard about is present in Congress. The greatest danger to our interests is to retreat to the Pentagon and pout when things go wrong with respect to our budget objectives.

The Honorable Howard Callaway, when he was Secretary of the Army, prescribed an open-door, "glad you asked" policy with Congress. Secretary Hoffmann has continued it. We give the Congress the bad news along with the good. We give it timely and straight. I believe this policy has had good results and will continue to pay off as a way of dealing with the Congress.

We tried last year, and will try again this year, to have the Con-

(Continued on page 20)

Secretary of Defense Statement

Secretary of Defense Donald H. Rumsfeld issued the following statement Jan. 21 prior to his departure for the NATO Nuclear Planning Group meeting in Hamburg, Germany:

Donald H. Rumsfeld

The Fiscal Year 1977 Department of Defense budget will provide the military forces and capabilities essential for deterrence, the maintenance of a worldwide military balance, and the support of U.S. foreign policy — in short, the underpinnings of our freedom and security. The adequacy of our Defense budget must be assessed against the background of trends in the military balance worldwide, trends which are a matter of concern.

Soviet defense spending over the past decade has been increasing steadily in real terms, while at the same time U.S. force levels and defense expenditures in real terms have been decreasing. Momentum on the part of the Soviet Union heightens the danger that the U.S. national security posture could lose its deterrent value in the years ahead, unless positive steps are taken now.

This budget provides for the essential real growth which will ensure that the United States can fulfill its objectives of mutual security, international stability and peace. At the same time the budget reflects a serious effort to achieve restraint.

The FY 1976 Defense appropriations could halt the downward trend of purchasing power, but they will not permit us to take the first steps upward which are essential to reversing the trends which have been running against us. The FY 77 budget will maintain a balanced force structure, modernize weapons systems, and improve the combat readiness of existing forces.

Further, strength is an essential prerequisite to the negotiation of acceptable agreements in the area of arms limitation. At the same time, we are concentrating our efforts on achieving efficiencies within the Department. That will include a search for opportunities for base closures and realignments, streamlining headquarters activities, and conversion of support resources into combat capabilities.

This budget reflects the national security needs of the United States and demonstrates a steadiness of purpose. It represents a balanced program and provides for the minimum essential level of spending required to support a national policy set forth by the President . . . that the United States should possess a military capability second to none.

ARMY RESEARCH AND DEVELOPMENT

ABOUT THE COVER . . .

The U.S. Army Engineer Topographic Laboratories (ETL), an element of the Corps of Engineers, conduct a diversity of research, development, test and evaluation activities. Support is provided primarily to the Defense Mapping Agency but ETL services are used by the U.S. Army Materiel Development and Readiness Command and other federal agencies. ETL's origin dates to 1920 when its predecessor was an engineer detachment of the Army Air Services.

The back cover shows the Dr. Paul Allman Siple Medallion, large bronze medallion and Certificate of Achievement which will be presented to authors of the best technical papers at the biennial Army Science Conference, June 22-25, U.S. Military Academy, West Point, NY.

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Grateful acknowledgement is made for the valuable assistance of Information Offices within the Army Materiel Development and Readiness Command, Office of the Surgeon General, Office of the Chief of Engineers, Army Training and Doctrine Command, Army Forces Command, Office of the Assistant Chief of Staff for Communications-Electronics, Computer Systems Command, and miscellaneous related activities. Use of funds for printing of this publication has been approved by Department of Army, Jan. 1, 1976.

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

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FEATURES

DEPARTMENTS

DISTRIBUTION is based on requirements submitted on DA Form 12-5. Army agency requirements must be mailed to the U.S. Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, MD 21220.

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Selective Scanner . . .

Defense FY 1977 Budget Proposal Items Listed

Acquisition costs of major strategic forces modernization and improvement programs in the proposed FY 1977 defense budget show the biggest increases are planned for the Trident I submarine missile system and the B-1 bomber.

An increase of about $1 billion to $2.9 billion is proposed for Trident. B-1 acquisition of about $1.5 billion compares with $661 million in FY 1976. Development of long-range cruise missiles launched from airplanes and submarines is proposed for acceleration by an increase to $262 million in contrast to $144 million for FY 1976.

Other major items proposed are: $472 million for Minuteman missile improvements including added protection for silos from which they are launched; development of advanced ballistic missile reentry systems and technology, $106 million; development and procurement of an Advanced Airborne Command Post, $99 million; development of systems technology (formerly site defense), $118 million; advanced ICBM technology including MX, a new missile with greatly increased throw-weight, $84 million.

Heading the Army acquisition proposals is $503.6 million for M60A1 and M60A3 tanks, as compared to $460.1 million in FY 1976, and $141 million for the XM-1 tank system, as compared to $39.1 million in FY 1976.

Other Army major budget items include (in millions of dollars): UTTAS helicopter, $213.0; AH-1 G/S Cobra TOW, $128.9; Hawk, $107.0; Dragon, $113.7; Lance, $109.2; Stinger, $71.5; Chaparral, $65.8; Lance, $75.7, M1133A1 armored personnel carrier, $89.4; M88A1 medium recovery vehicle, $84.9; M109A1 howitzer, $46.8.

Budget FY 1977 proposals for Weapon Systems in R&D only include: U.S. Roland, $85M; AAH (Advanced Attack Helicopter), $112.1; Pershing II, $36.3; CH-47 helicopter modernization, $25.9; MICV (Mechanized Infantry Combat Vehicle), $22.9; Cannon Launched Guided Projectiles, $36.1; Bushmaster (vehicle rapid fire weapon system), $22.5; Joint Tactical Communications Program, $37.5.

Over-all strengthening of U.S. general purpose forces is accented by substantial increases in FY 1977 budget proposals. The total request in this category is $41.8 billion — about four times larger than the authority proposed for strategic nuclear forces.

Included in general purpose forces are Army and Marine Corps troops, naval forces (aircraft carriers, surface combatants, maritime patrol aircraft, mine warfare, attack submarines, amphibious forces, logistics support ships), tri-service tactical air forces, and tactical mobility forces.

ETL Admitted to Federal Laboratory Consortium

The U.S. Army Engineer Topographic Laboratories, Fort Belvoir, VA, have been selected to join the Federal Laboratory Consortium for Technology Transfer. Dr. Armando Mancini, director of ETL's Research Institute, is the coordinator.

ETL joins two other Fort Belvoir agencies in the consortium, the Mobility Equipment R&D Command (MERDC) and the Night Vision Laboratory (NVL).

Fifty-two laboratories and centers from the Department of Defense (DoD), Department of Transportation (DoT), National Aeronautics and Space Administration (NASA), Department of Commerce (DoC), and the Energy Research and Development Administration (ERDA) comprise the Federal Laboratory Consortium.

Consortium laboratories offer specialized technological assistance to federal, state and local governments in pollution control, transportation, communications, housing, environmental protection, energy utilization, agriculture, forestry, water and land resources, and law enforcement.

Institutions requesting R&D work from a technology transfer office must fund their charters. Scientists may be detailed temporarily between federal agencies or between state and local government organizations or private businesses. Certain nonrefundable services also are offered.

Members of the consortium act as consultants to organizations and on scientific advisory boards, provide statistical information and other library services, and help to locate excess government property.

ETL offers potential technology transfer in the use of advanced techniques in surveying and measurements of deformations of dams and locks (or large structures in general); use of remote sensing for environmental impact assessments in civil programs; use of special-purpose computers for image processing and digital maps; and in many other techniques and hardware.

WSMR AAOD Earns Accident Prevention Award

The Army Aviation Accident Prevention Award of Honor has been presented to the Army Air Operations Directorate (AAOD), White Sands (NM) Missile Range for 20,000 accident-free flying hours.

CPT Gil Tam, AAOD executive officer, said that the feat was exceptionally noteworthy because of the climatic conditions at WSMR. The high altitude density lessens an aircraft's power and increases flight hazards.

Actual surface altitude at the AAOD flight line is 4,100 feet. However, the temperature increases the density altitude to as high as 6,100 feet. Mountain flying altitudes sometimes reach 12,000 feet.

Credit for the outstanding safety record was acknowledged to the crew of the aircraft, along with maintenance, supply, scheduling and administrative personnel.

AAOD has an inventory of 19 aircraft consisting of three fixed-wing U-8s, five UH-1s and 11 OH-58s. The U-8 and Hueys are utility aircraft. The Kiowa is used for observation purposes.

Multi-Agency Team Evaluates Pershing Firings

Representatives of five U.S. Army agencies and the Federal Republic of Germany Air Force comprised a 20-man evaluation team for Pershing missile Artillery-Ordnance firings, termed the first multi-agency experiment of this type for the Pershing, during January.

Two rounds were fired by batteries of the 3d Battalion, 9th Field Artillery, Fort Sill, OK, and two by units of the Seventh U.S. Army Europe were fired from McGregor Range Camp, about 22 miles northeast of El Paso, TX. All four rounds impacted as programed on White Sands (NM) Missile Range.

The development tests, involving a new Automatic Reference System and Sequential Launch Adapter, raised to 327 the test firings of the Pershing since 1960.

CPT Timothy R. Bodine, head of the evaluation team,

said "results appeared to be very favorable . . . in fact, the idea seemed to work even better than we had hoped it would. This will help to standardize evaluation procedures."

Operational since 1963 with battalions in the U.S. and Europe, Pershing is part of the NATO nuclear shield.

U.S. Army agencies represented on the evaluation team included the Missile R&D Command, 10 members from the Field Artillery Missile Systems Evaluation Group, the Field Artillery School, Field Artillery Training Command, and U.S. Army Europe (USAREUR).

Redstone Arsenal Speeders Being 'Gunned Down'

When a motorist gets "gunned down" by Military Police at Redstone Arsenal, AL, HQ of the Missile R&D Command and the Missile Materiel Readiness Command — both created Jan. 23 from what was the U.S. Army Missile Command — he may not be seriously wounded, except punishment for a traffic violation.

Arguing with the police will not do any good since the evidence for conviction of speeding is indisputable. The new "Speedgun" put into use recently has been "instantly successful" in that it takes only an instant to collect evidence for conviction as charged.

Even at distances of a half-mile or more, regardless of the angle, whether the vehicle is coming into view or going away, the speed is registered on a screen before the MP's eyes. A red light flashes for speed over 100 mph.

Actually, the new device is a miniaturized version of the radar police have been using for years in squad cars. But it does its job without set-up time, as effectively as operators in two cars using conventional radar.

Engineers FY 76 Civil Works Total $2.13 Billion

U.S. Army Corps of Engineers FY 1976 Civil Works projects for which Congress has appropriated $2,130,107,000, including permanent appropriations and $655,719,000 for the Transition Quarter (change of FY from July 1 to Oct. 1), are listed in a recently issued document.

Funding is authorized for 263 construction projects including 15 new starts, 241 continuations and one new land acquisition; also 25 new planning starts and 93 continuing planning projects (total 118). The categories are:

General investigations, $66,836,000 (TQ $17,110,000); construction, general, $1,228,648,000 (TQ $408,741,000); operation and maintenance, $582,073,000 (TQ $153,116,000); general expenses, $42,500,000 (TQ $10,650,000); flood control, Mississippi River and tributaries, $163,250,000 (TQ $60,300,000); flood control and coastal emergencies, $40,400,000 (TQ $3,750,000); special recreation use fees, $1,200,000; permanent appropriations, estimated, $4,500,000 (TQ $1,102,000); revolving fund, $700,000 (TQ $950,000).

President Ford's January 20 budget submission to Congress for FY 1977 shows a slight increase as compared to FY 1976 in the Corps of Engineers Civil Works Program funding. The total proposal is $2,178,895,000, a gain of $48,788,000. The break-out is:

General investigations, $64,255,000; construction, general, $1,266,332,000; operations and maintenance, $583,900,000; general expenses, $47,400,000; flood control, Mississippi River and tributaries, $191,220,000; special recreation use fees, $3,100,000; permanent appropriations, estimated, $4,548,000.

IRTs Improve National Guard Communications

Automated Interim Remote Terminals (IRTs) are being installed throughout the Continental United States to provide faster, more reliable communications between National Guard units and the National Guard Bureau in Washington, DC.

The U.S. Army Communications Command (USACC), headquartered at Fort Huachuca, AZ, has completed installation of the first IRT at the U.S. Property and Fiscal Office, Golden, CO. The terminal consists of an automated card punch system, card reader, visual display unit, chain-link printer and a communications controller. They replaced manual teletype, teletypewriter exchange and telex machines.

The IRT at Golden provides access to the Automated Digital Network through the Automated Multi Media Exchange (AMME) at Oakland, CA. Other IRTs will operate as remote terminals at AMMEs at Huntsville, AL, and Letterkenny, PA.

The upgrading action is the result of joint effort by the Army National Guard Bureau, the Department of the Army, the USACC and the U.S. Army Communications Agency. The program was initially funded at $1.2 million by the National Guard, which is responsible for operating and maintaining the IRTs. The USACC will assume funding for FY 77 and beyond.

Memorandum Initiates U.S./FRG SAM-D Study

Collaboration in a joint study on use of the U.S. Army's SAM-D air defense missile system is called for in a Memorandum of Understanding signed recently by the United States and the Federal Republic of Germany.

Termed Project Successor, the study will deal with potential SAM-D applications in European air defense roles and program commonality among members of the North Atlantic Treaty Organization.

Scheduled to terminate in the summer of 1977, the study is being conducted by the U.S. Army Missile R&D Command's Research and Engineering Laboratories. Study director is James J. Jernigan of the Advanced Systems Concepts Office.

The study team, which totals about 25, includes a German cadre of four headed by LTC Leo Mayer and U.S. representatives from Missile R&D Command, SAM-D Project Office, the Army Air Defense School and Office, and the Office, Assistant Chief of Staff for Intelligence.

Programed to replace the Nike Hercules and Hawk air defense systems, SAM-D is being developed for defense against aircraft of the 1980s and beyond as a mobile and effective system under all weather conditions.

New Pamphlet Lists Quality Assurance Guides

Designed to aid in the conduct of military quality assurance (QA) missions is a new pamphlet listing publications issued by the Departments of Defense and Army, and the Army Materiel Command (since Jan. 23 renamed the Army Materiel Development and Readiness Command).

AMC Pamphlet 310-6, dated 17 November 1975, classified publications for which QA is the proponent agency; those directly related to QA; indirectly related to QA; DoD/DA publications; allied QA publications; allied QA publications; and miscellaneous publications/military specifications.

R&D News . . .

Organizational Changes Continue . . .

Materiel Development and Readiness Command Replaces AMC

LTG George Sammet Jr.
DCG for Materiel Development

U.S. Army Materiel Development and Readiness Command (DARCOM) is the new name for what existed 13½ years as the U.S. Army Materiel Command (AMC).

Established effective Aug. 1, 1962 as a merger of R&D and logistic functions of five of the Army's former seven Technical Services, the Materiel Command was redesignated with Secretary of the Army Martin R. Hoffmann's announcement Jan. 23. Concurrently, he detailed other realignments.

Gone With the Wind of change is the concept of separate development and logistic centers. Henceforth, they are R&D Commands or Materiel Readiness Commands.

Establishment of the new commands is a further refinement of the general concept of reorganization detailed in the April 1, 1974 reports and recommendations of the Army Materiel Acquisition Review Committee (AMARC).

Redesignation as the Army Materiel Development and Readiness Command is explained as being in line with recent announcements of other organizational changes within the AMC — that is, the clear separation of R&D functions from logistics activities.

One of the realignments, as announced in the November-December edition of the *Army Research and Development Newsmagazine*, was the change of title which made the Deputy CG for Materiel Acquisition, along with promotion to 3-star rank, the Deputy CG for Materiel Development. Similarly, the Deputy CG for Logistic Systems became Deputy CG for Materiel Readiness, a 3-star position.

Secretary Hoffmann's announcement also separates the Army Missile Command, headquartered at Redstone Arsenal, AL, into a Missile R&D Command and a Missile Materiel Readiness Command, both expected to be fully operational by Oct. 1.

The commands are established at Redstone Arsenal and the announcement stated that no significant change will impact upon military and civilian employes. About 3,000 employes will be assigned to the Missile R&D Command and 5,000 to the Missile Materiel Readiness Command.

Development and initial procurement of missiles and rockets will be a function of the Missile R&D Command. Follow-on procurement and support activities to insure that full operational readiness of these weapons is maintained is assigned to the Missile Materiel Readiness Command, which also is responsible for Redstone Arsenal support activities.

Depending upon the phase of the materiel life cycle of the missile system with which they are working, project managers may be assigned to either command. The Missile Materiel Readiness Command will manage most field systems including Lance, Dragon and TOW systems, along with the 2.75-inch aircraft rockets.

While the Missile Intelligence Agency will be a part of the Missile R&D Command, the Army Metrology and Calibration Center is assigned to Missile Materiel Readiness Command. The realignment is not expected to yield short-term savings but long-term economies are anticipated due to strengthening of the management structure.

Secretary Hoffmann's order also affects the Natick (MA) Development Center, redesignated the Natick R&D Command; the Mobility Equipment R&D Center (now Command), Fort Belvoir, VA; the Tank-Automotive Development Center (now R&D Command), and the Tank-Automotive Logistics Command (now the T-A Materiel Readiness Command), both at Warren, MI; Armament Development Center (now R&D Command), and Armament Logistics Command (now Armament Materiel Readiness Command).

Assignment of LTG Eugene Joseph D'Ambrosio as Deputy CG for Materiel Readiness, U.S. Army Materiel Development and Readiness Command became effective Jan. 1 concurrent with promotion to 3-star rank. Since September 1975, he had served as special assistant to DARCOM Commander GEN John R. Deane Jr.

During the past five years LTG D'Ambrosio has served as: Director, Supply and Maintenance, Office of the Deputy Chief of Staff for Logistics, HQ DA, 1973-75; director, Maintenance, HQ U.S. Army Materiel Command, 1971-73; commanding officer, Red River Army Depot, Texarkana, TX, 1970-71; chief, Logistics Management Systems Division, Office of the Assistant Secretary of the Army (Installations and Logistics), 1970.

Other assignments: Chief, Equipment Maintenance and Readiness Division and director, Materiel Readines Support Services, OASA (I&L), 1968-70; student, U.S. Army War College, Carlisle Barracks, PA, 1967-68; logistics staff officer, J-4, U.S. Army European Command, 1966-67; and G-4, 1st Infantry Division, Fort Riley, KS (later U.S. Army, Vietnam), 1965-66.

Commissioned as an OCS graduate in 1944, he was promoted to captain in 1954, major in 1959, lieutenant colonel in 1963, colonel in 1968, brigadier general in 1971 and major general in 1973. His decorations include the Legion of Merit with 2 OLC, Bronze Star Medal with 2 OLC, Air Medal, Joint Service Commendation Medal and Army Commendation Medal with 2 OLC.

Corporate Goals is the subject of a Jan. 14 letter from GEN John R. Deane Jr. to headquarters elements of the Army Materiel Command, redesignated Jan. 23 as the U.S. Army Materiel Development and Readiness Command.

The letter states in part: "To accomplish the AMC mission under these austere conditions will require a commitment to excellence by AMC military and civilian personnel plus a soundly developed and well coordinated plan of action. We will need dedicated and enlightened management . . .

"These goals are statements of planned accomplishments during my tenure and will serve two basic purposes. First, they establish direction and parameters for AMC operations and should be kept in mind by all AMC managers during the day-to-day decision-making process. Second, they provide the basis for the new HQ AMC system of Management by Goals and Objectives . . ."

The 10 Corporate Goals GEN Deane has established for DARCOM management are:

- Improve the process of developing and acquiring materiel and of providing for materiel readiness of Army combat forces.
- Increase user satisfaction with materiel and the readiness support of that materiel.
- Improve the integration of individual weapons systems into total battlefield systems to attain the full potential of technological advancement.
- Increase efficiency in the utilization of DARCOM resources — manpower, facilities, dollars.
- Increase the number and grade of minority personnel and women in the DARCOM workforce.
- Improve the quality of DARCOM's civilian and military workforce.
- Maximize delegation of authority and commensurate responsibility within all elements of DARCOM.
- Insure that individual responsibility and accountability are fixed in the assignment of missions, functions and tasks.
- Improve DARCOM's image within the Army and throughout the defense establishment.
- Inculcate in the DARCOM workforce the philosophy of DARCOM being a command of action rather than reaction.

The Armament R&D Command will be headquartered at Picatinny Arsenal, Dover, NJ, and the Armament Materiel Readiness Command will remain at Rock Island Arsenal, IL. Each command reports directly to HQ DARCOM, 5001 Eisenhower Ave., Alexandria, VA 22333. An International Logistics Command (formerly a center) at New Cumberland, PA, headed by MG Joseph Fix III, whose office is at HQ DARCOM, was announced in the Nov-Dec *Army R&D Newsmagazine*.

Still under consideration as part of the implementation of the AMARC recommendations are commands involving electronics; aviation; communications/automated data processing systems; and troop support activities.

The Armament R&D Command at Picatinny Arsenal will utilize such existing capabilities as the Large Caliber Weapons Systems and the Small Caliber Weapons Systems Laboratories. Benet Laboratory is a part of the LCWSL and will continue to operate at Watervliet Arsenal, NY. Functions of the Rodman Laboratory at Rock Island Arsenal will be assumed principally by the Armament R&D Command.

Edgewood Arsenal, a part of Aberdeen Proving Ground, will be disestablished in its current organizational status. Most of its research, development and engineering activities will be reassigned to a newly designated APG Chemical Systems Laboratory (CSL). However, Edgewood's flame, smoke, incendiary, and suppressive shielding programs are slated for transfer to the LCWSL at Picatinny.

In-house production of chemical items at Edgewood will be phased out to established manufacturing facilities such as those at Pine Bluff, AR. The new Chemical Systems Laboratory will include seven offices — administrative, surety, safety, security, systems evaluation, manpower management, demilitarization technology, and technical plans, programs and analysis.

Other CSL elements are the chemical division, biomedical division, development and engineering division, manufacturing technology division, and technical support division.

Current planning calls for assignment of 1,267 of Edgewood's current work force, 1,103 civilians and 164 military personnel, to the CSL. Only a limited number of employes are expected to be involuntarily separated.

Employes in the flame, smoke, incendiary and suppressive shielding programs will be offered assignments in the LCWSL at Picatinny. The aeroballistic research laboratory will remain at Aberdeen Proving Ground as a part of the Ballistic Research Laboratories. Testing for chemical items will be transferred to Dugway Proving Ground, UT, and vegetation control research will be assumed by the U.S. Department of Agriculture.

The CSL will have responsibility as DARCOM's lead laboratory for pollution abatement and environmental control technology. It also will handle research, development and engineering transition to production of chemical items, along with chemical and biological defense measures and equipment.

Costs of the reorganization, a DARCOM press release said, will be held to the minimum in line with current austerity funding emphasis. The AMC official emblem will be retained. Existing stocks of stationery, publications, pamphlets and similar documents will be used until exhausted. Signs and labels will be changed through the use of headers, paste-ons, and when normal maintenance requires repainting.

Completion of all the organizational changes involved in redesignation of the AMC as DARCOM is expected to stretch over a 4-year implementation period, in accordance with a phased plan. The end product is programed to include a network of 66 military installations and 73 additional activities.

The announced objective is to strengthen management at all levels, to separate R&D from materiel readiness functions, to give major commands more responsibility and flexibility in the planning and conduct of programs, and to enable DARCOM management to operate as a streamlined corporate-type structure.

Department of Defense Budget Report Goes to Congress

Senate and House Armed Services Committees of Congress have under consideration, as part of the Fiscal Year 1977 budgetary process, Secretary of Defense Donald H. Rumsfeld's massive 339-page Annual Defense Department Report. Commonly known as The Posture Statement, it details nation's warfare capabilities and estimated requirements vis a vis potential aggressors.

Released to news media Jan. 27—just as the Army Research and Development Newsmagazine January-February edition was ready for submission to the printer—the report proposes a FY 1977 Defense Budget of $112.7 in total obligational authority and $100.1 billion in estimated outlays. This is a substantial increase over the FY 1976 request to Congress for TOA of $104.7 billion and $92.8 outlays.

Secretary Rumsfeld states at the outset of his presentation to Congress:

"We estimate that because of a declining rate of inflation, the budget . . . could permit some small real growth in defense spending for the first time since FY 1968. The budget request for FY 1977 and the preliminary five-year defense projection reflect our conviction that there must be a real growth in the years immediately ahead . . .

"It is useful to consider defense strategy, force structure and budget requests within a broad international context, as is required by law. That context has five major implications for defense planning.

—First, military power and the international appreciation of it remain basic arbiters of international disputes and major determinants of our capabilities to achieve the objectives of our foreign policy.

—Second, the United States has political, economic, and strategic interests in the world which must be fostered through foreign policies which are supported by our military posture.

—Third, U.S. interests remain under challenge, primarily by the USSR, which continues to add to its military capabilities qualitatively and quantitatively. These challenges can be seen in Europe, along the Mediterranean littoral, in the Middle East and Africa, in the Persian Gulf and, indirectly, in Northeast Asia.

—Fourth, the United States cannot escape the principal role in defending interdependent interests and maintaining world stability: if we falter or fail, there is no other power to take our place.

—Finally, the United States must maintain a military establishment which permits it—in conjunction with our allies—to safeguard its interests in the face of a growth in adversary capabilities. The U.S. establishment must be both nuclear and nonnuclear. Much of it must be ready at all times. Security is not available at bargain rates, and the instruments of security

(Continued on page 7)

Study Terms WSMR 'Ideal' for Solar Energy R&D

Based upon a tri-service study for the Department of Defense in cooperation with the U.S. Energy Research and Development Administration effort to stimulate widespread application of solar energy systems, White Sands Missile Range, NM, was acclaimed recently as an ideal site for this program.

Dr. John W. Bond, a scientist with the U.S. Army Mobility Equipment R&D Command, Fort Belvoir, VA (redesignated Jan. 23 from its title as a Center), gave his evaluation of WSMR for solar energy production after a 2-month study of 8 Southwestern U.S. military installations.

"My initial visits and studies indicate a high potential for providing solar cell power to field instrumentation sites on military installations throughout the Southwestern U.S.," he said.

Dr. Bond's study of WSMR included remote instrumentation sites throughout the 4,000-mile-square range. While all of the installations he visited have a "definite need for solar cell power," he said WSMR "would be an ideal spot to evaluate in detail solar cell power applications."

James Arnett of the Jet Propulsion Laboratory, Pasadena, CA, accompanied Dr. Bond to WSMR and concurred in his evaluation of the potential of the range to operate solar-energy for instrumentation sites "on a cost-effective basis."

The findings will be reported to DoD in a paper prepared by Dr. Bond jointly with JPL and the NASA-Lewis Research Laboratory, Cleveland, OH.

MERDC scientist Dr. John W. Bond (right) discusses operation of solar cell strip with Marvin P. Squires (left), White Sands Missile Range, NM, and James Arnett of the Jet Propulsion Laboratory, Pasadena, CA.

Programed for Improved Response . . .

NSF RANN Parley Gives Small Businessmen View of 15 Agencies

Small businessmen throughout the nation interested in U.S. Government R&D contracts, obtaining the benefit of technology advances through R&D performed by others (technology transfer), or receiving technical assistance, are going to get more satisfactory attention.

That was demonstrated emphatically by representatives of 15 major U.S. Government agencies with the largest research funding allocations at a Jan. 21-22 RANN (Research Applied to National Needs) Conference in Washington, DC.

Sponsored by the National Science Foundation (NSF) with Senator Edward M. Kennedy as the featured speaker, the conference opened in the National Academy of Sciences Auditorium and shifted the second day to the NSF Headquarters for a RANN Program Open House. About 400 attendees included small businessmen from all parts of the nation.

Agencies represented in addition to the NSF and the Small Business Administration included the Departments of Defense, Agriculture, Commerce, Interior, Justice, HEW (Health, Education and Welfare, including the National Institutes of Health), Energy R&D Administration, National Aeronautics and Space Administration, Environmental Protection Agency, Army, Navy and Air Force.

Army representation was headed by Harold J. Margulis, special assistant for Small Business, Office of the Assistant Secretary of the Army (Installations and Logistics). Dr. I. R. Hershner Jr., assistant director, Research Programs, Office of the Director of Army Research, Deputy Chief of Staff for Research, Development, and Acquisition, was the principal ODCSRDA participant. John Stolarek, assigned to the staff of Deputy CG for Materiel Development, MG George Sammet Jr., headed attendees from the Materiel Development and Readiness Command.

First-day speakers in addition to Senator Kennedy included NSF Director Dr. H. Guyford Stever (welcoming remarks), Harold K. Fletcher, Small Business Administration associate administrator for procurement assistance, and Milton D. Stewart, chairman, Research Council for Small Business and the Professions.

NSF-RANN programs were explained in detail the first day when NSF Assistant Director for Research Applications Dr. Alfred J. Eggers Jr. presided as chairman.

Under direction from Congress, the RANN budget for FY 1976 requires that a minimum of 7.5 percent, about $5 million, be spent with small business firms. RANN is committed to a best-performer policy in its problem-oriented interdisciplinary research program.

RANN supports research in the program areas of: Productivity Improvement Through Technology; Public Policy and Economic Productivity; Public Policy and Human Resources; Managing the Natural Environment; Disasters and Natural Hazards; Renewable Resources; Nonrenewable Resources; Resource Systems.

The RANN charter also provides for exploratory research and technology assessment, including systematic exploration and evaluation of social, economic and environmental consequences of the introduction, extension or modification of major technologies. This encompasses consideration of immediate and long-term interactive effects of new technologies in terms of benefits, costs, risks and the potential

Kennedy Addresses Small Firms' Problems

Senator Edward M. Kennedy's featured address to the National Science Foundation RANN Small Business Conference in Washington, DC, Jan. 21-22, opened with a "well-done" tribute to the organizers. He cited especially NSF Director Dr. H. Guyford Stever, Milton Stewart as chairman of the Research Council for Small Business and the Professions, and Dr. Alfred J. Eggers Jr., assistant director, Research Applications, RANN Directorate. The address follows.

This meeting has been called to discuss the problems facing the small research and development firms trying to do business with the Federal Government. It is not the first meeting on this topic, and it won't be the last. Some of these problems, as you know, are of very long standing, and progress in dealing with them has been painfully slow.

Yet it is essential that solutions be found, for in solving the problems of the small R&D companies we shall be taking a long step toward solving some of the critical problems facing the nation. Because this country must find realistic, imaginative, yet practical solutions to a long list of "crises" — environmental crises, energy crises, food crises — we must find ways to put science and technology to work more effectively, and to put the fruits of our research into the market place more rapidly.

In this national effort, the small research and development companies have a critical role to play. This is the sector of our economy which brought us the vacuum tube, the automobile, and the airplane — all within the span of a few decades. Without the imagination and drive of the small, innovative companies, this country and the world would be immeasurably poorer. So it is only fair for you to ask: What has the Federal Government been doing for us?

The Congress of the United States passed the Small Business Act over 20 years ago. There is a section in it which charges the Small Business Administration with three specific duties: To assist small businesses in obtaining R&D contracts from the Federal Government; to assist them to obtain the benefits of R&D performed by others; and to provide them with technical assistance.

In 1968, the Select Committee on Small Business of the House of Representatives held hearings and recommended that SBA "aggressively implement the statutory provisions" and report back by May 1, 1969. Follow-up hearings held in 1972 reported disappointing progress.

Just this past year the Senate Select Committee on Small Business held hearings — at which I had the privilege of testifying — on the role of small business in the development of solar energy. They found a situation distressingly similar to that of seven years ago.

Last month I chaired a workshop, similar to this one, in Massachusetts, cosponsored by the Associated Industries of Massachusetts and the Smaller Business Association of New England. I came away from that meeting with a clearer understanding of some of the problems confronting all of you. Let me be quite specific and give you a few case histories.

Item: A small, innovative company contacts the RANN Directorate of the National Science Foundation in February. They want help in developing a new electrical insulator which promises to save the utilities millions of dollars annually in power transmission costs. They are told that the review will be completed in four to six weeks. In May, they contact NSF again, and are told that their proposal has not yet been sent out for review. They call again in July. They call in August, in September, in October.

Finally, in desperation, the following January, they request action in a formal letter, and follow this up with phone calls in February. A full year has now gone by. In *March* they learn that their proposal has been turned down. Fortunately, in the meantime, they have obtained private funding for a similar project. They develop the insulating material, which promptly receives an award as one of the most significant new technological products of the year.

Item: A small, research-oriented firm submits a proposal to ERDA for the modeling of a particular process for coal gasification. After a long run-around and an expensive "competition," they are informed that ERDA (Energy Research and Development Administration) is not interested in such models. Why weren't they told this in the first place?

Item: A company wants to use equipment originally bought on the NSF contract for work under contract with a private funding organization. In the case of a university or non-profit institution, NSF normally will give title to equipment which has been purchased under a grant. They refuse to do this for a profit-making concern. Instead, they propose to take the equipment away and give it, free of charge, to a university.

I could go on, but I am sure that I don't have to convince the people in this room that there are inequities and inefficiences in our present system. Our task must be to improve the situation. And I cannot emphasize too strongly the importance of action — immediate action — on the part of the responsible agencies, to restore some measure of the confidence and good will necessary to revitalize the innovative research which this country so sorely needs.

The situation that we have today reminds me of one which arises annually, at the start of the football season, in the "Peanuts" comic strip. Every year Lucy offers to hold a football for Charlie Brown, and invites him to kick it. And every year she pulls it away at the last minute, and Charlie Brown takes a terrible flop and lands flat on his back. And every year Charlie Brown says: "Oh no, not this year. You're going to pull the ball away at the last minute and I'll land on my back." And Lucy says: "This time I've changed, Charlie Brown. I wouldn't do a mean nasty thing like that! Have faith, Charlie Brown."

And he gives in and tries to kick that football one more time. She yanks

(Continued on page 15)

opportunities.

Intergovernmental Science and R&D Incentives is another area of RANN concern. This is a complementary program to strengthen institutions and test incentives to increase the utilization of science and technology, and to accelerate technology transfer in both the public and private sectors of the nation's economy.

AN UNPRECEDENTED OPPORTUNITY for small businessmen to gain information about RANN programs and the R&D activities of the 15 agencies that participated in the Jan. 21-22 Small Business Procurement Conference was offered during the NSF-RANN Open House. A press release described this part of the program as a chance to "visit and pre-sell 15 major federal agencies under one roof."

During 1975 the RANN program opportunities were exploited to small business at a series of 12 regional seminars. However, never before were they enabled to gain as broad a perspective of chances for participating in U.S. Government R&D programs as they were given at the Jan. 21-22 meeting in Washington.

Commenting on this aspect to an *Army R&D Newsmagazine* staff member, Roland Tibbetts, the conference coordinator and director of the NSF Office of Programs and Resources, stated:

"We feel the conference was judged by participants as very successful. From responses to the questionnaire, this appears to have been due to the opportunity for small businessmen to talk directly with representatives of 15 major federal agencies with the largest research budgets under one roof on the same day; the opportunity for meetings with the entire RANN technical staff on an individual appointment basis; and the participation of Senator Kennedy."

Department of Defense Budget Report Goes to Congress

(Continued from page 5)

cannot expand and contract on short notice.

"Today, there are a number of misunderstandings about the relationship between defense and the international environment. I want to address two in particular. The first misunderstanding is that there is an inconsistency between detente and a strong national defense. The second is that there is a contradiction between increases in the U.S. defense budget and the maintainability of international stability.

"To deal with the first misunderstanding, it is important to be precise about the meaning of *detente,* this word borrowed from the French. Literally, in French, detente is applied to a number of things having to do with weapons.

"For example, the entire trigger mechanism of a pistol is called 'detente'—the part you pull to fire it, the hammer, the firing pin, and the spring mechanism. Detente is the word, also, for uncocking a cocked pistol—that is, releasing the tension on the spring which moves the hammer. In similar ways, detente is used to describe relaxing the tension on a taut bowstring, or reducing the pressure of gas in a closed container.

"In none of these meanings is there any hint that detente means friendship, trust, affection, or assured peace. In all uses, detente means relaxation of tension that exists—for real, not imaginary, reasons.

"On our side, detente is also a hope and an experiment. In this age of nuclear weaponry, it makes sense to seek a reasonable accommodation of our differences with the USSR. But, keeping the basic meaning of detente in mind, we should be under no illusions as to when and how accommodations might be reached.

"Strength is a prerequisite to acceptable agreements. That is why there is no inherent contradiction among the three main objectives of U.S. policy: defense, deterrence, and the effort to see if it is possible to achieve some relaxation of tension—detente. That is why successive Presidents, including President Ford, have emphasized the connection between strength and peace, between weakness and war . . ."

Secretary Rumsfeld told Congress that Soviet defense spending has been increasing steadily in real terms over the past decade, during which the Soviet military establishment (not counting border guards and internal security forces) has expanded by a million men from 3.4 to 4.4 million.

During that 10-year period, the USSR has increased its intercontinental ballistic missiles (ICBMs) from 224 to 1,600, sea-launched ballistic missiles (SLBMs) from 29 to 730, strategic warheads and bombs from 450 to 2,500, and has developed four new ICBMs. Two of the new ICBMs being deployed, he said, have multiple independently targetable reentry vehicles (MIRVs).

Other Soviet ICBM developments including increased throw-weight destructive power and improved accuracy, Secretary Rumsfeld said, pose an increasing threat to survivability of the U.S. fixed-silo Minuteman missile forces.

In numerous other areas of combat capabilities — particularly general-purpose forces, nuclear missile submarines with increased range, and expansion of naval forces —U.S. intelligence reports indicate the USSR has strengthened its threat to put the U.S. in some respects in a "catch-up" position.

The proposed 5-year U.S. continuing budgetary increases, in terms of real-growth funding of U.S. defense needs, is termed minimal within current austerity constraints to counter the USSR gains and the threat of continuing progress.

The FY 1977 proposed U.S. budget is described as a real increase of $7.2 billion in the baseline program "to make up deficiencies in force modernization and readiness." This provides also for "constant growth of about $750 million for research, development, test and evaluation." The over-all RDT&E budget proposal is $10,942 million.

The projected 1977-1981 budgets *in billions* of dollars as listed in the report to Congress are: FY 1977 — $112.7; FY 1978 — $120.6; FY 1979 — $130.0; FY 1980 — $139.8; FY 1981 —$149.7. Adjusted from "total current prices" to "total constant FY 1977 prices," the budgets, based on a real growth for defense purchases of 4 percent annually, become: FY 1978 — $113.2; FY 1979 — $115.9; FY 1980 —$118.9; FY 1981 — $121.9. The assumption is that the economy-wide rate of inflation for 1977-1981 will be about half that of 1973-1977.

Unless economies proposed by President Ford in the FY 1977 budget are approved by Congress, another $2.8 billion will be needed to meet defense objectives, the report states. Savings include elimination of 26,000 civilian personnel spaces.

"Modernization programs must continue to be sound, prudently paced and provide the nation with the proper mix of forces and capabilities to maintain its desired position of essential equivalence with the Soviet Union under terms of negotiated agreements," the report states. It contends also that:

"The U.S. must maintain a solid research and development program to hedge against future uncertainties and retain the current technological lead over the Soviet Union."

TRI-SERVICE USERS of White Sands Missile Range discuss schedule of Army Western Ranges Commanders Conference at WSMR, NM. From left are MG O. L. Tobiason, WSMR commander; Cdr J. R. Roepke, deputy for the Navy at WSMR and commander of the Naval Ordnance Missile Test Facility; COL J. P. Jones Jr., assistant deputy for the Air Force. During the 2-day conference, commanders and representatives of the western test ranges discussed missions and workloads, software and computer capabilities, instrumentation and reduction of testing activities duplication.

PRODUCT IMPROVEMENT of the General Sheridan M551 Armored Reconnaissance/ Airborne Assault Vehicle will consist of 22 subtasks that will take almost three years to complete. More than $55 million has been allocated to the Product Improvement Program (PIP) project, halted in 1975 because of a funding cutoff. Eighteen subtasks will be handled at Rock Island (IL) Arsenal. Watervliet (NY) Arsenal and Frankford (PA) Arsenal will each complete two subtasks.

Natick Climatic Chambers Control Weather for Many Tests

Weather made to order for operational requirements has long been high on the "wish list" of combat commanders, but for environmental studies linked to manpower, materiel and equipment scientists at the Natick (MA) R&D Command routinely attain this goal.

Natick's Climatic Chambers have a capability of regulating the temperature from 165 degrees Fahrenheit to 70 below zero, as controlled for experimentation by Dr. John Maher. He is a researcher in the U.S. Army Research Institute of Environmental Medicine. USARIEM is an element of the Medical R&D Command, Office of the Surgeon General of the Army.

Equally easy, the chambers can generate a wide range of wind velocities (balmy breezes or bone-chilling blasts), mist, a gentle rain or a torrential downpour (four inches an hour). Tropic or arctic and other environmental extremes can be produced as desired. The condition can be hot-wet, cold-wet, cold-dry or hot-dry inside the huge test chambers in rapid transitional time.

Environmental studies in a laboratory setting are conducted to determine effects on human performance and materiel as related to the primary military requirement of being able to conduct successful operations in any of the world's climatic extremes.

Instrumentation wired to the bodies of volunteer test subjects precisely records data on physical responsiveness to the wide range of environmental extremes that can be produced in the chambers. The purpose is to learn what protective clothing is required to enable soldiers to be effective under a diversity of conditions.

Dr. Maher explains that measurements of blood pressure changes, pulse, skin and body temperature, and other physical responses, all are related to the Army's need to know how rapidly and desirably a soldier may react (acclimatize) to sudden transfers from one environmental extreme to another.

What kind of reaction might normally be expected, for example, if a soldier is moved from a northern zone installation to a tropic zone; will he adjust without suffering heat stroke, exhaustion and other adverse effects? If reaction is severe, what treatment can minimize time lost from duty?

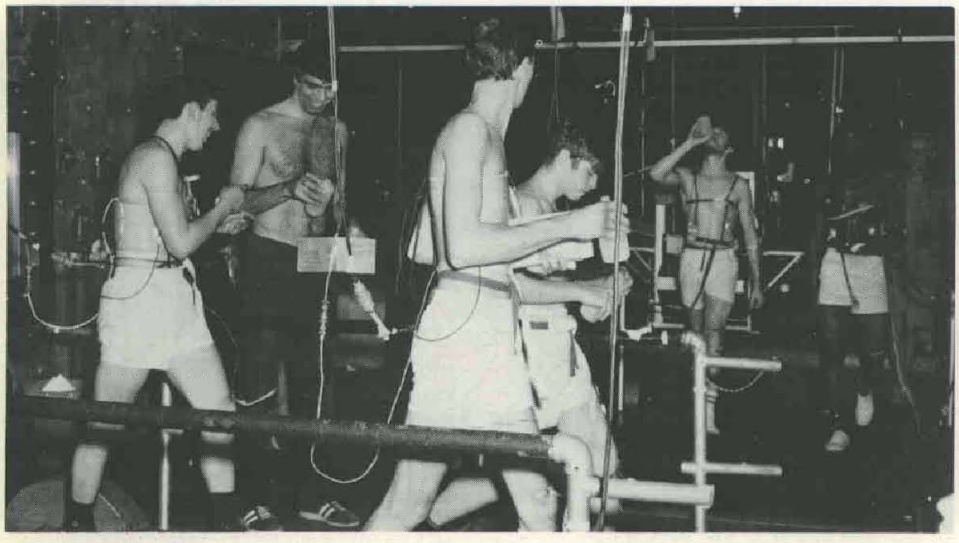
Before pharmacological treatment can be developed, Dr. Maher points out, it is essential to determine how acclimatization occurs.

Dr. Carolyn Bensel is another Natick scientist who is investigating problems of providing adequate protection for soldiers in extreme cold areas. She uses the climatic chambers to test clothing, face masks, gloves and footwear. Currently she is testing layers of protective clothing for the female soldier who now wears a hybrid of men's and women's apparel. Flexibility of movement to perform work assignments is among primary considerations.

The climatic chambers use treadmills to simulate the physical exertion of work or operational requirements. Volunteers may be observed on any given test day jogging the equivalent of miles without going anywhere, sometimes sweating it out in temperature as high as 120 degrees F.

The climatic chambers also may be used by researchers representative of other federal agencies or the outside scientific community. The Massachusetts Bay Transportation Authority, for example, has tested its center rail heating ability during icy conditions in the arctic wind tunnel. Other studies have been conducted by such agencies as the U.S. Department of Transportation or by private research organizations.

Next time anyone comments, "You just cannot control the weather," you might respond: "That is not true, at least for experimentation purposes in facilities of the U.S. Army Research Institute of Environmental Medicine."



WHEN IT'S 120° F. and test volunteers have been walking treadmill for an hour, it's "water-break" time, as Dr. Ralph Francesconi (second from left), coinvestigator of Army acclimatization tests, hands out water at the Climatic Chambers of the Natick R&D Command.

CRREL Researchers Identify 21-Year Winter Cycle

Identification of characteristics of a 21-year pervasive cycle of winter temperatures throughout the Eastern United States was reported by U.S. Army researchers in presentations to a recent meeting of the American Geophysical Union in San Francisco, CA.

Dr. Steven J. Mock and Dr. William D. Hibler III of the U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, NH, said they have identified a January temperature cycle which has recurred every 21 years dating to about 1890.

Statistical techniques originally devised for examining glacier ice core records were used to analyze temperature records from 19 U.S. weather stations ranging from Montreal, Canada, to Mobile, AL. The techniques permitted an assessment of the stability and predictability of the cyclic pattern.

Similar cyclic effects were found in midwestern summer temperature and rainfall records, reinforcing the belief that droughts in this area occur about every 20 years. The appearance of maximum sunspot activity from the 1890s to the 1960s, possibly only coincidentally, followed closely the 21-year cold weather cycle.

Mock and Hibler cautioned against any simple explanation for cold weather patterns and warned against making predictions. Although the cycle does not seem to be present at this time, Mock and Hibler emphasized that such effects should not be dismissed as mere chance.

Hibler also has performed experimental and theoretical studies on sea ice drift and deformation while Mock has performed and analyzed polar glacier flow and deformation measurements. Their collaboration began with the development of a surface-effect vehicle for use in cold environments.

MICV Group LASR Actions Earn Citation for $613,000 Savings

Management improvement actions resulting in validated savings of $613,000 have earned a group citation for six logistics managers in the Mechanized Infantry Combat Vehicle (MICV) Program, U.S. Army Tank-Automotive Research and Development Command, Warren, MI.

Credited with applying the Logistics Analysis Support Review (LASR) concept to the MICV engineering development state are William Wyroba, Johnathan Glasscock, Nancy Oswald, LTC Don Adams, Don Barton and CWO Henry Venn.

LASR is a computerized process which documents all logistics elements required in the intensive management of the MICV life cycle.

During the award period, 91 cost savings items influencing the vehicle design and life cycle were validated. Similar progress was achieved through user troop reviews, maintenance teardowns, and other evaluations.

MICV Logistics Management Division personnel have estimated that over-all life cycle support savings may exceed $40.7 million.

New Laws Increase Veteran Pensions

Under a new law effective in January, about one million veterans and 1.6 million veterans' survivors on pension status received an eight percent increase in monthly rates and a $300 increase in annual income.

The Veterans Administration notes that another recent law provides pension payments to veterans and widows without dependents whose income does not exceed $3,300, and those with dependents whose income does not exceed $4,500.

Similar income limits apply to parents receiving dependency indemnity compensation (DIC) from the VA. The new law does not apply to veterans compensated for service-connected injuries or dependents of veterans who died of such injuries.

Device Opens Careers to Blind . . .

Invention Earns Human Engineering Lab Engineer 'Outstanding Young Men' Honor

Invention of a braille calculator expected to open numerous career fields for the blind has earned Deane B. Blazie, a 29-year-old U.S. Army civilian electrical engineer, selection by the National Junior Chamber of Commerce as one of America's 10 Outstanding Young Men for 1976.

According to Jaycee records, Blazie is the first Department of the Army civilian employe to win this distinction during the 38-year history of the award. Blazie is a computer resources coordinator with the U.S. Army Human Engineering Laboratory, Aberdeen Proving ground, MD.

Blazie was assigned to APG in January 1970, after completing basic training, as an enrollee in the Army Scientific and Engineering Assistants Program and remained as a civilian employe when he was discharged in May 1972.

The Jaycees' award is presented annually to 10 men between the ages of 21 and 35 who represent "the highest qualities of leadership and accomplishment." Previous award winners include John F. Kennedy, Gerald Ford, Nelson Rockefeller, Ralph Nader and Dr. Henry Kissinger. This year's selectees include the governor of Oklahoma, the chief assistant to President Ford, and a professional basketball player.

Dr. John D. Weisz, director of the HEL, states in a letter nominating Blazie for the award: "He typifies the American dream of starting from an average socio-economic level, striving for and achieving an extremely high level of accomplishment without losing humbleness and deep humanitarian convictions.

"He has spent hundreds of manhours of his spare time devoted exclusively to improving the lives of blind people through a variety of electronic and mechanical materiel design developments which, when used by these handicapped persons, enhance their lives materially and spiritually."

Blazie's latest development is an Audio-Tactile Display (ATD), described as "the world's first known system enabling blind people to use electronic calculators." This major scientific breakthrough is expected to open to the blind career fields in business, mathematics, engineering, the sciences and other disciplines.

In essence, the ATD "marries" a metal braille numbers chart with a manually operated electronic calculator. Through the senses of sound and touch, it permits a blind person to "read" answers appearing on the calculator.

A 5x7-inch metallic braille plate covers a small wooden-framed box that houses an intricate miniature electronics network, the key to the system. The cover plate has eight columns of braille digits ranging from 0 to 9 in each column with decimal points. The columns correspond to the eight digits on the viewer of the electronic calculator.

The calculator and the braille box are electronically linked. When a problem is worked out on the calculator, and the answer appears on its viewer, electronic impulses are sent to the box and automatically matched up with the corresponding braille digits.

The blind person "reads" the answer by gently running his fingers over the braille digits in each column. For example, he starts at the extreme left-hand column and runs his finger over each braille digit in each column until he hears a "beep." The beep is the signal that the braille digit is the number corresponding with the first digit on the calculator. He then continues through the remainder of the columns to get the remainder of the answer.

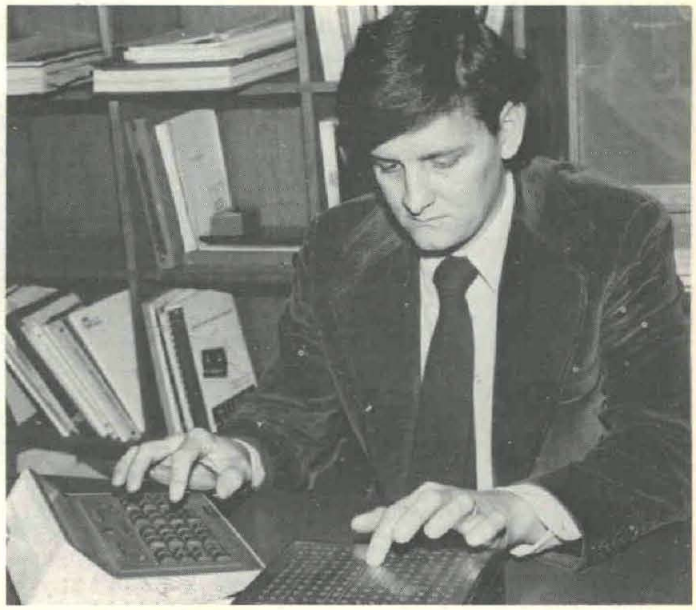
The ATD system has a number of special built-in features, according to Blazie. Like the calculator, it can read out any answer to any problem solved by addition, subtraction, multiplication and division. A single beep tells the blind person that the digit is a positive number and a continuous series of beeps indicates the digit is a negative number. A different tone indicates a decimal point.

Should the blind operator make an error while solving the problem on the calculator, the braille box will emit a constant "tone" without the operator touching any of the braille digits.

Blazie said prototype models of the system have cost in excess of $2,000 to construct; however, he estimates that mass-produced commercial models can be sold for less than $200.

Working prototypes of Blazie's invention are currently being analyzed at the University of Kentucky, where they are being used by blind students. Patents paving the way for commercial development are expected to be awarded in the near future.

Blazie has been working with the blind and handicapped since he was 12. He is credited with developing electronic braille stopwatches, electronic page markers and a number of other convenience items for the blind. In the works are ideas such as paper money identifiers, digital counters for thermometers and volt meters, and liquid level indicators.



Deane Blazie demonstrated how a blind person would use the Audio-Tactile Display, a system he designed and developed to help the blind use an electronic calculator. At 29, Blazie is the youngest of the 10 national finalists in this year's U.S. Junior Chamber of Commerce awards program, citing the 10 Outstanding Young Men of the Year for America. He also is the first Department of the Army civilian employe to win the honors since its inception in 1938.

Blazie, an Army veteran, holds a BS degree in electrical engineering from the University of Kentucky, an MS degree in computer science from the University of Delaware, and is pursuing doctoral studies. He resides with his wife and two sons in Churchville, MD.

Edgewood Reports on Productivity of S&E Assistants

Will Modern Volunteer Army Recruits Respond to Challenge of Careers in Highly Successful S&E Program Since 1948? That was the headline for a feature article on the Army Scientific and Engineering Assistants Program published in the May-June 1972 edition of the *Army Research and Development Newsmagazine*.

Edgewood Arsenal has produced a partial answer to that question with a recent report on its success in recruiting during the past 18 months, through the Volunteer Army's "Strikes for Skills" program, some outstanding talent to fill scientific and engineering assistants vacancies.

Screened out of Army reception processing centers, the recent additions are bolstering the Chemical Commodity Center's dwindling complement of exceptionally well-qualified university trained young scientists and engineers. The jobs to which they are assigned at Edgewood correspond as closely as possible to the experience and education of all others available at the time.

Typical of a recent recruitment of 35 S&E enlisted personnel selected for Edgewood assignments are:

SP5 Carol Lee Martin, a 1974 graduate of the University of Dayton (Ohio), who is assigned to the Development and Engineering Directorate. She is engaged in research of equipment for protection against chemical, biological and radiological agents.

A former civilian laboratory technician, she conducts studies of reactivity and absorbtion of experimental protective clothing material. She also studies methods of bonding protective chemicals to textiles and determines technical suitability of fabrics and wear characteristics.

SP4 William Lawrence, a native of Pakistan, is a physical sciences assistant assigned to the Pollution Abatement Branch, Environmental Research Division, Chemical Laboratory. He conducts experiments to separate and estimate reaction products from toxins.

Lawrence has bachelor's and master's degrees from Forman Christian College and Panjab University, Lahore, Pakistan, and was a college lec-

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Siple Medallion Tops Army Science Conference Awards . . .

96 Papers Selected From Over 400 Proposals for Presentation

Programed for presentation at the biennial Army Science Conference scheduled June 22-25 at the U.S. Military Academy, West Point, NY, are 96 technical papers judged as significant Army in-house laboratory contributions related to the national defense technology base.

Prestigious recognition for authors and coauthors (a total of 228 for the 96 primary papers selected from more than 400 narrative proposals) will be highlighted by the Dr. Paul Allman Siple Medallion accompanied by a $1,000 honorarium, the top honor since it was first presented at the 1970 ASC.

Large bronze medallions bearing a crest symbolic of Army research, also initiated in 1970, will honor authors and coauthors of other top-rated papers, along with $3,500 to $4,000 (normal total) in awards funded through the Army Incentive Awards Program.

Usually about 25 percent of the papers also earn the authors Certificates of Achievement signed by the Assistant Secretary of the Army (R&D) and the Deputy Chief of Staff for Research, Development, and Acquisition.

Cast in silver, the Siple Medallion carries a likeness of the U.S. Army's renowned cold regions explorer and research scientist based on his picture as it appeared on the cover of TIME Magazine following his notable achievements in 1958 during the International Geophysical Year.

Dr. Siple's illustrious career began when he was selected in a nationwide competition of Boy Scouts to accompany the first Admiral Byrd Expedition to the Antarctic (1928-30). When he died at his desk in 1968, ending more than 25 years as an Army scientist, he was scientific adviser to the Director of Army Research, Office of the Chief of Research and Development.

Twenty-four supplemental papers involving 43 authors and coauthors also have been selected for consideration for presentation should any of the 96 primary papers be withdrawn. All of the 120 papers will be eligible for consideration for honorary awards and all will be published in the proceedings.

Seventy primary papers are representative of research performed at laboratories within the Army Materiel Command (now the Army Materiel Development and Readiness Command). More than 80 percent of all Army in-house laboratory effort is under DARCOM control. Twelve of the supplemental papers also represent DARCOM effort.

Other quotas established by the ASC Advisory Group include: Office of the Surgeon General — 10 principal and 5 supplemental papers; Office of the Chief of Engineers — 11 principal and 5 supplemental papers; other R&D activities — 5 principal and 2 supplemental papers.

Diversity of the in-house RDT&E efforts reported in the selected papers encompasses all major scientific disciplines. Titles of the papers, authors and agencies they represent include:

ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND — *Stochastic Combat Model,* by Dr. Ceslovas Masaitis, U.S. Army Ballistic Research Laboratories (BRL), Aberdeen Proving Ground (APG), MD; *Fundamental Limitations on Fire Control Predictions,* by Harry L. Reed Jr., BRL; *Porosity and Spall Structure of Shock Loaded Metals,* by P. W. Kingman, Dr. C. M. Glass and Dr. V. A. Greenhut, BRL; and

Physics of the Response of Explosives to Shock Loading, by Dr. Philip M. Howe, Robert B. Frey, Boyd Taylor and Vincent Boyle, BRL; *Laser Terminal Homing Engagement Simulator,* by T. J. Gleason and M. E. Sword, Harry Diamond Laboratories (HDL), Adelphi, MD; *Tunable Mercury Cadmium Telluride Infrared Lasers,* by J. P. Sattler, B. A. Weber and J. Nemarich, HDL; and

The Invention and Development of PLACER, by Huey A. Roberts and Forrest J. Agee, HDL; *A Method for Analyzing Air Target Fuzes,* by John F. Dammann, HDL; *Maximizing User Acceptance: A Systems Approach,* by D. Jones and CPT W. Kaminski, U.S. Army Human Engineering Laboratory (HEL), APG; *Detection of Combat Sounds by the Human Ear,* by Drs. G. R. Price and D. C. Hodge, HEL; and

Use of Color in Air Defense Displays, by Ms. Jane Davis, HEL; *New Wave-Shaping Concepts in Fragmentation Munitions,* by J. Mescall, P. Riffin and C. Polley, U.S. Army Materials and Mechanics Research Center (AMMRC), Watertown, MA; *Piezoelectric Polymer Films for Application in Monitoring Devices,* by R. J. Shuford, A. F. Wilde, J. J. Ricca and G. R. Thomas, AMMRC; and

Hardened Tuned-wall Plastic Radomes for Military Radars, by Joseph J. Prifti, Anthony L. Alesi and Eugenio DeLuca, AMMRC; *Improved Hawk Survivability,* by Robert J. Redwinski, U.S. Army Materiel Systems Analysis Activity (USAMSAA), APG; *Methodology for Forecasting Soviet Weapon Trends,* by Dr. Robert A. Jones, U.S. Army Foreign Science and Technology Center (FSTC), Charlottesville, VA; and

Comparison of Nuclear Resonance Techniques for Detecting Concealed Explosives, by Dr. J. Roland Gonano, U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, VA; *Surface Research for Development of New Electrocatalysts for Aud Electrolyte Fuel Cells,* by Johann A. Joebstl, J. H. Calderon and E. J. Taborek, MERDC; and

An Improved Electrolyte for Direct Oxidation Fuel Cells, by G. W. Walker, R. V. Lawrence and A. A. Adams, MERDC; *Irradiation of Multilayered Materials to Improve Performance for Packaging Thermoprocessed Foods,* by John J. Killoran, U.S. Army Natick Development Center (NDC), Natick, MA; and

Development of a New Infantry Helmet, by Lawrence R. McManus, Philip E. Durand, William D. Claus Jr. and John H. Greendale, NDC; *Novel Techniques for Preservation of Crispness and Tissue Integrity of Salad Vegetables,* by A. R. Rahman, J. W. Shipman, S. J. Wallner and D. E. Westcott, NDC;

Chemical Effect of Irradiating Frozen, Hydrated Muscle Proteins: Myosin and Actomyosin, by I. A. Taub, J. W. Halliday, L. G. Holmes, J. E. Walker and F. M. Robbins, NDC; *The Rayleigh Velocity for a Slightly Anisotropic, Orthotropic Solid,* by Dr. G. Gerhart, U.S. Army Tank-Automotive Systems Development Center (TASDC), Warren, MI; and

Procedure for Statistical Analysis of Vehicular Noise Emission Spectra for Limited Samples, by Dr. R. Brooke, TASDC; *Automatic Height Correction Technique for Use With Weapon Location Radars,* by G. Yaeger, C. Emigh and C. Christianson, Office, Project Manager MALOR, Fort Monmouth, NJ; and

Gunhardened Crystal Oscillators for the Remote Battlefield Sensor System, by Erich Hafner, Stanley S. Schadowski and John R. Vig, Office, Project Manager, REMBASS and ETD Laboratory, Fort Monmouth; *Ionospheric Scintillations at SHF,* by Luke K. McSherry, U.S. Army Satellite Communications Agency, Fort Monmouth; and

In-flight Far Field Acoustic Measurement, by Donald A. Boxwell and Fredric H. Schmitz, U.S. Army Air Mobility R&D Laboratory (AMRDL), Ames Directorate, Ames Research Center, Moffett Field, CA; and

Examination of Stability of Nonlinear Equations by Use of Floquet Theory, by Herman I. MacDonald and Paul H. Mirick, AMRDL, Eustis Directorate, Fort Eustis, VA; *A New Capability for Predicting Helicopter Rotor Noise in Hover and in Flight,* by Thomas J. Brown and F. Farassat, AMRDL, Langley Directorate, Langley Research Center, Hampton, VA; and

Wind Tunnel Testing of Aeroelastically Scaled Helicopter Models, by Charles E. Hammond and William H. Weller, AMRDL, Langley Directorate; *High-Frequency Acoustic Waves in Combustion of the M113, 175mm Gun,* by Gerald W. Goble and Richard L. Moore, U.S. Army Armament Command, Rock Island, IL; and

Aerosol Spectroscopy in the Infrared, by Hugh R. Carlon and Davis H. Anderson, Development and Engineering Directorate, Edgewood Arsenal, APG; *A New and Effective Antidote for Nerve Gas Poisoning,* by LTC James A. Vick and CPT Jurgen von Bredow, Biomedical Laboratory, Edgewood Arsenal, APG; and

A New Experimental Technique for Studying the Explosive Comminution of Liquids, by Arthur K. Stuempfle and Bernard V. Gerber, Chemical Laboratory, Edgewood Arsenal, APG; *Infrared Effectiveness of Tactical Screening Smokes,* by Gerald C. Holst, Robert W. Doherty and Edward W. Stuebing, Pitman-Dunn Laboratory, Frankford Arsenal, Philadelphia, PA;

Plastic Piezoids for Fuze Applications, by Dr. R. J. Esposito, H. A. Jenkinson and W. J. Warren, Pitman-Dunn Laboratory, Frankford Arsenal; *Wake Region Perturbation for Base Drag Reduction,* by Walter J. Puchalski and Dennis J. Mancinelli, SARFA-MDP-Y, Frankford Arsenal; and

Contact and Surface Effects in the Electric Field Initiation of Explosives, by T. Gora, J. Sharma, D. A. Wiegand, W. L. Garret and D. S. Downs, Picatinny Arsenal, Dover, NJ; *Advances in Techniques for Structural and Dynamical Studies of Stability in Energetic Materials and Applications to Diverse End-Item Problems,* by Z. Eqbal, C. Choi, C. Christoe, M. Farr, A. Forsyth, H. Prask and S. Trevino, Picatinny Arsenal; and

Development of a Methodology for Design of Optimum Illumination Flare Systems, by J. Tyroler, P. Kemmey, T. Gora, R. Davis, F. Schroyer, Picatinny Arsenal; *A More Rational*

Approach for Analyzing and Designing Steel Cartridge Cases, by J. J. Toal and S. C. Chu, Rock Island Arsenal (RIA), Rock Island, IL; and

Target Discrimination With an Infrared Reticle Seeker, by S. T. Babiak, M. J. Amoruso and G. E. VanDamme, RIA; *Unique Materials and Properties in the New High-Pressure Temperature Regime Above 250 Kbars,* by T. E. Davidson, D. P. Kendall, C. G. Homan, J. Frankel and F. J. Rich, Watervliet Arsenal, Watervliet, NY; and

Exterior Collocation for Three Dimensional Surface Flaws, by M. A. Hussain, R. F. Haggerty, S. L. Pu and B. Noble, Watervliet Arsenal (Noble is with the Army Mathematics Research Center, Madison, WI); *SATFAL — The Application of Meteorological Satellite Data to Nuclear Fallout Prediction,* by Dr. Louis D. Duncan, Atmospheric Sciences Laboratory (ASL), White Sands Missile Range (WSMR), NM; and

Laboratory Testing Techniques for High-noise Environment Communications Systems, Arthur W. Lindberg and 1LT Mitchell S. Mayer, Avionics Laboratory, Fort Monmouth; *Scanning Optical Augmentation Locator (SOAL),* by K. Kraus, Combat Surveillance and Target Acquisition Laboratory (CSTL), Fort Monmouth; and

Radar Vulnerability Reduction: Evaluation of XP Polymer Material for Antenna Radomes, Russell Wagner Jr., CSTL; *Combined Radar —Electrooptic Sensor,* William Fishbein, Dr. R. Buser, Dr. R. Rohde and Otto E. Rittenbach, CSTL; and

The Development of Secure Optical Fiber Data Links for Army Communications, by J. R. Christian and L. V. Dworkin, Communications/Automatic Data Processing Laboratory (C/ADPL), Fort Monmouth; *Ionospheric and Plasmaspheric Effects on Satellite Navigation Systems,* H. Soicher, C/ADPL; and

Charge Transport Tactical Dosimeter, S. Kronenberg, R. A. Lux, R. Pfetter, H. Berkowitz and K. Nilson, Electronics Technology and Devices Laboratory (ETDL), Fort Monmouth; *Low-Temperature Pressure —Oxidation of Silicon for Integrated Circuit Technology,* by R. J. Zeto, E. Hryckowian, C. D. Bosco and C. G. Thornton, ETDL; and

Mechanisms of Dielectric Resonant Oscillators for Microwave and Mm Wave Integrated Circuits, by Dr. Harold Jacobs and M. M. Chrepta, ETDL; *High-Efficiency Pentaphosphates for Miniaturized Laser Applications,* by A. Schwartz, M. Wade, T. Au-Coin and John Gualtier, ETDL; and

Methodology of Vulnerability Analysis in Electronic Warfare, by Karl H. Agar and Dr. Otis A. Davenport, U.S. Army Electronic Warfare Laboratory, WSMR; *Fundamental Noise Limitations for High-Performance Imaging Systems,* by Dr. Donald D. Graft and Richard E. Franseen, Night Vision Laboratory (NVL), Fort Belvoir; and

High-Performance Pyroelectric Vidicon, by F. C. Petito and J. T. Cox, NVL, Fort Belvoir; *Optical Measurement of Missile Wing Deformation in High-Velocity Tests,* by C. R. Christensen, J. L. Smith and T. A. Martin, U.S. Army Missile Research Development and Engineering Laboratory (AMRDEL), Redstone Arsenal, AL;

Solid Propellants for Hydrogen Gas Generators, by Orval E. Ayers, James A. Murfree, Pasquale Martingnoni and William M. Chew, AMRDEL; *IR Counter-Countermeasure Technique for the Chaparral AN/DAW 1 Seeker,* by Stepehn P. Golden and Joseph R. McGinty, AMRDEL; and

Diagnostic Significance of Macro- and Microscopic Features of Catastrophic Gun Tube Failures, by R. L. Huddleston, APG; *Remote Portable Solar-Powered Microwave System,* by Anthony G. Dottone, U.S. Army Yuma Proving Ground (YPG), AZ; *An Adaptive Prediction Filter Algorithm for Optimizing Servo System Performance,* by Lester M. Bradley WSMR; and

Neutron Spectrum Measurements at the WSMR Fast-Burst Reactor, by H. Wright, MAJ J. L. Meason and J. Harvey, WSMR; *Evaluation of Gamma-Ray Techniques for Nondestructive Measurement of Vegetative Biomass,* by Dr. J. H. Kitchen and D. T. Malseed, U.S. Army Tropic Test Center (TTC), Fort Clayton, CZ; and

The Fate of Methylphosphonofluoridate in Growing Plants, by Martin J. Houle, Ned Hill, Ray LeGrand and Ms Sandra Janroga, U.S. Army Dugway Proving Ground (DPG), UT; *Fluidic Security Systems for Bunkers and Storage Areas,* by SP6 Michael J. Goes and John R. Masly, Nuclear Development and Engineering Directorate (NDED), Picatinny Arsenal.

OFFICE, SURGEON GENERAL — Antibody to Hepatitis B Core Antigen, by Dr. R. G. Allen, Walter Reed Army Institute of Research (WRAIR), Washington, DC; *Lactic Acid Derived Biodegradable Implant,* by COL D. E. Cutright, J. M. Brady, COL L. Getter and R. Miller, U.S. Army Institute of Dental Research (USAIDR), Washington, DC; and

Incidence of Coronary Risk Factors and Evidence of Ischemic Heart Disease in a Selected Military Population, by MAJ J. C. Denniston, MAJ Marcos U. Ramos and MAJ Ronald E. Jackson, U.S. Army Research Institute of Environmental Medicine (ARIEM), Natick, MA; and

Transfusions With Hemoglobin Prepared by Crystallization, by F. DeVenuto, A. I. Zegna, W. Y. Moores and T. F. Zuck, Letterman Army Institute of Research (LAIR), Presidio of San Francisco, CA; *Experimental Scrub Typhus Immunogens,* by George H. G. Eisenbert and Joseph V. Osterman, WRAIR; and

Effects of High Altitude and Heat on Simulated Artillery Fire Direction Center Tasks, by Bernard J. Fine and John L. Kobrick, ARIEM; *Electroanesthesia,* by LTC E. F. Huget, 1LT K. S. Hertert and L. B. deSimon, USAIDR;

A Biodegradable Osteogenic Implant Material, by LTC Marvin P. Levin, COL L. Getter and COL D. E. Cutright, USAIDR; *An Evaluation of Physical Fitness in the "Pro-Life" Program, 2d Infantry Division, Korea,* by CPT John F. Patton and Dr. James A. Vogel, ARIEM; and

First Successful Use of a Chemical Compound for the Prophylaxis and Treatment of a Lethal, Systemic, Viral Infection Common to Man and Subhuman Primates, by MAJ Edward L. Stephen, U.S. Army Medical Research Institute of Infectious Diseases (AMRIID), Frederick, MD.

CORPS OF ENGINEERS — *Projectile and Fragment Penetration in Snow and Frozen Soil,* by George W. Aitken, Dr. George K. Swinzow and Dennis R. Farrell, U.S. Army Cold Regions Research and Engineering Laboratory (CRREL), Hanover, NH; *A Projectile Penetration Theory for Layered Targets,* by Robert S. Bernard, U.S. Army Waterways Experiment Station (WES), Vicksburg, MS; and

A New Approach to Photogrammetric Comparator Design, by A. J. Bondurant Jr., U.S. Army Engineer Topographic Laboratories (ETL), Fort Belvoir; *High-Velocity Fragment Penetration Into Sand: A Comparison of Experimental Results With Theoretical Predictions,* by D. K. Butler, WES; and

Effects of Tactical Low-Yield Nuclear Warheads on Airfield Runways, by L. K. Davis, WES; *Shoreline Reaction to Impermeable Groins,* by Eugene F. Hawley, U.S. Army Coastal Engineering Research Center (CERC), Fort Belvoir; *RFI Shielding Effectiveness of Steel Sheets With Partly Welded Seams,* by Dr. E. M. Honig Jr., U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL; and

Wastewater Renovation by a Slow Infiltration Land Treatment System, by Dr. I. K. Iskandar, R. S. Sletten and T. F. Jenkins, CRREL; *Predictions of the Noise Impact of Military Facilities,* by Dr. R. K. Jain, CERL;

Dual-Purpose Nuclear Power Plants for Military Installations, by CPT Anthony V. Nida and Gary Stewart, U.S. Army Facilities Engineering Support Agency, Fort Belvoir; *Effects of Environmental Factors on the Irradiance Reaching Airborne Sensors,* by Dr. H. Struve and H. W. West, WES.

OTHER R&D AGENCIES — *Helicopter Engagement Force Attrition Model,* by H. N. Cohen, LTC K. H. Gates, S. H. Miller, LTC R. W. Newton and R. P. Reale, U.S. Army Concepts Analysis Agency (CAA), Bethesda, MD; *Detonation Properties of the Insensitive Explosive TATB,* by MAJ Richard K. Jackson, Lawrence Livermore Laboratory, University of California, Livermore, CA; and

Historical and Cross-Cultural Perspectives on Women in Combat, by Dr. Nora Scott Kinzer, U.S. Army Research Institute (ARI) for the Behavioral and Social Sciences, Arlington, VA; *Effects of a Thermal Reactor on the Energy Efficiency on a Turbocharged, Stratified Charge Engine,* by CPT Oleh B. Koropey and CPT Paul J. Kern, U.S. Military Academy (USMA), West Point, NY; and

A Criterion for Swim-Capable Combat Vehicles: Analyses and Evaluations, by Alexander Levin, CAA.

Supplemental Papers

ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND — *Three-Dimensional Boundary Layer Studies as Applied to the Magnus Effect on Spinning Projectiles,* by Walter B. Sturek and Robert P. Reklis, BRL; *New Concept of Survivability Enhancement With Self-organizing Electronic Circuits,* by Dr. Berthold Zarwyn, HDL; and

Silicon Nitride/Yttria: A Potential Gas Turbine Material, by George E. Gazza, AMMRC; *A Self-adapting Target State Estimator,* by Robert A. Scheder, U.S. Army Materiel Systems Analysis Activity (USAMSSA), APG; *Chemical Neutralization of TNT and TNT Base Explosives,* by David C. Heberlein, MERDC;

Discrimination of Microbiological Organisms by the Luminol Chemiluminescent Reaction, by Henry Tribble, Roy Shaffer, Michael Shepel, William Kraybill, Dr. Abe Pital, Stan Mumford, Development and Engineering Directorate, Edgewood Arsenal; *"Fused On" Rotating Bands for Small Caliber Ammunition,* by David E. Shillinger and Harry J. Addison Jr., Pitman-

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(Continued from page 11)

Dunn Laboratory, Frankford Arsenal; and

A New Development in the Radiation Hardening of Military Electronic Circuitry, by R. V. Nicolaides and L. W. Doremus, Picatinny Arsenal; *Chemically Vapor Deposited Tungsten Coatings for Erosion Protection,* by R. W. Haskell and A. R. Iman, Watervliet Arsenal; *Water Vapor Absorption Measurements Using a Line Tunable Deuterium Fluoride Laser,* Kenneth O. White, Wendell R. Watkins, Charles W. Bruce, ASL, WSMR; and

The Development of Thin-Film Photodetectors for the 8-14 um Atmospheric Window, by R. E. Callendar, NVL; *Estimating Climatic Changes Following Volcanic Eruptions From Tree Growth Records,* by John Bart Wilburn Jr., U.S. Army Electronic Proving Ground (USAEPG), Fort Huachuca, AZ.

OFFICE, SURGEON GENERAL — *Optical Additive Systems as an Effective Strategy for Blood Storage in Military Blood Banking,* by MAJ Thomas A. Bensinger and LTC Thomas F. Zuck, LAIR; *Chemotherapeutic Agents in Ocular Metallosis,* by LTC Horace B. Gardner, LAIR; and

Sensitivity of the Rhesus Monkey Cornea and Surrounding Tissues to Heat Produced by CO_2 Laser Radiation, by D. I. Randolph and B. Stuck, LAIR; *Current Approaches to Resolving the Physiological Heat Stress Problems Imposed by Chemical Protective Clothing Systems,* by Dr. Ralph F. Goldman, ARIEM; and

Multiple Leucocyte Factors That Induce Reactions Characteristic of the Inflammatory Response, by Dr. Carol A. Mapes and LTC Philip Z. Sobocinski, AMRIID; and

CORPS OF ENGINEERS — *Method for Estimating the Performance of Solar Heating and Cooling Systems,* by Douglas C. Hittle, George N. Walton and Dr. Donald Holshouser, CERL; *A New Cement for Cold Weather Construction,* by George C. Hoff, WES; *Automated Procedure for Airfield Site Evaluation,* by Dr. M. P. Keown and J. K. Stoll, WES; and

Systematic Application of Remote Sensing to Environmental Management at Military Facilities, by L. E. Link Jr. and Dr. D. H. Cress, WES; and *Wastewater Treatment in Cold Climates,* by Robert S. Sletten and Ants Uiga, CRREL.

OTHER R&D AGENCIES — *Stochastic Analysis of Multivariate Sensor Responses in a Surveillance Environment,* by MAJ John D. Howard, HQ U.S. Army Recruiting Command, Fort Sheridan, IL; and *The Algebra of Institutional Discrimination in the Army,* by David R. Segal, ARI.

BWL Fabricates Recoilless Rifle From High-Strength Composites

Fabricated from composite materials, a 106mm recoilless rifle has been successfully test fired as part of a Manufacturing Methods and Technology (MM&T) program of Watervliet (NY) Arsenal's Benet Weapons Laboratory.

Developed by BWL's Organic Materials Group, the weapon was constructed from a combination of high-strength steel wire and a plastic epoxy with a light gun tube structure. The program is "Application of Filament Winding to Cannon and Cannon Components."

Designed by a research team headed by Dr. Giuliano D'Andrea, the weapon weighs 40 pounds less than the conventional M40A1 rifle, an overall weight reduction of 33 percent.

During the tests, conducted at Picatinny Arsenal, Dover, NJ, a total of 20 106mm M344A1 projectiles were fired, the last nine rounds at a rate of one every 2.5 minutes.

Development of this new manufacturing technology permits computerized design and computer-assisted filament winding techniques which may be employed to meet specific weapons systems requirements.

QUOTE: "The closest to perfection a person ever comes is when he fills out a job application form." — Anonymous

Army Testing XM-1 Prototypes . . .

Single Contractor Selection Set

Delivery of validation prototypes of the XM-1 Tank System early this year will be followed by competitive testing, evaluation and selection by July of a single contractor to continue full-scale engineering development.

Competitive prime contractors, Chrysler Corp. and General Motors Corp., received $8 million each in cost-plus-fixed-fee contracts in January for long-lead hardware/engineering services on the highly maneuverable, heavily armed U.S. main battle tank of the 1980s.

The XM-1 program was initiated in December 1971 when Congress directed termination of XM803 Tank System development as unnecessarily complex, excessively sophisticated and too expensive. Congress supported the concept of a relatively inexpensive new tank and provided funds to initiate competitive prototype development.

In February 1972, the Army activated a task force with user, trainer and developer participation to formulate the new tank concept. A report was published in August 1972 and the proposed characteristics and program were reviewed to reduce cost by eliminating all except "absolute essential" capabilities.

The constraint on combat weight was raised to 58 tons to permit an increase in the level of armor protection. The final approved program is contained in a Development Concept Paper signed Jan. 18, 1973 by the Deputy Secretary of Defense.

In addition to the competitive development program, the Army signed a Memorandum of Understanding with the Federal Republic of Germany on Dec. 11, 1974, to evaluate a modified version of the German Leopard 2 Tank. The goal is to achieve maximum standardization of American and German tanks by the date of introduction into service.

FMC Corp. was awarded a contract July 22, 1975, to investigate producibility of the Leopard 2 in the United States. The Army will test the Leopard 2 during the fall of 1976 and evaluate results against the same criteria and constraints as the XM-1 prototypes by March 1977.

Initial production of the XM-1 will start in 1979 at a low rate of 10 a month. Following a comprehensive evaluation of the production vehicle, full production at the rate of 30 tanks per month is scheduled to start in late 1980, with a goal of 3,312 tanks at a desired unit cost of $507,000 in constant FY 1972 dollars, including government-furnished equipment.

The XM-1 will replace M60 series tanks in selected Active Army units. MG Robert J. Baer is project manager for the XM-1 system at the U.S. Army Tank-Automotive Research and Development Command, Warren, MI.

The XM-1 will have a 105mm main gun and two or more complementary armament systems, with improved fire control and shoot-on-the-move capabilities. Improved ballistic protection will allow the XM-1 to engage targets at shorter ranges than current tanks, with resultant increased first-round kill capability.

Higher cross-country speeds and faster acceleration will make the XM-1 a more difficult target for opposing ground and air forces. Maintenance requirements will be reduced in the XM-1 because of emphasis on reliability, availability, maintainability and durability during engineering and test programs.

General Motors Corp. XM-1 Prototype

Chrysler Corp. XM-1 Prototype

Army Issues Procedures to Stimulate PIP Proposals

Submission of proposals to the recently established U.S. Army Materiel Development and Readiness Command Product Improvement Office is being stimulated by widespread dissemination of information regarding staffing and coordination procedures—with emphasis on adequate justification for consideration.

The objective of the Product Improvement Program is to extend the useful service life of existing materiel as a cost- and time-cutting method of upgrading capabilities in comparison to new materiel research, development, test, evaluation and acquisition expenditures.

The DARCOM Product Improvement Program may be financed by any combination of research and development funds, PA (Procurement Appropriation), OMA (Operations, Maintenance, Army) or stock funds—depending upon the production status or the extent of the modification involved. PIP proposals must compete with each other as well as other items in the budget.

Priority establishment for a product improvement is determined by HQ Army Materiel Development and Readiness Command (DARCOM), HQ Training and Doctrine Command (TRADOC), and the Deputy Chief of Staff for Operations (DCSOPS). Coordination with TRADOC is a prime consideration in procedural requirements for submission of proposals.

Copies of recently established TRADOC procedures for PIP proposals have been distributed to Army Materiel Development and Readiness Command organizations. Copies or responses to specific questions may be obtained by writing to HQ DARCOM (DRCPI) or calling Autovon 284-8007/8008/8044/8041.

PI proposal justifications are categorized under Increased Operational Effectiveness; Reliability, Cost Reduction; Maintainability; Safety; Availability; and Environmental Protection.

Improved safety and cost reduction without sacrificing essential operational reliability and maintainability characteristics rate high in the categorical listing, the latter in view of peacetime budget constraints, the DARCOM PIP Office has announced. A new category that will receive special attention is Energy Conservation, in all its forms; it is anticipated that funding will be provided for meritorious PI proposals in this class.

Eventually the Department of the Army is hopeful of establishing an account to fund self-amortizing energy saving suggestions. Presently, the proposals in this category must compete with all other PI suggestions.

Black Brant Firing Initiates 5-Year SPAR Program

Space Processing Applications Rocket (SPAR) flights, a 5-year test program to collect information on processing materials in the near-weightlessness of space, were initiated Dec. 11 with the launching of a Black Brant VC (5C) rocket from White Sands Missile Range (WSMR), NM.

Carrying a 9-experiment payload of about 300 pounds, the initial sounding rocket traveled to an altitude of 140 miles and impacted about 50 miles uprange. Three flights annually carrying similar payloads are planned for 1976 through 1980.

NASA's Goddard Space Flight Center, Greenbelt, MD, shares SPAR program responsibilities with the Marshall Space Flight Center by providing rocket systems and directing launch and payload activities.

WSMR's Naval Ordnance Missile Test Facility will launch the rockets throughout the program. The U.S. Army Electronic Command's WSMR Atmospheric Sciences Laboratory will provide launch wind-weighting support.

The SPAR program was initiated to provide research on metal and nonmetal processing in space. The purpose is to improve materials processing on earth and ultimately to produce products in space that cannot be produced on earth.

The program will expand upon studies made during the Apollo, Skylab and Apollo Soyuz test space flights, on which semiconductors and metals were melted and allowed to solidify with little convection and sedimentation.

The Black Brant missions will provide a means of obtaining space-processing scientific data in near-zero gravity until flights of the reuseable Space Shuttle, now under development by NASA, get under way in the early 1980s.

In the first Black Brant flight, about 5½ minutes of low gravity (one ten/thousandths of earth's gravity) was provided during the coast phase of the rocket's suborbital trajectory.

The Black Brant VC (5C) is a 31-foot sounding rocket used by Canadian and U.S. scientific agencies for upper atmospheric research. First fired in Canada in 1971, it has been used for research by NASA at Wallops Island, VA, and at White Sands Missile Range.

Fiberglass Spiral-Winding Technique Used to Construct Storage Tanks

Successful demonstration of an exploratory development spiral-winding technique using fiberglass materials and polyester resin for construction of bulk liquid storage tanks is reported by the U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, VA.

Engineers in MERDC's Fuels Handling Equipment Division recently produced on-site a continuous ribbon from a rectangular box beam shaped pultrusion temporarily stored in a canister placed on the tank foundation beneath a winding machine.

The pultrusion is layed up in a spiral, mechanically interlocked by a double tongue and groove joint and sealed by an adhesive. The first six wraps are hand assembled to form a base on which the winding machine builds until the desired tank height is attained. The floor is sealed and a roof is added after the machine is removed by crane.

Swirled fiberglass mats, fiberglass woven cloth, continuous strand fiberglass rovings, a thin film fluid barrier and resin are used.

One 23,000-gallon demonstration tank has been wound and with improvements in the process engineers expect to wind the shell of a similar size tank in two hours. Eventually, they hope to spiral-wind 50,000 barrel tanks.

The ultimate goal of the project is to produce a storage tank that is cost competitive with steel tanks, quick to erect using a small crew, noncorrosive and noncontaminating to the stored liquid, and practically maintenance free. Significant savings in logistical costs are anticipated.

SPIRAL-WOUND Storage Tank

Roland Missile Completes White Sands Test Firings

Test firings of the French-German developed Roland missile, which the U.S. Army has selected for an all-weather, short-range, air-defense system, were completed during November and December at White Sands Missile Range, NM.

The launch and tracking components of the system have been moved to Cape Canaveral, FL, for tracking tests that will be completed during February.

In the initial firing at WSMR, conducted by a German crew, the Roland intercepted a jet drone. Later firings were conducted by American crews.

COL Henry F. Magill, U.S. Army Roland project manager, reported that all test objectives were satisfied. The purpose, he explained, was to collect "operational data through hands-on firing experience . . . to surface any problems that might arise early in the transfer of technology for incorporation into the U.S. Roland system."

Designed to protect battlefield troops and equipment along with rear area emplacements against low-level air attack, the Roland system will be built in the United States by Boeing Co. and Hughes Corp. and mounted on a U.S. vehicle.

CDA Initiates Worldwide Data ID Service

Designed to serve the needs of soldiers in the field, a worldwide data/item identification service has been initiated by the U.S. Army Catalogue Data Agency (CDA), New Cumberland Army Depot, PA.

The Management Information Research Assistance Center (MIRAC) service is commonly referred to as CDA's "hot line" to enable staff members to assist callers in finding solutions to specific supply and item identification problems.

Inquiries may be made directly by telephone to MIRAC personnel during the normal work day (7:45 am - 4:15 pm). Answering equipment records calls during non-duty hours and responses are provided the following work day.

The MIRAC may be contacted by calling AUTOVON 977-7431 or WATS and FTS (717) 782-7431.

Project Manager Describes Qualities of Stinger Weapon System

By COL David Green

Stinger Project Manager

Nothing with the exception of enemy penetration of the forward edge of the battle area (FEBA) attracts attention of ground troops faster than a warning of incoming, unidentified aircraft.

Whether these aircraft are high-performance attack fighters or armed helicopters, there is no doubt as to the damage and casualties they can inflict on combat and support troops and equipment, supply concentrations, air defense and field artillery positions.

Army leaders have recognized since World War II that the standard air-defense automatic weapons, the .50-caliber machinegun and 40mm, were obsolete because of their short range, low lethality, and inability to engage high-speed, low-altitude targets. Accordingly, studies were directed toward development of a surface-to-air guided missile capable of protecting forward combat area units from low-level attacking aircraft.

Feasibility studies of a lightweight, man-portable, low-altitude missile system to meet the increasing threat of high-performance aircraft were started in 1955 by the Pomona Division of General Dynamics. Results led General Dynamics to design the shoulder-fired, passive, infrared (IR)-homing Redeye missile system which required no outside source target illumination.

Fielded in October 1967, the Redeye weapon system demonstrated outstanding effectiveness against the threats it was designed to counter, such as helicopters, prop-driven aircraft, and medium-speed jets. Continued advances in the air-attack threat, however, have imposed limitations on the Redeye system. Development of the Stinger man-portable weapon system is eliminating these limitations.

Stinger is an advanced shoulder-launched, guided-missile system designed to counter the present and future low-level air attack threat. It uses Redeye's reliable 2.75-inch diameter, lightweight, rolling airframe and, by using advanced technological concepts, has a far greater capability for engaging and destroying low-level targets.

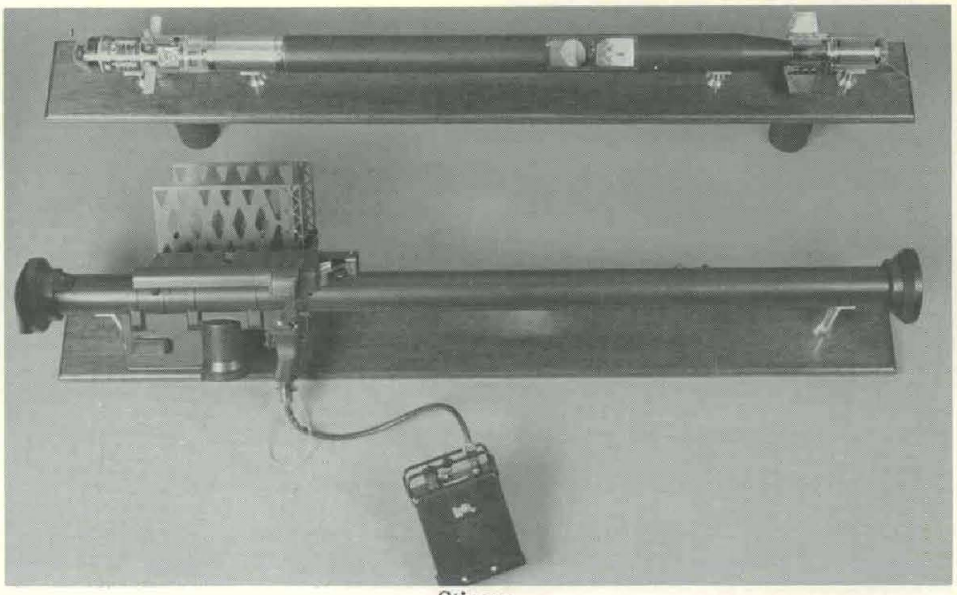
Stinger's new, high-performance rocket motor provides the greater missile velocity and longer range required to intercept high-speed targets such as incoming jets, crossing targets, and even to catch them moving away.

The baseline Stinger guidance system employs an advanced, passive homing seeker that can acquire and track targets at any aspect. This system produces a higher kill probability by causing hits in highly vulnerable areas.

Stinger consists of the 2.75-inch rocket sealed in a nylon launch tube, a separable gripstock with an Identification, Friend or Foe (IFF) antenna, a Battery/Coolant Unit (BCU), and a shipping and storage container.

Inserted into the gripstock, the BCU is a one-time-use, disposable assembly that provides prelaunch electrical power to the gripstock and missile; it also supplies cryogenic coolant gas to the missile IR detector assembly. Once the gripstock is "mated" with the launch tube, the BCU inserted, and the end cap removed, the weapon is considered "full-up" or ready to activate.

The sight assembly is attached to the launch tube and snapped into position when ready for



Stinger

use. Following IR acquisition of the target, an acoustical device mounted on the rear of the sight transmits IR acquisition and IFF information to the gunner. He then uncages the seeker gyro, allowing it to track, and inserts lead angle and superelevation.

Once the gunner activates and fires the missile, it becomes a "fire and forget" weapon, that is, he has no guidance tasks to perform under the stress of being attacked by aircraft, artillery, or small-arms fire.

IFF interrogation is compatible with equipment used on both U.S. and NATO aircraft. The antenna, as mentioned earlier, is mounted on the gripstock; a coax cable, and the electronics are contained in a belt-pack worn by the gunner. Correct interrogation words-of-the-day are programed from a KIR computer through an IFF programer and are stored in the belt-pack interrogator with correct replies.

The Stinger weapon system training set and ancillary equipment provide a means for training and establishing performance proficiency of the operator. The training set contains the Tracking Head Trainer, IFF simulator belt-pack, BCU-type trainer battery, and a shipping and storage container. Ancillary equipment consists of a battery charger and a gas pumping unit (GPU).

Used to train gunners in interrogating, acquiring, ranging and tracking targets, the THT has the same general appearance, weight and center of gravity as the tactical weapon. Included are the electrical components necessary to provide the trainee with the same indications as the tactical weapon.

Built-in indicators also are provided to evaluate performance of the trainee. The belt-pack unit provides simulated IFF interrogation responses to the audio devices of the trainer. The GPU recharges the THT gas reservoir, and contains filtration elements to purify commercial Argon gas to meet the cryogenic cooling gas purity requirements.

To facilitate loading and transporting the basic load of missiles authorized to each Stinger gunner team, harness assembly, adaptable to an M416 ¼-ton jeep trailer, will be issued.

Since the Deputy Secretary of Defense approved initiation of engineering development on the Stinger weapon system in June 1972, a test and evaluation program has been conducted and will continue through September 1978.

Sixteen Guided Test Vehicle (GTV) flights were completed July 28, 1975. These flights verified computer simulations and laboratory tests on guidance accuracy and missile maneuverability against high-performance aircraft.

The first of 19 Design Flight (DF) tests was successfully completed July 17, 1975. This was the first shoulder-launched Stinger fired at a high-speed target employing countermeasures. Fifteen additional firings as of mid-January included targets ranging from a high-speed, maneuvering F-102 jet to a hovering helicopter.

The highly mobile Stinger will replace Redeye and become a member of the family of Short Range Air Defense (SHORAD) weapons designed to protect field Army units. It will be employed to provide low-altitude air defense for battalion, squadron, and company-size units operating near the FEBA.

In addition, Stinger may be employed to provide air defense for surface-to-air missile sites and small, vital areas when no other ground-based air defense means are available.

Although Stinger will not be assigned the mission of defending large areas, its presence will force enemy aircraft to operate at higher speeds and altitudes, decreasing their effectiveness and increasing aircraft vulnerability to other air defense weapons.

The maintenance concept for the Stinger weapon system is predicated on limiting the maintenance and logistics burden placed on tactical organizations to the minimum required, thereby assuring a combat-ready posture. Operator/crew organizational maintenance will be the responsibility of the using unit commanders and will be performed by the Stinger teams.

Items requiring additional maintenance will be evacuated through supply channels to a depot for repair. No special categories of field maintenance are planned.

Stinger, with its high-performance propulsion system, its unique and highly accurate guidance system, and its very effective size, will provide a lethal air-defense capability wherever ground troops have to fight.

Kennedy Addresses Small Firms' Problems

(Continued from page 6)

it away and he falls on his back.

Well, many of the smaller companies are still lying on their backs, and they are too tired and hurt to pick themselves up and try again. But there are others who are willing to give it another try, only they are going to be looking for some sign that this year Lucy means business. And that's going to take some positive action from some of the federal agencies.

But there are deeply ingrained institutional barriers that prevent the small business community from interacting successfully with many of these agencies. For example, there is the unwritten rule — and this is most clearly evident at NSF — that in the spectrum from research to development, industry does the development and universities and nonprofits do the research. Now just where does that leave the small businesses? They are too small to do much of the development, and they have just been ruled out of order on doing the research.

This bias reflects the situation of 15 years ago, when universities were growing by leaps and bounds, and most of the research capability of the nation was to be found in them. But what has been happening more recently? That educational establishment which was built up during the 60s has continued to turn out scientists and engineers who for the most part have found jobs in industry. So the reality of the present situation is that a large fraction of our scientific and technical expertise is now found in small, innovative and (when they can be) profit-making companies.

But the National Science Foundation has two very good features which I want to emphasize. One is that they are set up to handle large numbers of small proposals; the other is that they have no in-house research capability of their own.

The first of these is a very important aspect of an agency, which is too often overlooked — because the job of a funding agency is to spend money, and it is only natural to look for ways to spend that money most efficiently. So if I can give a big contract to a giant corporation and spend $6 million, why should I go through the same amount of paper work, and maybe five times the bother, to spend $50,000 on some small company I never heard of that thinks it has a bright idea? Well, NSF manages, somehow, to spend its money this way, and maybe the other agencies have something to learn.

The second feature of the NSF — the absence of any in-house research — makes it unique among the government agencies funding R&D, and this too is a very important difference. With other agencies the story is all too familiar: A company comes up with a clever idea, and applies to ERDA, say, for funding.

The proposal will be reviewed by the individuals at ERDA who are the most knowledgeable on the subject. But these reviewers are then also competitors for whatever limited funds are available (and funds are always limited — even at ERDA!).

Is it reasonable under these circumstances to expect them to render an unbiased verdict? Is it reasonable to expect a company to divulge its clever idea — and ideas are often all they have going for them — to an agency which has a stake in keeping its own facilities at top potential?

I think it's clear that we have our work cut out for us. But there is an important and vital role that the Congress can and must play in this process, and I want to share with you some of my thoughts on that score.

My good friend and colleague in the United States Senate, Tom McIntyre, has sponsored — and I have been happy to cosponsor — legislation designed to assist small businesses to participate in the nation's energy R&D programs, particularly in solar energy.

This bill would establish the position of Assistant Administrator for Small Business at ERDA, who would be charged with encouraging small business participation in ERDA's programs. It would insure that federal funding of energy R&D would not result in a decrease of competition or in increased barriers to the entry of new companies into the energy industries. It would set aside 20 percent of ERDA's funding dollars for small business.

These are necessary and useful provisions, and I hope we will pass this legislation for its impact to be felt during the present budget cycle.

At the same time, I believe that there is more that we can and should be doing. The SBA could be doing more to carry out its Congressional mandate to assist small businesses in obtaining R&D grants. One difficulty is that SBA lacks the trained technical personnel to do this job adequately.

This can and should be corrected by the Congress. But there is a real need in many small companies for good financial advice, and for assistance in preparing financial statements that will communicate effectively to members of the banking community. SBA can and should provide such assistance.

Several years ago, SBA had a program which provided loans to high-risk, technically oriented firms. This program was stopped after three years, and is presently being evaluated. I hope it will be started up again in the near future. I believe that a careful study should be made of the existing tax laws to determine whether tax writeoffs applicable to R&D are equitable in their application to the small business community and to make recommendations if they are not.

In addition, we should explore ways of assisting small companies to weather the "blackout" period that often occurs between the end of a contract and the start of its follow-on.

In closing, I would like to make some general remarks which apply to the RANN program at NSF and to many other agencies as well. Through these programs the Federal Government is subsidizing a substantial portion of the applied research being performed in this country. In many cases, the application is supposed to take place very rapidly, and the taxpayer expects to see an immediate payoff of the research he has sponsored.

So two things have to happen: It goes without saying that the R&D effort must be competently performed — and it is not always an easy matter to find people who can do this. But it is even more important — and more difficult, in many cases — to take into account the market pressures, tax laws, regulatory procedures, and so on, into which the end product of the research must fit. The ultimate practical use of the research does not happen automatically, and the relevant federal agencies still have much to learn about how to make it happen.

But this is precisely the sort of problem that confronts the industrial R&D firm daily. They don't always do it well — they can make mistakes, miss opportunities, bungle the job in a variety of ways. But when they do, results are all too obvious — and the ones that fail too often don't survive.

This is why the role of small business is so crucial — because the aim of every business is to be successful, and one of the best ways to do this is to come up with a clever idea, do the research necessary to put it into practice, and then make sure it gets into the marketplace. Failure at any stage of this process is tantamount to over-all failure.

It is precisely because you people have learned that lesson that I am optimistic that some important changes will come out of this meeting —changes that will nurture the relations between you and your government, and will enable you to make the essential contributions that you alone can, toward the furtherance of our national goals.

4 DA Civilian Employes Cited for EEO Contributions

Assistant Secretary of the Army (Manpower and Reserve Affairs) Donald G. Brotzman recently cited the following four Department of the Army civilian employes for outstanding contributions to Equal Employment Opportunity programs.

Collette G. Parks, federal women's program coordinator, U.S. Army Engineer District, Omaha, NB, was commended for advancing the FWP and designing special training programs to help women achieve upward mobility.

Roland J. Cavatoni, financial manager, U.S. Army Harry Diamond Laboratories, was praised for recruitment, selection and career development of minority employes.

C. Kevin Collins, equal opportunity officer, U.S. Army Engineer District, Portland, OR, was cited for "highly successful" EEO action plans and additional programs benefiting minority groups.

Francisco A. Escobar, spanish-speaking program coordinator, Fort Huachuca, AZ, was recognized for "outstanding" achievements in recruiting, guiding and counseling minority employes.

Initiated in 1970, the EEO award is presented annually to DA civilians and soldiers. It specifically recognizes individual effort in providing leadership and stimulating respect in Army EEO programs.

Exemplifying Corps of Engineers Motto: Essayons . . .

Topographic Laboratories Serve Defense, Civil Works Needs

Whenever anyone repeats the adage common throughout military history, that "An Army travels on its stomach," meaning nutritious, healthful, sustaining food, he undoubtably should comment — in view of precisely demanding modern military requirements — "but not effectively without accurately reliable maps."

That critical addendum puts the role of the U.S. Army Engineer Topographic Laboratories (ETL), Fort Belvoir, VA, in proper perspective relative to success in combat. ETL is the largest R&D organization of its kind, acclaimed as "a national asset to the U.S. Government" in that it supports Army requirements and functions importantly for the Defense Mapping Agency.

In striving to exemplify the Corps of Engineers motto: Essayons — meaning "Let us try" — ETL uses an interdisciplinary team approach to problem solving. "Totally dedicated to satisfying the needs of Army and Department of Defense users of their services" is the way ETL Commander and Director COL Maurice K. Kurtz Jr. likes to describe ETL personnel in response to their mission.

COL Maurice K. Kurtz Jr.

Present and future military combat operations require ever increasingly more accurate and more responsive geodetic, topographic and geographic information — at a rate and volume often exceeding current conventional capabilities. Technological advances in optics, electronics, automatic data processing and space sciences, however, enable ETL to develop needed equipment and techniques.

ETL's origin dates to 1920 when its predecessor was an Engineer Detachment of the Army Air Services. This R&D group was concerned with improving capabilities for use of aerial photographs for topographic mapping. Later it became an activity within what is now the Mobility Equipment R&D Command.

To cope with problems incident to the advent of the space age, the group in 1960 became a separate field operating agency of the Office of the Chief of Engineers (OCE). Redesignated then as the Geodesy Intelligence and Mapping Research and Development Agency (GIMRADA), it was renamed the ETL in 1967.

Operating under the direction of the Research and Development Office (RDO) of OCE, which has responsibility for maintaining a funded technology base program, ETL primarily supports the Army Materiel Development and Readiness Command and the Defense Mapping Agency (DMA) development, testing and evaluation (RDT&E) in the topographic sciences.

Under terms of Memorandums of Understanding, about one-third of ETL's financial support comes from OCE. Similar amounts are provided by DARCOM and DMA. This joint funding enables ETL to equip military field elements with highly responsive mapping and point-positioning systems for military weapon systems and operations and to maintain a technology base for future requirements.

A recent in-house accomplishment was delivery of a high-precision measuring device for locating weapon launch points and targets for missiles such as Lance. This Analytical Photogrammetric Positioning System (APPS) is also used by DMA to control the quality of its data bases sent to the field for use by APPS-equipped troop units.

ETL provides to Army users scientific and technical advisory services such as environmental design criteria for Army materiel developers. Provided also are tactical terrain analyses to support contingency plans and wargaming scenarios.

Preparation of terrain analyses needed to support such scenarios is a recent example of technical services provided by ETL. The information directly affected deployment plans in the scenario. Planners thus capitalized on "lessons learned" from the 1973 Mideast war.

Over a period of many years ETL has painstakingly recruited a staff of professional personnel widely recognized for mission capabilities and achievements. In addition to 260 permanent staff civilians, 7 officers and 6 enlisted personnel are assigned. Commander and Director COL Kurtz has LTC William T. Stockhausen as his deputy and Robert P. Macchia as the technical director.

LTC W. T. Stockhausen

Robert P. Macchia

Engineers, scientists and technicians comprise 78 percent of ETL's work force. Many are internationally recognized experts in the fields of cartography, coherent optics, geodesy, geography, geology, mathematics, photogrammetry, and photointerpretation.

Indicative of the professional credentials of the staff is the fact that 12 percent hold doctorate degrees, 21 percent have master's degrees, and 47 percent have bachelor's degrees. One percent are selected on a yearly basis to continue their education under a long-term training program.

Except for two occasions since 1967, at least one ETL employe has received one of the annual Army Research and Development Achievement Awards — a record few agencies comparable in size to ETL can match or surpass.

Engineers and scientists at ETL are acutely aware of the need to share their knowledge and findings with others in the scientific community. Transmission of this information is accomplished through publications in national media and professional involvement in 73 scientific and technical societies.

Two of ETL's seven officers have patents pending for military hardware items. Extensive field and combat experience enables officers working with their civilian counterparts to assist invaluably in making an R&D product easier for the field soldier to use. Military personnel serve in management, R&D coordination, terrain analysis, photointerpretation, systems design, and research in the geological, topographical and biological sciences.

The mix of military and civilian technical expertise provides a significant in-house capability including the balance to manage and effectively monitor outside contractual support.

Dedicated to the memory of William C. Cude, ETL's first technical adviser, ETL's new facility on North Post, Fort Belvoir, provides 100,000 square feet of office and laboratory space.

Five subordinate operating elements comprise the ETL capability: the Research Institute, Computer Sciences Laboratory, Topographic Developments Laboratory, Geographic Sciences Laboratory, Terrain Analysis Center.

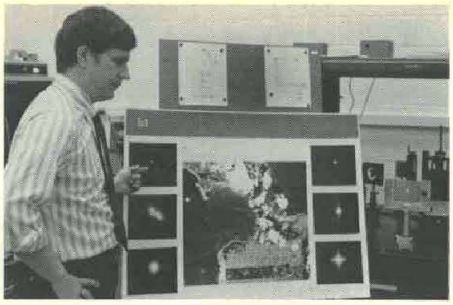
RESEARCH INSTITUTE. Technology-oriented and mission-oriented R&D activities at the Research Institute under Dr. Armando Mancini cover a broad range of scientific and engineering disciplines including the physical, natural, and earth sciences; engineering; mathematics with theoretical analysis; and laboratory and field experimentation.

The Institute is staffed with a team of professional resident scientists and engineers, nonresident researchers, university consultants, and industrial investigators who work together as the program requires. A panel of leading European university professors assists in incorporating foreign science and technology developments into the solution-finding process. Dr. Mancini also coordinates efforts of domestic investigators through the federal laboratory consortium for technology transfer.

Research in coherent optics includes automated pattern recognition, automated photogrammetry, optical memories, holographic terrain displays, real-time modulators, and holographic recording materials.

Optical pattern recognition research has led to a system design with the potential of delineating and positioning clouds on aerial imagery at the film passage rate of 100 feet per minute with better than 98 percent accuracy. This system employs the optical power spectrum detection technique and may replace existing techniques that are slow and tedious.

One of the recognized driving forces behind much of this work is a young scientist named George E. Lukes who became highly motivated by an ETL In-house Laboratory Independent Research effort. Holding a degree in forestry when he joined ETL, George is now completing an interdisciplinary MS degree program in biology, mathematics and physics during off-



duty hours. His thesis on automating agricultural crop classification from multiband/multidate aerial photography incorporates the strategies previously used by expert human photointerpreters.

Seeking new and improved techniques to use remote sensing systems and analysis methods for obtaining environmental information, ETL routinely uses aerial photography, infrared thermal imagery, radar imagery, and ERTS (Earth Resources Technology Satellite) imagery. Other sensor systems such as magnetometers are employed as the need arises.

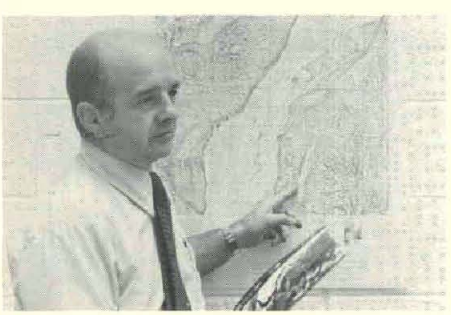
Multidiscipline team analysis of imagery is used to derive environmental information; to identify rock, soil, vegetation, and land-use type; to deduce properties such as moisture content, density, mantle depth, plant vigor, and susceptibility to stress. Additional efforts include evaluations for analysis of military operations, site selection for proposed construction, and predictions about potential impact of construction on the environment.

Robert E. Frost specializes in remote sensing and has trained more than 500 users in Civil Works and the military sector on the use of photointerpretation. Frost recently conducted an experiment with the Ohio River Division, using an interdisciplinary team to show environmental assessment capabilities with remote sensing techniques. The problems addressed were locations and routes of canals, location of dams, assessment of acid mine drainage and effective land use in recreational parks.

The Chief of Engineers recognized the success of the experiment by directing that the remote sensing techniques be implemented into future Civil Works activities.

A team of ETL scientists has done extensive work in arctic, temperate, desert and tropic regions on projects associated with military and civil works. Procedures were developed for detecting fires, caves, crevasses, and damaged vegetation; measuring ice thickness; mapping permafrost; selecting and evaluating sites for airfields; and analyzing areas of operation.

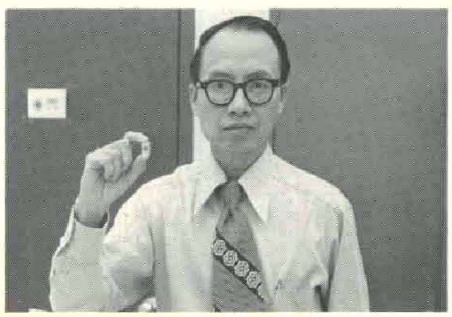
The current program is directed toward using these techniques for rapidly assessing an area in relation to the deployment of air-cushion vehicles (ACVs) over the shore in beaching operations including cargo handling; evaluating an area with respect to lines of communication, including cross-country mobility; and for evaluating soil moisture and camouflage parameters.



The remote sensing group recently developed a winter conditions prediction map of vegetation and hydrology for the Fort Greely area in Alaska. Dr. Ambrose O. Poulin used analogous thermal imagery with projected conditions for a given season and produced a map valuable for assessing winter conditions with respect to land navigation, camouflage and sources of water. The idea for the map resulted from earlier research using infrared thermal imagery in arctic regions.

The Research Institute has an active program involving solid-state arrays. Sensing arrays made of matrices of solid-state, light-sensitive elements as small as 1-mil square transduce images into electronic signals; more than 100,000 elements may be in an array. Because of the precise position of each element and the ability to transfer light into electricity in extremely fast sequence, the elements are highly suitable for image processing applications in mapping.

Dr. Pi-Fuay Chen and Dr. William W. Seemuller, electronics engineers, are using arrays to develop a high-speed parallel scanning system. The system will extract gray-shade data from aerial imagery in near real time, that is concurrent with combat requirements. It will convert images produced by a coherent and incoherent optical system into electrical signals for computer processing; automatically detect changes between two photographs of the same scene taken at different dates; and mechanize a sensor array on a theodolite to study the possibility of automating astronomic position determinations.



Dr. Chen's research has resulted in many applications and has led to the development of a perturbation technique to improve the sensing resolution of arrays by a factor of 20 to 50. He has successfully simulated the inhibition process of the eye with arrays to create sharper edges on poor-resolution imagery. These and other results of his research have been reported in more than 20 scientific papers.

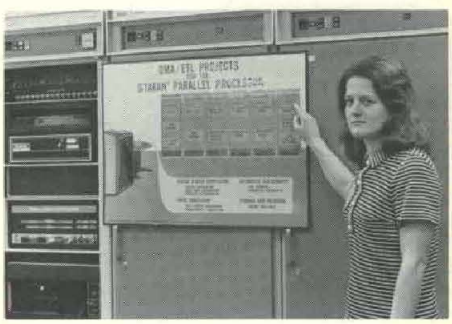
Current ETL research in geodesy focuses on gravity gradiometry and satellite geodesy, and supports defense requirements for minimizing the geophysical errors in missile trajectories. Accurate alignment of the missile's inertial platform is critical for delineating local anomalies of the gravity field and identifying missile perturbations during flight.

These factors inspire research programs to advance scientific theory and to develop extremely sensitive sensors for terrestrial or space use. Theory and instrumentation are being developed for rapid determinations of precise positions, gravity, and the deflections of the vertical. ETL devised a totally new concept by using inertial platforms on land vehicles presently used in mobile point-positioning systems. Dr. Angel Baldini and Nathan Fishel are co-researchers on this program which opens an entirely new area in geodesy and is yielding appreciable savings in time and costs.

THE COMPUTER SCIENCES Laboratory (CSL) under Lawrence A. Gambino develops highly sophisticated uses for systems such as digital computers to enhance the quality of photographs which will extract from them the ground position and elevation of selected topographic features needed for mapping; also, a unique system that can efficiently manipulate photographs into computer compatible form.

CSL has interfaced a new kind of computer to process digitized photographs to a conventional computer system. The new array processor can process a set of numerical data simultaneously in parallel as opposed to conventional sequential or serial processing. The parallel computer performs high-speed operations to aid the interpreter, such as changing the contrast of photographs and extracting 3-dimensional information from overlapping pairs of photographs used to make maps.

CSL depends upon its creative scientists and engineers to develop most of the software used in-house. Barbara H. Brooke, who came to ETL as a GS-9 mathematician, entered the training program then available to career scientists and engineers. She is now a GS-12 mathematician.



Currently working toward her master's degree in computer science, Barbara is investigating the potential of the new parallel computer for efficient retrieval of mapping information. Her research is expected to lead to more efficient production procedures in the mapmaking process.

Michael A. Crombie, who has done extensive post-graduate work in mathematics and statistics, heads a research team that has developed new digital techniques using a parallel computer for precise extraction of 3-dimensional information from photographs.

Michael is also investigating the application

(Continued on page 18)

ETL Serves Defense, Civil Works Program Requirements

(Continued from page 17)

of a whole new technology, array algebra, to his computations. Array algebra, in addition to parallel processing and appropriate computer architecture, holds promise of being able to reduce computation time by several orders of magnitude as compared to matrix algebra solutions on serial computers.

Physicist Dr. Bryce L. Schrock is responsible for producing an interactive digital image processing system; consisting of a large-scale conventional sequential computer, an associative array processor, and an image display subsystem. He leads a team of researchers working on an interactive picture processing system with a variety of input/output consoles.

This interactive computer complex, rated as one of the most advanced in the world, will be used at ETL and other organizations to investigate advanced digital techniques in mapping and to extract information from digitized photographs in near real-time.

THE TOPOGRAPHIC DEVELOPMENTS Laboratory (TDL) under Howard O. McComas performs R&D in surveying, precise point positioning, and mapping. The goal is to improve the operational procedures of the DMA centers by replacing the tedious manual operations with computers, peripheral devices, and automatic plotters.

Other major programs, under the cognizance of DARCOM, provide new and advanced systems for military units in the field. These include precise inertial positioning systems for jeeps and helicopters; analytical photogrammetric positioning systems for survey and target locations; equipment for exploiting airborne sensor data from remotely piloted vehicles; and limited, quick-reaction color reproductions of maps and overlays.

In support of the Pershing II program, TDL is conducting R&D to provide the hardware and techniques to produce synthetic radar scenes of selected targets for use in the terminal guidance correlator of the missile. The program requires investigation in techniques and applications of software for digital image processing, radar technology, image correlation, total system error analysis, and range instrumentation/testing.

One team working on image correlation has a combination of more than 50 years of experience in advanced systems and is typical of the expertise and know-how possessed by other teams within TDL. Composed of physicist Donald J. Skala, electrical engineer Robert E. Saxe, civil engineer F. Raye Norvelle, test support coordinator Clyde E. Berndsen and military R&D coordinator CPT Terrence Cooney, the team is fabricating a correlation facility.

Norvelle has twice received the ETL Commander's Award for Technical Achievement as well as a Department of the Army R&D Achievement Award for developing technique to establish contours in radar imagery.

Drafting in map production requires many man-hours of tedious effort, and ETL is developing an experimental system to automate part of the process by using a large computer, digitizing devices, output plotters, and computer software.

Some items of hardware and software have been phased into production at DMA on a limited basis. Others are in the development phase. Based on an annual production rate of 500 maps, this system when implemented could save from $1 million to $1.5 million.

Joseph A. Honablew, a cartographer/computer programer with a broad knowledge of mapping requirements and digital concepts, provided the know-how to develop techniques utilizing a manually operated computer-controlled digital compiler.

Designed initially for military map production, the techniques and equipment are envisioned as having civil applications such as land-use studies, thematic mapping, and special terrain graphics.

Digital data must be edited for errors and corrected before it is used to drive automatic drafting machines. The lab has successfully tested a prototype interactive system to do this, and engineering models for all three DMA production centers are being developed by a team headed by physicist Wesley H. Shepherd.

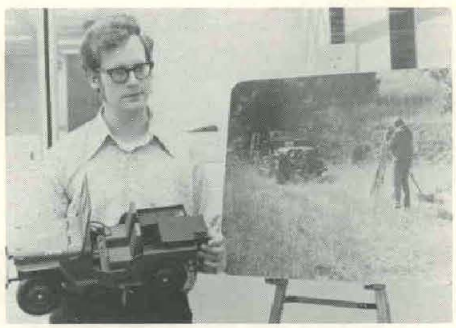
Another group is developing a cathode ray tube (CRT) plotting system. Map names and location data are placed on magnetic tape which is then input under computer control to a plotter that automatically exposes the names onto large sheets of film. A wide variety of type fonts of graphic arts quality can be produced by applying this technology.

A long-range development is a prototype Electron Beam Recorder (EBR) system, an effort headed by Julius F. Merkel, a mathematician experienced in opto-mechanical instrumentation. For this application, an electron beam impinges directly onto recording film instead of onto a phosphor-coated surface as with conventional CRTs. Lines less than three micrometers wide can be drawn at speeds typical of CRTs.

ETL has demonstrated the ability to generate visual perspective displays of terrain by using digital terrain data and generating rectilinear lines on a model. The general effect is likened to a luminescent fishnet draped over the terrain. Responsible for this in-house team effort is engineer/physicist James R. Jancaitis, who has authored more than 30 technical publications and is internationally recognized.

The Position and Azimuth Determining System (PADS) and the Inertial Positioning System (IPS) are related surveying systems that provide precise horizontal and vertical position coordinates and azimuths in real time. The self-contained "black boxes" can be installed in standard ground vehicles or helicopters and are insensitive to electronic countermeasures.

PADS is a DARCOM program to develop a militarized survey system for field artillery and is expected to be used primarily for battalion area surveys. The program is in the full-scale development phase with delivery of five prototypes and support equipment for DT/OT II (design and operational testing) scheduled for the second quarter of FY 1977. An advanced development prototype was designed, fabricated and successfully tested by project engineer Frederick M. Gloeckler Jr. He has a BS degree in electrical engineering and extensive experience in developing satellite and airborne systems for geodetic and tactical surveying.



The IPS was developed at the request of DMA. IPS requires higher position accuracy than PADS, but the environmental and operational constraints are less severe. The IPS has been delivered to DMA and is undergoing modification by the Research Institute to measure gravity parameters as well as position. Technology transfer has resulted in several commercial versions delivered to nonmilitary agencies and private surveyors.

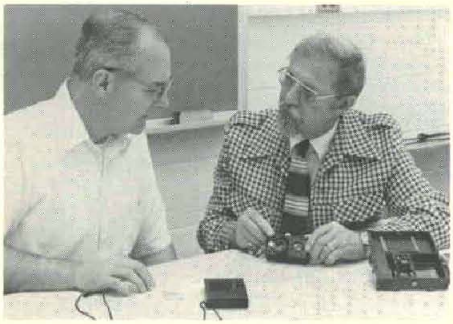
THE GEOGRAPHIC SCIENCES Laboratory (GSL) under Dr. Kenneth R. Kothe works to improve the Army's Military Geographic Information (MGI) capability. This involves R&D of climatic and terrain constraints on materiel and operations; also, developing better equipment, maps, and topographic data displays.

Personnel involved in designing, developing and testing military materiel must consider real-world phenomena such as rain, snow, blowing sand, mud and extreme temperatures to avoid increased development costs due to overdesign or lack of reliabile performance due to underdesign.

ETL geographers Dr. Paul C. Dalrymple, Dr. Llewelyn Williams and Harry S. McPhilimy combine 85 years of experience in dealing with environmental effects on materiel. They know, for example, that if they can reduce the materiel design criteria for extreme temperatures by only a few degrees without increasing the risk of equipment failure, they will enable the Army to save money in development costs.

McPhilimy is the U.S. Army member of the

Quadripartite Special Working Party on Induced and Natural Environmental Conditions, whose meeting he will host in 1976. Paul has been honored for his work in Antarctica by the christening there of Mount Dalrymple.



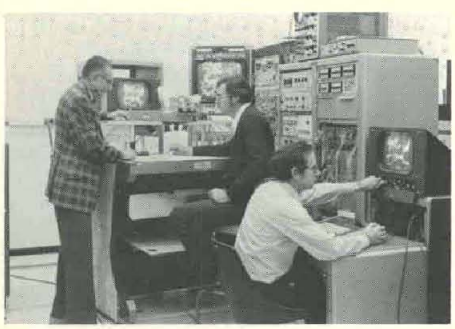
Technicians Erik K. Woods and Leroy J. Morkes have developed experimental viewers for miniaturized escape and evasion charts, plus a map illuminator for night land navigation. Designed for DMA, the devices are intended to help downed pilots and soldiers escape from enemy territory. A magnifying lens and light bulb allow the escapee to read miniaturized maps during the day and at night, and to use a built-in compass to find the way to safety.

Lee developed the pocket-size night illuminator for maps so that it does not reveal the soldier's position to the enemy or destroy his night vision. Two small bulbs illuminate the map which reflects light back through a simple but cleverly designed light control system. The bottom of the device contains etchings of map coordinate scales.

GSL personnel have been concentrating on extraction of useful terrain information from aerial photographs and radar imagery. Several digital, analog and hybrid (analog/digital) approaches to automate terrain data extraction have been explored by Bernard B. Scheps and Lawrence P. (Pat) Murphy through in-house research and contracted studies.

Their early efforts pointed to development of a near real-time, nearly parallel, image processor with human interaction. Parallel processors are now available to continue the digital approach, but earlier work emphasized use of the in-house, analog experimental Automated Image Data Extraction System (AIDES). Edward G. Trelinskie Jr. led the AIDES design and fabrication team.

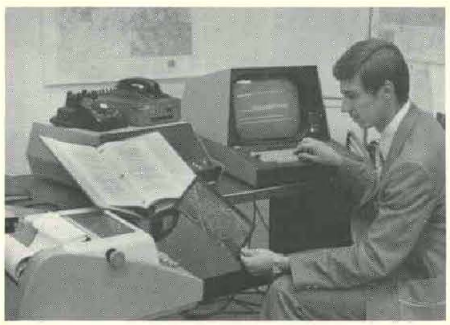
With various types of aerial photography, the experimental AIDES has been useful for extracting terrain data, evaluating camouflage, generating perspective "3-D" displays with terrain profiles, and depicting line-of-sight on the battlefield.



Pat Murphy and Ed Trelinskie are designing equipment for near real-time extraction and display of ground slope for use by terrain analysts in the field. Pat's experience with map compilation and pattern recognition complements Ed's recognized knowledge of electronics and computer technology.

Remotely sensed multispectral imagery is particularly useful in automated image data extraction. The GSL multiband photography team consists of photographers Richard K. Roedel, Warren W. Daniels and Gunther Schwarz, under the leadership of Theodore C. Vogel, physical scientist.

Vogel has been involved with remote sensing since 1959 in military, civil engineering, civil works, and environmental applications of multispectral imagery. He was program chairman for the recent Workshop for Environmental Applications of Multispectral Imagery held at Fort Belvoir, cosponsored by ETL and the American Society of Photogrammetry. Research in photographic technology at ETL is directed by John S. Odell, former vice president, Technical Association of the Graphic Arts.



Management of vast quantities of ETL terrain information in documentary form has posed a real challenge. Alden C. Gunther designed a system for automated storage and retrieval of textual and graphic information on many geographic subjects, and documented the software.

Using photography and holography, he and William R. Graver from the Research Institute are attempting to reduce a document from 48 by 60 inches to 0.8 by 0.8 inch and enlarge it again to 48 by 60 inches without losing any detail or resolution. Such a capability has many potential applications, but the savings in space and the rapid access to map reproducibles would provide exceptional benefits. All of the reproducibles for a theater of operations, for example, could be stored in a device no bigger than a breadbox.

THE TERRAIN ANALYSIS Center (TAC) under James D. O'Neal provides operational rather than R&D support. The Chief of Engineers established the Center in April 1975 to provide a terrain analysis capability at Department of Army level. Historically, terrain analysis has played an essential role in military operations, but in recent years had lapsed into near nonexistence.

In support of contingency plans and wargaming scenarios, TAC prepares specific terrain studies and analyses. TAC also assists and complements users and producers of terrain intelligence in developing a capability to provide military geographic information and terrain data needed for military and civil contingency planning, training and engineering. TAC's location within ETL enables it to test new methodologies, techniques and systems resulting from RD and to represent the user.

The TAC organization consists of two interdisciplinary teams of analysts skilled in physical and cultural geography, geology, soil science, engineering, image interpretation, soils and terrain analysis, and library science (technical information specialists). Individual experience averages 18 years service.

Recent TAC activities include support of engineer terrain detachments with data prepared for terrain analyses in support of TRADOC war-gaming scenarios; preparation of a terrain analysis and trafficability/maneuverability study in response to FORSCOM requirements related to stationing plans; and development of special terrain studies in support of Military Operations in Built-up Areas (MOBA) studies by DARPA.

Other activities involved completion of basic environmental resources inventories in support of civil requirements of the Corps of Engineers and pollution monitoring effects of the EPA, and provision of a specific terrain analysis to support current Command and General Staff College course requirements.

Geographer R. Herschal Ottinger led a team effort that responded in two weeks to an urgent need in support of TRADOC Commander GEN William E. DePuy's recent emphasis on terrain appreciation, thereby epitomizing the Corps of Engineers' motto: *Essayons* (Let us try).

Corps of Engineers Contract Calls for Environmental Study

Methodology for rapid assessment of environmental impact of small projects and related construction activities in navigable waterways will be developed during an 8-month contract with the U.S. Army Corps of Engineers.

Announced Nov. 24, the $108,000 contract with Mitre Corp. of McLean, VA, calls for techniques of assessing EI of such actions as riprap placement for shoreline stabilization; bulkhead, groin and jetty construction; filling of wetlands; aerial crossing of waterways; submerged lines; outfall and pipe placement for storm and sanitary improvements.

The Corps of Engineers is responsible for regulating such activities and has authority to issue permits from Section 10, Rivers and Harbors Act of 1899; Section 404 of the Federal Water Pollution Control Act Amendments of 1972; and other federal statutes.

Responsibility for administration and technical monitoring of the Mitre Corp. contract is assigned to the Corps' Institute for Water Resources.

22d Army Mathematicians Conference Offers 4 Lectures, Technical Papers

Four major lectures and numerous technical papers are scheduled for presentation at the 22d Conference of Army Mathematicians programed May 12-14, Watervliet Arsenal, N.Y.

Sponsored by the U.S. Army Mathematics Steering Committee, the meeting will feature reports and discussions involving Army mathematicians, personnel from the Army Mathematics Center, University of Wisconsin and industry and university representatives.

Lecturers who have accepted invitations are Prof. A. C. Erigen, School of Engineering and Applied Science, Princeton University; Prof. James Rice, Engineering Division, Brown University; Prof. G. S. S. Ludford, Center for Applied Mathematics, Cornell University; and Prof. Thomas Kailath, Department of Electrical Engineering, Stanford University.

SPEAKING ON . . . *(from inside front cover)*

gress refrain from making across-the-board cuts or large numbers of small cuts. We would rather have them kill outright those programs with which they disagree, allowing the others to proceed on schedule. We have not succeeded here, but we will try again. The practice of stretching out a program still persists. It is still considered an economy though in reality it is not. We also will try again on this one.

We expect several different philosophies to be stressed in Congress. Among these is designing for the concept of commonality of major components of materiel systems for common use within the U.S. Military Services and among our allies. Another major area of emphasis is stimulating competition to provide a better product at less cost and simplicity of design and production — to achieve lower costs and less sophistication. In our business, you cannot reasonably fault these goals.

Another major hurdle we must clear is to improve our management of manpower and funding resources in the materiel acquisition process. We began this effort in 1974 by reorganizing the Department of the Army general staff. For example, my office, the Deputy Chief of Staff for Research, Development, and Acquisition, was formed to combine R&D and procurement functions.

Major purposes of this action are: First, provide for consideration of the procurement aspects of a major weapon system program early in the development stage. Second, insure staff accountability. Third, to get better control over the procurement bow-wave, such as we now face in the 1978-80 period, with a number of new high-cost systems scheduled to enter the inventory.

Finally, we acted to bring these closely related objectives together below the Chief of Staff level, thus presenting the Chief of Staff a balanced program with most issues resolved. All of our problems have not been solved, but the system is working well. The concept appears sound. A study is now under way to see what additional changes, if any, may be needed.

GEN John R. Deane Jr. has reorganized his Army Materiel Development and Readiness Command headquarters into a smaller, corporate-type structure. Laboratories and R&D elements of the commodity commands are being reorganized into mission-oriented development centers — with the readiness functions established in similar centers. All report directly to HQ, DARCOM.

Our toughest hurdle, as I see it, is cost control. It is the biggest problem I face. Several of our major weapon systems programs today are encountering severe cost growths. The options available to us in such cases are all bad. We can go to the Congress to request more money and, at best, we are criticized. At worst, the Army, the contractors, and the programs themselves lose credibility.

When this happens, the consequences are really bad. We can stretch out the program, but this always results in higher costs, delays in fielding new or improved materiel, and is seriously disruptive. We can direct a "best effort" approach by the contractor, but we face the danger here of never achieving the desired capability or, in the case of competitive programs, of selecting the wrong system.

Another option is to let the contractor pay the bill and proceed at his own risk. We used this latter option last year and I hope not to have to do this again.

Competitive development programs inherently make this escalating cost problem most acute. Naturally, the contractor wants to provide his prototype with the best performance possible, so cost consideration tends to be subordinated.

We are receiving heavy pressures on this problem of cost from all sides — from Congress, the Office of the Secretary of Defense, the Office of Manpower and Budget and from my bosses in the Army. Robert Parker, the Principal Deputy Director of Defense Research and Engineering, recently told an audience that everyone in government and industry must become more cost conscious. In responding to defense requirements, engineers are generally inclined to look to the requirement first and to cost as secondary. This is wrong!

Deputy Secretary of Defense Clements has directed attention to the requirement that design engineers in the commercial community key their efforts to a simple design and a product easy to produce and maintain. In the defense industry, the tendency has been toward complex and sophisticated design — objectively to produce an advanced weapon system far superior to that fielded by a potential aggressor nation. This also must change. We must concentrate on producing the best possible weapon systems at an affordable cost by realistic design geared to combat needs for firepower, operational simplicity, rugged reliability, and minimal maintainability costs.

In this same vein of thought, a recent speech by a key industrial official, themed on quality control, mentioned the growing trend in commercial products toward how good, how reliable, how useful —in contrast to how big and how much capability of a few years ago.

In that context, my message today is clear; it is that we must concentrate on trying to control cost. We simply must find ways to check cost growth. We recognize that a "cost plus" contract is just that; but to return to Congress year after year for additional funds reminds everyone too much of the MBT (Main Battle Tank)-70 and Cheyenne aircraft programs. If you have some fresh ideas on how to solve this serious problem, please let me know.

We in the military must share much of the blame for cost overruns by making our specifications and requirements unrealistically demanding. In this respect, we are sincerely trying to improve our ways. There is little satisfaction to us in building a system to get the last ounce of performance when we may not be able to afford to buy it due to cost escalation.

All of us here know well that research, development, test and evaluation constitute a high-risk business; that dealing with the unknown, the never-done-before, very often leads to unpredictable problems. In trying to control our cost estimating, we are using Norman Augustine's TRACE concept, an acronym for Total Risk Analysis Cost Estimating. *We hope by this approach to obtain a 50 percent probability of not overrunning.* (Italics added.)

A related hurdle, one closely associated with costs, is weapon systems standardization with our allies. Our goals are to reduce research, development and acquisition costs and to improve our mutual combat capabilities. But standardization is not as simple to achieve as one would believe at first glance. Access to foreign data and the technical translation to American production designs are difficult. What does one mean by interchangeability, by standard modular components? We have severe problems here too in reaching understanding of goals and methods of achieving them; they must be solved.

Another hurdle is that of changing the requirement. Should the user be allowed to change the requirement? The answer is obviously yes. But how many times can it be changed? When? How much? The answer is that there must be some acceptable degree of control appropriate to a particular weapon system or other materiel items.

The Letter of Agreement concept now in use between the developer and the user insures a closer interface between the two; the requirement is not fixed until the user is sure of what he wants. This process should provide the user with the product he wants —not what somebody else thinks he wants — and it will be delivered quicker.

In summary, we have a number of problems of mutual concern in the materiel acquisition business, and we have to make responsively rapid progress in solving them. However, we have to understand what the problems are, and where they are, before we can solve them. Some of the things we talked about today are purely the military's responsibility; others impose upon industry a big responsibility. We need solutions and working together as partners in strengthening our national defense posture, we can find solutions.

Cost Reduction Suggestions Earn President's Acclaim

President Gerald Ford will send you a letter of appreciation and you may receive a cash award proportionate to the value of your idea if you submit a Cost Reduction Program suggestion that will save the U.S. Government $5,000 or more during its first year of operation. **But May 5 is the cutoff date.**

Aberdeen Proving Ground, MD, reported recently that Larry G. Koons, an employe in the Materiel Testing Directorate, received a Presidential letter and a cash honorarium of $330 for a suggestion to increase safety and efficiency in operation of 20-ton mobile cranes.

Presidental support of the program was scheduled to terminate in December 1975 but was extended due to its gratifying results. Nearly 700 civilian and military personnel within 22 departments and agencies had been recognized by President Ford as of December.

Battelle Forecasts $38.150 Billion for R&D During 1976

Federal Government funding will support about $20.228 billion of research and development this year, up $2.068 billion (11.4 percent) from 1975. This is almost 53 percent of the Calendar Year 1976 national projection of $38.150 billion for R&D expenditures.

Industrial funding is forecast at $16.592 billion, up $1.657 billion (11.1 percent) from 1975. This accounts for 43.5 percent of total R&D funding. Academic institutions are expected to fund $780 million (2.0 percent), and the not-for-profit organizations $550 million (1.4 percent).

These statistics are included in the annual prediction of the nation's R&D structure prepared by Dr. W. Halder Fisher and colleagues at the Battelle Columbus (OH) Laboratories. Computations are based on data from the U.S. Bureau of Budget, the National Science Foundation (NSF), the McGraw-Hill Survey —Business Plans for R&D Expenditures, and analyses by Battelle's Department of Resource Management and Economic Analysis Research and other departments.

The national forecast anticipates an increase of $3.805 billion (11.1 percent) over the $34.345 billion that the NSF estimates was spent for R&D in 1975. The Battelle estimate is that about half of the increase (5.8 percent) will be caused by inflation.

Continued inflation is expected during 1976, possibly contributing to economic weakness. The forecast notes that a leveling or decline in federal funding started in 1968 but this seems to have ended in 1971.

The expected rise in federal R&D expenditures reflects the net impacts of three sets of interacting forces: increased emphasis on energy problems (now the fourth largest category of government R&D expenditures), fiscal indecision because of the danger of further inflation during recovery, and a slightly more favorable congressional attitude recognizing the national defense requirement for military R&D to strengthen the national technological base.

Funding rates implicit in the fiscal 1976 federal budget requests likely will be continued through September rather than changed in July as in the past, the forecast states. This assurance comes from the proposed shift to Oct. 1 as the fiscal year beginning, instead of July 1.

Four agencies account for almost 87 percent of anticipated 1976 federal R&D funding, specifically: Department of Defense, 49.1 percent; NASA, 15.8 percent; Energy R&D Administration, 11.0 percent; and the Department of Health, Education and Welfare, 10.7 percent. An additional 6.4 percent will be shared by the NSF, Department of Transportation, and Environmental Protection Agency.

Developments during 1975 substantially support Battelle's 1975 forecast, with energy R&D firmly established as a major area of expenditures. The fastest program expansions are directed toward reducing national dependence on fossil fuels, especially on gas and oil. However, a trend seems to be emerging, with the nonfossil and nonnuclear energy sources (especially geothermal, solar, and wind) gaining in relative emphasis.

Industrial effort remains one of the faster growing sources of R&D funds. Between 1971 and 1975, the industrial and academic sectors increased funding by 38 percent, the U.S. Government by 21 percent, and not-for-profit organizations by 25 percent.

Industry is expected in the Battelle forecast to *perform* 69.8 percent of all research, with 14.5 percent by Federal Government agencies, 11.9 by academic institutions, and 3.9 percent by not-for-profit organizations.

Industry's share of research has increased by 30 percent from 1971 to 1975, in contrast to 25 percent for the Federal Government and academic sectors and 20 percent for other not-for-profit.

The expected pattern is one of stability or very slow change, with resource, energy, and environmental problems providing the major impetus for new trends.

AMSUS Recognizes 2 WRAIR Personnel for Research Success

Medical research directed to development of a safe vaccine for dengue-hemorrhagic fever, and contributions to clinical urology over a 35-year career, earned awards of the Association of Military Surgeons of the United States (AMSUS) for two personnel of the Walter Reed Army Institute of Research.

COL Phillip K. Russell, director of WRAIR's Division of Communicable Diseases and Immunology, was honored as the 1975 winner of the Gorgas Medal for outstanding achievements in preventive medicine. The award memorializes MG William C. Gorgas for his PM research during Panama Canal construction.

COL Anthony A. Borski, Walter Reed's senior urologist and consultant to the Army Surgeon General, was presented the 1975 Stitt Award, consisting of a bronze plaque and $500, for his urological research.

COL Russell was cited for his research on dengue fever, a disease common in Southeast Asia and the Caribbean, in an effort to produce a vaccine for use by American troops. He also was cited for research leading to a vaccine against upper respiratory infection common in basic training camps.

Carried by mosquitos, dengue is rarely serious unless it results in hemorrhagic fever, which can be triggered as an immunologic overaction. This results in severe bleeding, shock and even death.

Along with his urology achievements dating back to 1941, COL Borski was cited for service in chairing AMSUS scientific panels.

Currently he is studying a substance used by African witch doctors to treat urinary disorders caused by an enlargement of the prostate gland. Widely used in Europe, the drug has reportedly produced an "80 percent positive" result in over three million people.

COL Borski has published numerous articles on such topics as treatment and diagnosis of testicular tumors with radiation, use of an artificial bladder, and priapism.

ETL Technology May Aid Civilian Requirements

Advanced technology systems developed by the U.S. Army Engineer Topographic Laboratories to meet Department of Defense and modern Volunteer Army requirements are being considered for possible applications in solution of environmental and other civilian community problems.

Assistant Secretary of the Army for Civil Works Victor H. Veysey and his deputy, Jack Ford, were accompanied by top Army Corps of Engineers leaders during a recent tour of ETL facilities at Fort Belvoir, VA. They were briefed on the advanced systems as a basis for considering their use in coping with some of the adverse environmental factors.

Deputy Chief of Engineers MG John W. Morris, Deputy Director of Civil Works (OCE) BG Kenneth E. McIntyre and OCE Chief of Research and Development William B. Taylor joined Veysey and Ford on a tour of ETL facilities conducted by Commander and Director COL Maurice K. Kurtz Jr.

Advanced technology systems demonstrated to the visitors, along with briefings on the capabilities of each system, included the Analytical Photogrammetric Positioning System (APPS), an ETL concept developed primarily in support of the Lance Missile System.

Currently used by the Army, Navy and Air Force, APPS provides important capability for the Defense Mapping Agency and has been adapted for commercial production.

Other hardware and software systems shown to the group included the Position and Azimuth Determining System (PADS), and remote sensing techniques used in an interdisciplinary approach for planning and development in Civil Works Program projects.

Robert Frost of ETL briefed the visitors on the use of remote sensing and interdisciplinary analysis for planning and development in civil works. He advocated an intensive course in photointerpretation for members of groups having a diverse background in fields such as geology, biology, engineering, architecture, geography, economy, archeology and law.

ANALYTICAL PHOTOGRAMMETRIC Positioning System (APPS), developed by the Army Engineers Topographic Laboratory (ETL), is demonstrated to (l. to r.) MG John W. Morris, William Taylor, LTC Tilford C. Creel and Victor V. Veysey.

USAAMRDL Studying Composites in Advanced Structures

By Frederick H. Immen

Structures technology improvement efforts of the U.S. Army Air Mobility Research and Development Laboratory are being directed toward development of composites of advanced fibrous materials in resin or metal matrices.

USAAMRDL is headquartered at the Ames Research Center, Moffett Field, CA. Scientists working on better materials for design engineering of new aircraft are employed in the Eustis and Langley, VA, directorates.

They are concentrating on an in-depth understanding of a few composites as candidates to supplement aluminum, titanium and steel materials, rather than undertaking a broadbrush exploration of numerous fibers and matrices.

Future aircraft structures are expected to be hybrids of several materials combined for optimum structural integrity. Potential advantages of composites include:

Design flexibility. By "laying-up" fibers in several orientations, the designer can mold his structure to satisfy aerodynamicists' dreams of the contours of a sleek air foil.

The designer is not constrained by limitations imposed by extrusion technology, machining complications, brake-forming limits, etc. Critical dynamic components, such as helicopter rotor blades, can be formed with relative ease with mass and stiffness distributions to resolve frequency tuning problems. Figure 1 illustrates this characteristic.

On a plot of specific Young's modulus versus specific torsional modulus, a particular fibrous composite permits any combination of specific stiffnesses along a diagonal line by variation of fiber orientation. Almost any desired combination of stiffnesses within a large envelope can be achieved by mixing fibers, for example, glass and boron. By comparison, all metals fall at one point on this plot.

Reduced weight, cost. Specific static strengths of composite materials are approximately three times as great as metals (see Figure 2). Fabrication of lighter components can permit lower aircraft structural weight fractions, and thereby reduce design gross weights and installed power requirements to perform a specific mission.

These reductions can have a direct and powerful effect on system life-cycle costs, which are more important than the possible higher unit cost of a composite component. Reduced weight also can be traded off against increased combat-damage tolerance and fail-safe characteristics.

Increased fatigue resistance. Research indicates that composites have 100 percent greater fatigue strength than conventional structural metals.

Increased damage tolerance. Composite materials, particularly fiber glass, when interleafed in appropriate fiber orientation, have exceptional ballistic impact damage tolerance and great resistance to damage propagation. When combined with metals, the fibrous material inhibits crack propagation and provides a second fail-safe load-path in case of complete failure of the primary structure.

Figure 3 shows the results of applying unidirectional fiber glass to titanium on an equal load-to-weight basis. As the proportion of titanium

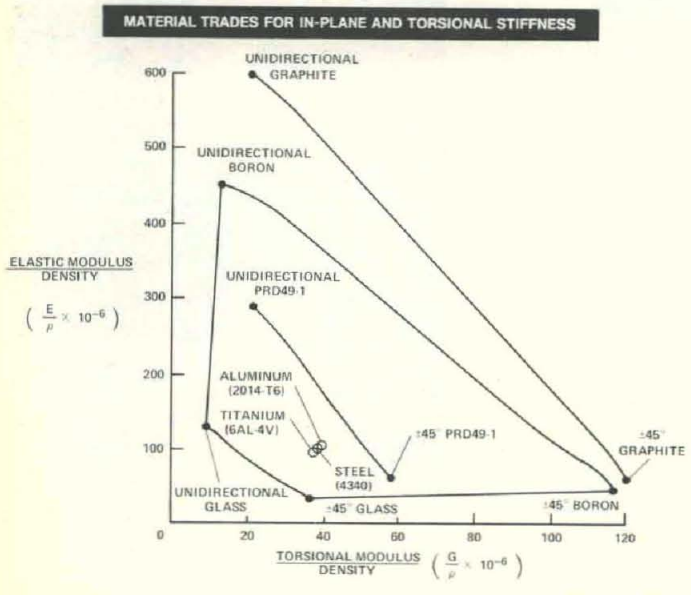


Figure 1

STRENGTH/DENSITY COMPARISON
COMPOSITES VS METAL

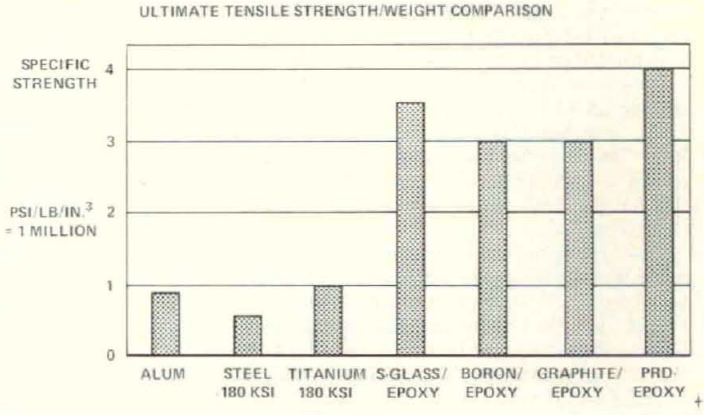


Figure 2

and glass is varied, an optimum fail-safe combination is achieved.

Increased structural damping. In the dynamically critical components of the helicopter, it is possible that the structural damping characteristics of the composite material will reduce vibratory loads in the aircraft. USAAMRDL research and development activities are progressing to verify and reliably quantify attractive characteristics of composites.

Known and unknown hazards in the use of composites must be clearly defined and accounted for during design. Known deficiencies are relatively easy to attack. Unknown problems can be handled only by astute observation on the part of the researcher. Unfortunately, the unknowns can cause the designer to have lack of confidence in anything new. A technology demonstrator can go a long way to dispel these fears.

Known problems with composites are:

Joining. Transfer of loads into and out of composite structures creates secondary interlaminar stresses that often cause peeling and interlaminar cracking.

Interlaminar stresses near stress-free edges in composite plates. This problem and the joining problem require micro-mechanics analytical methods to understand and account for the phenomenon.

Stiffness degradation under cyclic load. The composite fatigue-load limit often will have to be defined as a maximum allowable stiffness degradation (see Figure 4). This is particularly true in frequency-critical components, such as rotor blades, where natural frequencies must be located to avoid harmonics of rotor RPM and thereby minimize loads.

This phenomenon can be used as a fail-safe detection device. If the blade experiences excessive fatigue loads, degradation of natural frequency might trigger unacceptable vibratory loads, indicating that the blade had been "overloaded."

Environmental degradation. Composites exposed to heat, moisture,

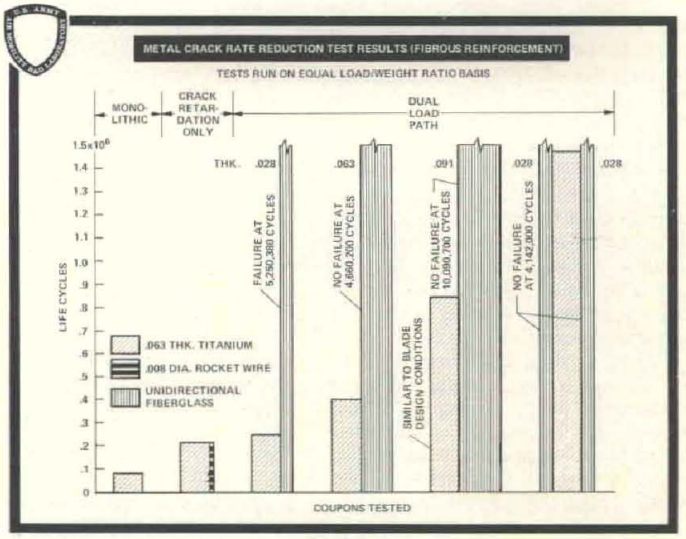


Figure 3

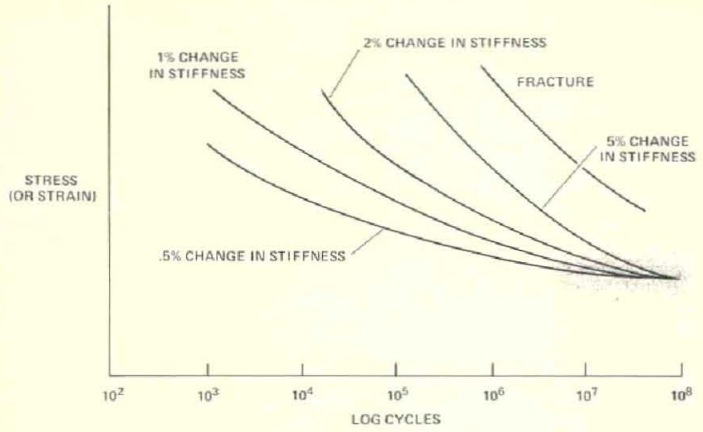


Figure 4

and solar radiation can mechanically degrade about 25 percent. Development of protective surfaces should reduce this problem, apparently no more severe than that of conventional metals, to manageable proportions.

Fracture control. Capability of predicting progression of structural degradation through a composite component requires continued research. Some work indicates that the theory of fracture mechanics can be adapted to composites. The failure mode of composites promises to be benign. Detection techniques should be easier to devise than for metal structures.

Inspectability. Inspection techniques during manufacturing and in service monitoring need to be devised so that reliable minimum acceptable quality levels of components can be defined and maintained. This problem is acute in the bonding interface between the composites and isotropic materials.

Manufacturing methods. Costs of fabrication must be reduced to make composite structures viable competitors for future aircraft systems.

Confidence. The engineering designer may need some convincing to incorporate a new concept or material.

USAAMRDL is pursuing solutions to these various problems through a balanced R&D program. Physical and mechanical characteristics of potential engineering materials are being developed so that significant allowables can be statistically defined. Loads, strain, fatigue and fracture mechanics methods are being developed and verified in the laboratory.

Manufacturing methods and technology are being developed to insure that composite component unit costs, and the hazards of large dispersions in physical and mechanical properties due to hand layup, are minimized.

Technology being developed for this purpose includes:

• Filament-winding process for fabrication of primary structural elements utilizes wet fibers laid up on a spinning mandrel (see Figure 5). The process is not new; however, the technique of forming these layups in a semicured state into noncircular sections to form highly efficient components of very repeatable machine-made properties is a significant technological breakthrough.

• Automated 6-degree of freedom tape layup machine will automatically layup preimpregnated tapes of fibers in six axes.

• Pultrusion machine will form composite shapes similar to extrusions by pulling on the wet fibers instead of pushing (see Figure 6). As in the other devices, the product is very compact with a high-fiber fraction, consistent properties, and low cost.

The subdisciplines of structures technology, which are being improved, combine to culminate in improved structural concepts for Army aircraft.

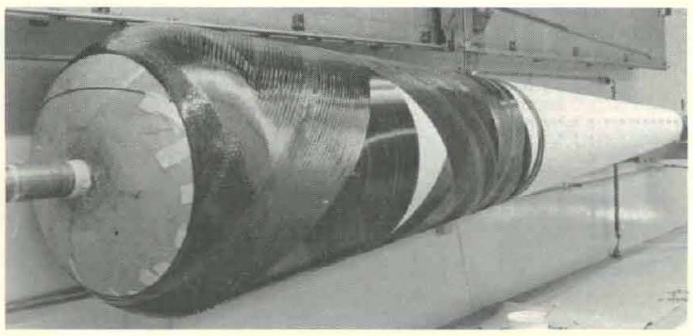


Figure 5

HOLLOW PROFILE PULTRUSION PROCESS

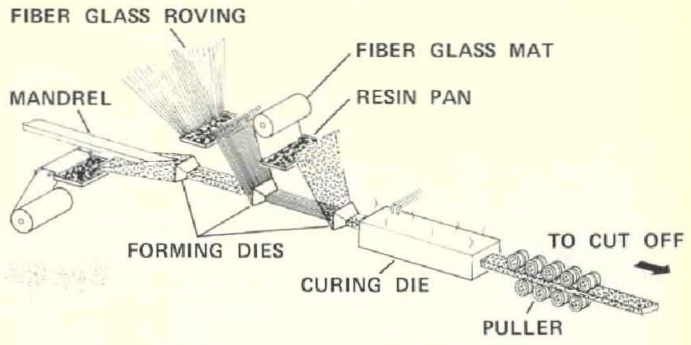


Figure 6

Technology improvement for technology's sake is not the name of the game. The structural concepts must be demonstrated and put on the shelf ready for the designer to use.

In order to dispel the designer's fear of the unknowns, and to give him confidence in composite structures, USAAMRDL is planning to build an Advanced Structures Technology Demonstrator Vehicle (ASTD).

This program will permit the utilization of advanced composites in the initial stage of an Army aircraft design. The composite can be considered as an engineering material and real synergistic benefits evaluated.

Several current advanced developmental programs are expected to provide technology that will be used in the design and construction of the ASTD. A sampling of a few of these programs indicates what the final ASTD might look like.

A design concept, which utilizes filament-wound components to achieve essentially a machine-made rotorblade, is being developed (see Figure 7). Not only the tubular spar elements, but also the blade skin, are filament wound.

In this manner, good and repeatable mechanical properties can be achieved at a low cost. Compared to present metal blades, a 20-percent weight savings and 10-percent cost savings are estimated for this blade, with the added bonus of high combat-damage tolerance due to the multipath construction.

The filament-winding technique also is being utilized to fabricate a low-cost, lightweight fuselage structure (see Figure 8). An AH1G tailboom, also constructed in this manner, is expected to be 20 percent lighter and 18 percent lower in cost.

Another composite fuselage developmental program is oriented toward large-panel construction. This concept calls for a layed-up hybrid composite construction in the form of sheet, stringers, and frames (see Figure 9). Similar weight and cost savings are anticipated for this concept. The automated tape layup machine can contribute materially to low-cost fabrication of these panels.

A bearingless rotor concept is under development for both a helicopter tail rotor and main rotor. The rotorblade is connected to the hub by a torsionally soft spar of unidirectional fibers (see Figure 10). By utilizing

(Continued on page 24)

AH-1G MULTI-TUBULAR SPAR BLADE CONCEPT

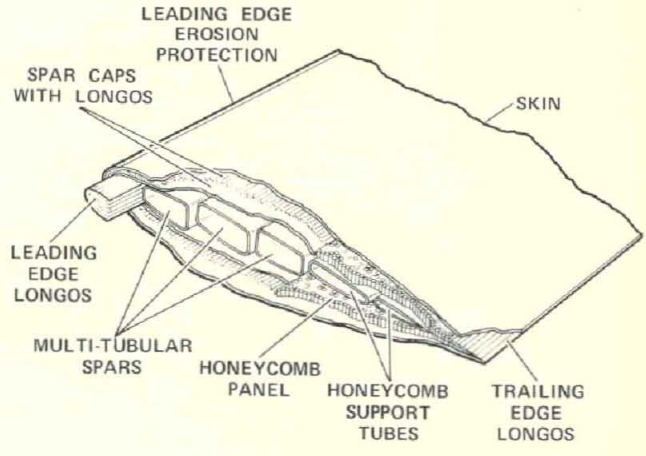


Figure 7

(Continued from page 23)

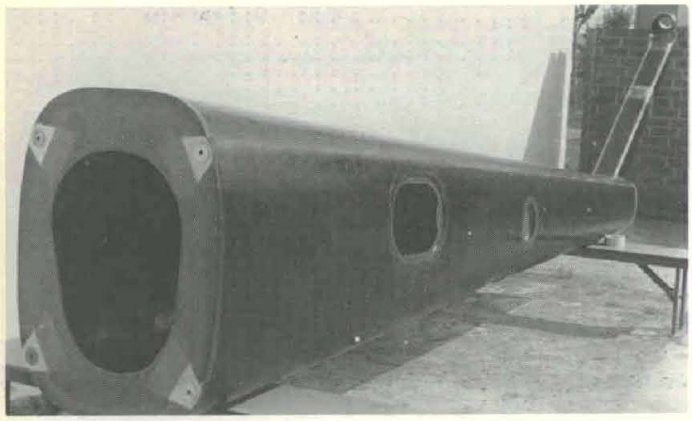


Figure 8

various spar dimensions and high-modulus fibers, satisfactory strength, and flapping and chordwise natural vibratory modes can be maintained in the rotor system. The concept offers a simple, maintainable and low-cost rotor system. Spars will be fabricated by the pultrusion process.

High-modulus composites are being used to fabricate drive-shafting, which promises to provide a 30- to 50-percent lighter power-drive system. Various drive-shaft structural arrangements are being fabricated to develop the optimum damage tolerance to high-energy projectiles and low-energy impact, e.g., Murphy's wrench.

Because of difficulties in fabricating large monolythic forged-metal rotor hubs, and because of a desire to make the hubs with redundant load paths for fail-safety, a composite-hub concept is being developed.

Advanced composite primary components are starting to emerge on new helicopters by virtue of past R&D efforts. The most notable success has been achieved by Bolkow on their model BO 105. This rotorblade is all fiber-glass with a wraparound, continuous fiber, root-end attachment.

The blade is in production and has had considerable service time. All reports indicate that it will be quite successful. This success and some limited design, fabrication and experimental testing of all-glass and high-modulus composite blades by other manufacturers, have convinced the designers to use varying amounts of advanced composite materials on rotorblades in the new HLH, UTTAS, and AAH aircraft.

In order to take the next step in the acceptance of advanced composite structures, it may be necessary to design, build and test the ASTD to demonstrate the efficiency of this structure for the next generation of Army mission systems or for product improvements of existing systems.

In this way, we will see more efficient rotorblades utilizing filament-winding techniques, the first use of composites for primary airframe structure, composite rotor hubs, drive shafting, transmission cases and controls, and composite landing-gear structures. Future aircraft probably

HYBRID COMPOSITE DESIGN CONCEPT
FOR CH-53 FUSELAGE

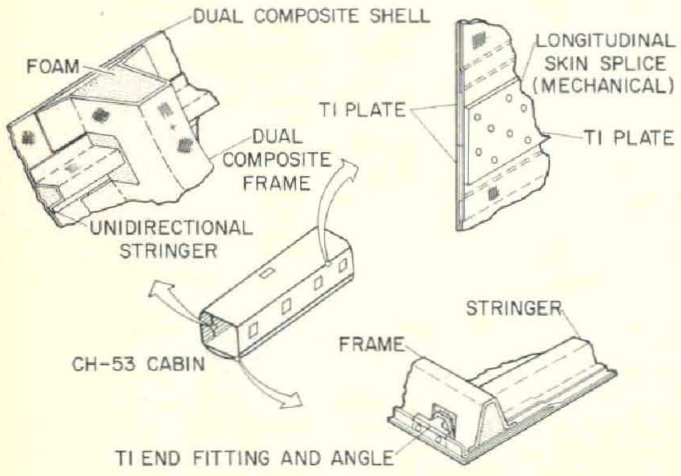


Figure 9

BEARINGLESS ROTOR CONFIGURATION
PROVIDES 40% WEIGHT SAVINGS

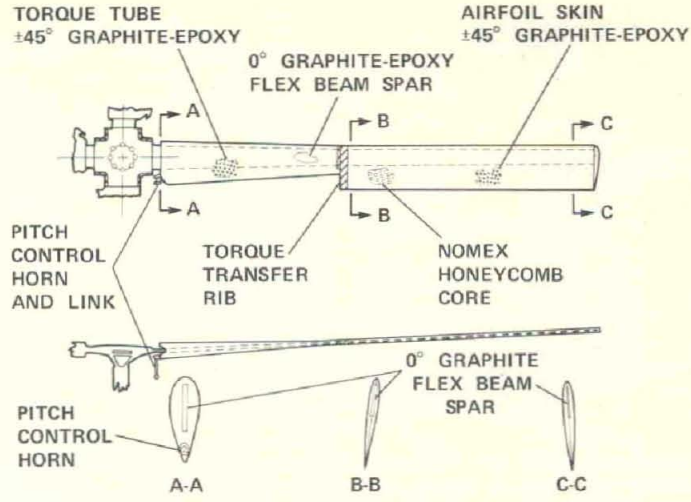
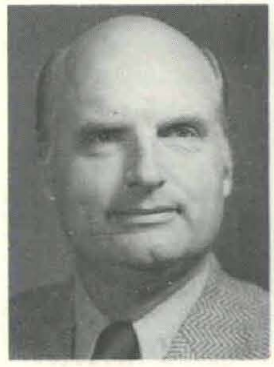


Figure 10

will be 70 percent hybrid composite structure, for the best in performance, damage tolerance, and low life-cycle cost.



FREDERICK H. IMMEN, chief of the Advanced Systems Research Office, U.S. Army Air Mobility Research and Development Laboratory (USAAMRDL) at Ames Research Center, Moffett Field, CA, has a bachelor of mechanical engineering degree from Cornell University.

Prior to joining the Army laboratory, he had a 20-year career with the Boeing Co., during which he held several titles, including chief of Stress, and chief of R&D Structures, Vertol Helicopter Division.

He is chairman of the American Helicopter Society Structures Committee and guest lecturer for professional groups.

Congress Authorizes National Bicentennial Medals

You can invest from $5 to $4,000 in the official national Bicentennial Medal as a memento of America's celebration of its 200th anniversary by placing a purchase order to arrive by July 31, 1976.

Featuring the Statue of Liberty on one side and the Grest Seal of the United States on the other, the medal is being minted in several size and metal combinations.

Gold versions of the medal are advertised as the first in U.S. history ever authorized by Congress for public sale. A 3-inch version will sell for $4,000, with smaller ones going for $400 and $100.

Other offerings include a 3-inch sterling silver for $150; a 1½-inch sterling silver for $25; a 1½-inch gold-plated bronze for $15; and a 1½-inch bronze priced at $5. Five of each medal per order is the limit.

Checks and money orders may be sent to: ARBA, P.O. Box 1976, San Francisco, CA 94101.

2 WSMR Employes Earn $510 for IA Suggestions

U.S. Army Incentive Awards Program suggestions expected to save $319,000 in installation of equipment and first-year maintenance costs have earned individual awards of $510 for two employes at White Sands (NM) Missile Range.

Jake S. Rains and Luis R. Holguin, assigned to WSMR's National Range Operations Directorate, jointly suggested the relocation of azimuth encoders used on Versatile Tracking Mount (VTM) instruments.

Relocating the encoders to the top of the azimuth halted hydraulic fluid and water leakage which had contaminated the encoders. Relocation also decreased downtime, maintenance and repair time. An annual savings of $7,000 in maintenance costs is projected for which they earlier received a $250 award.

ISEF Winners Visit Tokyo, Stockholm

Five students selected by U.S. Army, Navy and Air Force judges as winners at the 26th International Science and Engineering Fair were rewarded in January by trips to the Japan Student Science Awards in Tokyo and the Nobel Prize award ceremonies in Stockholm, Sweden.

In cooperation with numerous professional and scientific societies, the military services cosponsor the International Science and Engineering Fair through Science Service, a nonprofit organization designed to popularize science and stimulate gifted high school students to pursue research careers — hopefully with defense or other federal agencies.

Each year the ISEF climaxes competition among high school students in about 225 local, state and regional fairs, including some in foreign countries. The 26th ISEF brought together 396 finalists from these fairs.

Categories for award purposes include the behavioral and social sciences, biochemistry, botany, chemistry, earth and space sciences, mathematics and computers, medicine and health, microbiology, physics and zoology, and engineering.

Operation Cherry Blossom, as the Japan trip is termed, was initiated in 1963 by the Army, Navy and Air Force under sponsorship of the Japanese newspaper Yomiuri Shimbun. The Air Force discontinued participation in the Japan trip in 1972 but joined the Army and Navy in sponsoring a winner to attend the Nobel Prize ceremonies in Stockholm.

This year's Operation Cherry Blossom winners were Holly Ann Barrett (Army) and Darcy P. McGinn (Navy). Their official escort party included Anne G. Taylor, U.S. Army Research Office, Research Triangle Park, NC, and Dorothy Schriver, assistant director of Science Service.

Miss Barrett, currently a freshman at Graceland College, IA, won the trip for her project "The Possible Effects of Induced Anxiety: A Comparative Study." The project dealt with responses of elementary school children faced with frustrating experiences.

McGinn is enrolled as a freshman at Tulsa University. His project was "An Investigation of a Coherent Optical Computer." He intends to pursue a career in engineering physics.

During their 7-day stay in Japan, the American students were introduced to Their Imperial Highnesses Prince and Princess Hitachi of Japan's Royal Family. They also met with U.S. Ambassador to Japan James D. Hodgson.

The JSSA ceremony and banquet was attended by more than 500 Japanese middle and high school students who received recognition for scientific achievement in science.

In addition to the awards presentation, the American and Japanese students heard Mrs. Junko Tabei, the first woman to conquer Mt. Everest, speak of her climb to the top of the world. Both Americans termed her address "very interesting."

Other highlights of the trip included a dinner reception with LTG John R. Guthrie, commander, U.S. Army Japan, a trip to HQ U.S. Army, Japan at Camp Zama, and a stay in a Japanese Ryokan (Inn) where they sampled traditional Japanese food and slept Japanese style on the floor.

The student itinerary also included tours of the Imperial Palace, the National Diet Building (seat of the national government), a stroll along the world famous Ginza shopping area, a 3-day tour of ancient shrines of Nara and Kyoto, and a ride on Japan's famed "Bullet Train."

Nobel Prize award ceremonies in Stockholm were viewed this year by Army winner Jon M. Huppenthal, Navy selectee Reginald Kevin Jenkins, and Air Force representative David Eslinger. Their escorts were Dorothy Schriver and A. M. Leahy, director of Command Information Division, Office of Naval Research.

Huppenthal's winning ISEF display was "Human Cancer Detection Through Application of NMR Spin-Spin Relaxation Time." Jenkins won with "Effects of Chalones on Transformed Lymphocytes," and Eslinger presented "Glucose-Oxygen Fuel Cells."

On their way to Stockholm, the students visited the National Institute of Medical Research (NIMR) near London, England. They also were honored by a reception at the European scientific research offices of the services they represented.

In Stockholm, the ISEF winners were greeted by Swedish students from Brannkyrka Community College who served as hosts and escorts during their stay. They also were taken on a tour of the old town section of Stockholm.

The American students visited with Swedish Minister of Foreign Aid Gertrud Sigurdsen, and were briefed at the Swedish Parliament by Anna Eliasson, a 27-year-old member of Parliament who has been serving since she was 20, the minimum age.

Special significance was placed upon this year's awards ceremonies in recognition of the 75th anniversary of the Nobel Prize. The gala banquet and ball were graced with the presence of many living Nobel laureates, specifically invited this year.

Included on the student agenda was a tour of the Swedish Technical Museum and an opportunity to take independent trips to Swedish scientific institutes engaged in specific research fields of student interest.

The visitors also held a panel discussion with their Swedish escorts and were treated to the festive street celebration of Santa Lucia Day, a national Swedish holiday.

OPERATION CHERRY BLOSSOM award winners Holly Ann Barrett and Darcy McGinn flank Masami Hasegawa, winner of the individual Prime Minister's Award, during 19th annual Japan Student Science Awards (JSSA) ceremony and banquet in Tokyo. Hasegawa was cited for his prize-winning research project "Observation of Lizards' Population" at ceremonial events that honored more than 500 Japanese middle and high school students for their scientific achievements during the past Year.

Edgewood Reports on Success of S&E Assistants

(Continued from page 9)

turer prior to coming to the United States in 1973. Before joining the U.S. Army, he was a tester with a private firm.

SP5 Abraham Vasquez is a 29-year old graduate chemical engineer from the Philippines. Although his monthly salary is only about $500, Edgewood supervisors report that he performs research tasks equivalent to those of a Civil Service GS-12 employe.

He is assigned as a production engineer in Edgewood's Warning and Protection Branch, Defense Division, Manufacturing Technology Directorate. His duties include preparation of cost estimates for developmental and production items. Vasquez spends a great deal of his time conducting literature searches for process or production methods for chemicals, plastics and various detection items.

SP7 Jonnie T. Jones has served in the U.S. Army for 13 years, 9 of which have been at Edgewood. At 35 years of age he is one of the oldest in the program and one of the few accepted without a college degree. He did receive a BS degree from Johns Hopkins University in 1971.

Commended by civilian supervisors for his dedication and competence, Jones conducts basic and applied research on decontamination of chemical agents. He also studies reaction kinetics and mechanisms involved in agent decontamination.

Jones was awarded a Certificate of Achievement for superior performance and was recently granted a $300 Special Achievement Award for contributions to Edgewood's chemical agent demilitarization program.

Although only a small number of enlisted scientists and engineers are currently assigned to Edgewood as compared to the first group of S&E assistants in 1950; by 1952 the number exceeded 1,000. Most of them served at the arsenal for about 18 months. Many remained in a civilian capacity following release from Army duty.

Milton Christensen, a former S&P biological assistant, traded his khakis for a GS-7 pharmacologist assignment. Today he is a GS-14 chief of the Physiological Toxicology Branch, Biomedical Laboratory.

John N. Carter remained as a GS-7 civilian employee and is now a GS-14 general products manager in the Chemical Demilitarization and Disposal Office.

Army Research Institute Reports Achievements of Women Employes

Women comprise about 34 percent of the 250 employes of the U.S. Army Research Institute for the Behavioral and Social Sciences in Arlington, VA, including several credited with outstanding contributions to ARI's mission.

The ratio of about one woman employe for every two men on the staff of a research, development, test and evaluation activity is believed among the highest for Army installations of this type. ARI Technical Director and Army Chief Psychologist Dr. J. E. Uhlaner commented:

"Professional expertise in designing, planning and conducting a research program, including contributions to effective management at all phases, is a first consideration in hiring, assigning and promoting our professional staff.

"Women have long demonstrated, from ARI's beginnings in predecessor organizations since 1939, that they can perform effectively in our programs. We have no hesitation about employing women in view of their well established capability of strengthening our staff."

Bertha H. Cory, currently a GS-14 who has been on the staff since 1949, is the first woman to be selected as a work unit leader. The Manpower Utilization Systems Work Unit she heads is involved in design and testing of a computer-based Army Career Progressional Information System.

Mrs. Cory identified the need for such an integrated approach to career development when she addressed the Eastern Psychological Association (April 1974) on "Research Design for Computer-Aided Career Counseling." The goal of the system is to achieve the best correlation between the Army's career force structure requirements and individual career development needs.

Mrs. Cory's experience with computer research includes service as a consultant to the American Institutes of Research on "Project Talent," which considered computerized methods for processing and analyzing data on 500,000 high school students. Among her many presentations was "Computer-Aided Career Counseling Research," given to the 31st Military Operations Research Symposium (MORS) at the U.S. Naval Academy (June 1973).

A number of her articles have appeared in the *Journal of General Psychology,* and *Journal of Consulting Psychology, Psychometrika* and other publications.

Mrs. Cory graduated *summa cum laude* from the University of Rochester where she was also a Phi Beta Kappa. She earned her master's degree in psychology at the same institution and was on the faculty for several years teaching courses in psychological measurement and research methods.

A former president of the District of Columbia Psychological Association and currently a member of the board of directors, she also belongs to the American Psychological Association, the Eastern Psychological Association, the Maryland Psychological Association, and the Psychometric Society. She also served as an editor of the *Journal of Educational Psychology.*

Dr. Louise G. Yates, GS-13, worked with Mrs. Cory until recently and was a senior research psychologist in career development research since 1967. Dr. Yates has performed research and prepared published reports on officer career counseling and ratings of officer potential. She is now assigned to the ARI Field Unit at Heidelberg, Germany.

Prior to doing research at ARI, Dr. Yates was an assistant professor of psychology at Texas Christian University where she graduated *magna cum laude* in psychology and mathematics and continued to earn her MS degree. She also has had experience in clinical psychology. She trained in several Veteran's Administration hospitals and interned at the Topeka State Hospital.

While doing graduate work at TCU and at the University of North Carolina (PhD in psychology), she was granted several teaching fellowships in psychology and a research assistantship in psychometrics.

Dr. Yates is a member of the American Psychological Association and has completed the Operations Research/Systems Analysis Course at the Army Management School at Fort Belvoir, VA.

Dr. Claramae (Mazie) Knerr, GS-13, has been a research psychologist in ARI's Individual Training and Performance Evaluation Technical Area since 1973. She recently completed an effectiveness evaluation of the Training Extension Course (TEC), a program of self-paced audio-visual lessons designed to upgrade individual MOS skills and to assist commanders in conducting individual proficiency training.

This program is being implemented throughout the Active Army, Reserve components, and Senior ROTC detachments. The study evaluated the training effectiveness of TEC lessons compared to live instruction and to a baseline group with no special training.

Data from Active Army and National Guard units showed performance to be highest for TEC trained soldiers. In addition, a cost analysis done at ARI indicated large-scale use of TEC to be less expensive than conventional methods.

Dr. Knerr is now working on Skill Qualification Tests (SQT), designed to test individual performance when training has been completed. In May 1975, she accompanied a performance test evaluation on live-fire battle runs for scout reconnaissance with the Fort Bliss 3d Armored Cavalry Regiment.

These combat preparatory exercises provide practice in armored vehicle formation by responding to "key" vehicle movements. The full-scale performance test based on the exercises provides proficiency evaluation and serves as a criterion measure for other testing.

Dr. Knerr has served as statistical consultant at the Center for Sociological Organization of Schools at Johns Hopkins University and assistant statistican at the Center for Vocational and Technical Education in Columbus, OH.

Before earning her PhD in industrial and mathematical psychology from the University of Maryland, Dr. Knerr received a degree in nursing from the Medical College of Virginia and practiced for four years.

She is a member of the Division of Military Psychology (Div 19) of the American Psychological Association, the League of Women Voters, for which she serves as Arlington chairman of the Role of the Presidency Committee and member of the Arlington County Board of Directors, and the American Nursing Association. She lives in Arlington, VA, with her husband who is also a research psychologist at ARI.

Sociological concerns such as race relations and the role of women in the Army also are among ARI subjects of research. Two professional women are particularly involved in these efforts. *Dr. Nora Kinzer,* GS-13, is planning a research project focusing on the utilization of women in the U.S. Army. *Dr. Sophia F. McDowell,* GS-13, is researching black-white relationship problems on an Army base.

Dr. Kinzer served as an assistant professor of sociology at Purdue University where she received her PhD degree in sociology. In 1967, she was a visiting professor of sociology at the Universidad de El Salvador in Buenos Aires and a visiting research associate at the Instituto Torcuato di Tella in Buenos Aires. She has held positions as instructor of Spanish and of sociology at several other colleges.

Dr. Kinzer's interests are shown by membership in numerous professional societies including the American Sociological Association, the Society for Applied Anthropology, the Latin American Studies Association, and Sociologists for Women in Society.

Dr. Kinzer's home town is Toronto, Canada. Until a few months ago, she lived in Indiana and managed a cattle farm. She is fluent in Spanish and French and reads and writes Portuguese. She has written several articles dealing with the women of Latin America and with general sociological problems which have been published in *Psychology Today, Saturday Evening Post,* and other magazines and journals.

Dr. McDowell hopes through participant observation to determine why groups separate by race and at what point this is harmful to efficient Army operations. She works three days a week with an Army unit at Fort Belvoir, VA, in her efforts to describe racial relations in their military context.

A second phase of her data gathering will compare findings at Fort Belvoir with other Army installations. After basic problems have been identified, she will focus her 2-year project on ways of coping with them.

Dr. McDowell has been a research sociologist at ARI since August 1974. She was a professor of sociology at Loyola College in Baltimore and also taught at Howard and American Universities. She has conducted research for the Department of Health, Education and Welfare on interracial attitudes of black youth and has published articles in *American Sociologist* and *American Education.*

Dr. McDowell received her PhD from the University of Chicago. She is a member of the American Sociological Association, the Society for the Study of Sociological Problems, and is secretary of the District of Columbia Sociological Society.

Dr. Joyce L. Shields, GS-13 senior research psychologist, joined ARI in 1968 after two years with the Army Research Institute of Environmental Medicine in Natick, MA. She conducted research there on the effects of high altitude on military performance, and assumed major responsibility for the conduct of a field study at Pike's Peak, CO.

Identification of human performance capabilities for effective military operations also is a research concern at ARI, and Dr. Shield's current research deals with educational technology and simulation. Previously she was a leader for the Human Performance Capability Work Unit.

One of the major new thrusts in this area is concerned with human performance in night military operations; this involves study of night movement effectiveness by the infantry as well as night nap-of-the-earth helicopter flight.

Research is planned to identify those factors contributing to improved navigation and orientation under conditions of reduced visibility. Use of new technological developments as aids in efficient and effective training will be examined.

Dr. Shields also is working on utilization of speech compression devices that allow the playback rate of recorded material to change without a change in pitch. Application of these devices is directed to more rapid review and assessment of military communications.

Another area of her research is the applicability of a new theory of the structure of speech to military communication problems. She has published and is writing several articles on this effort.

Dr. Shields also is a part-time instructor at the University of Maryland in the Department of Measurement and Statistics where she did her doctoral research. Granted an Army long-term fellowship to attend the University of Maryland, she was elected to the honor society of Phi Kappa Phi and nominated in 1974 by the College of Education for the Outstanding Graduate Woman Award of the University of Maryland.

Pauline T. (Polly) Olson, GS-14, is assistant chief of the Computer Center and chief of the ARI Statistical Systems and Computer Group. Her job involves streamlining Computer Center operations and planning efficient use for research projects. She also monitors statistical processing and computer programing.

Mrs. Olson formerly headed ARI's Simulation of Personnel Operations (SIMPO) Task concerned with evaluation of personnel policies through simulation of manpower systems. This work was done during the American involvement in Vietnam. Much of this simulation, however, is still applicable to the peacetime volunteer Army.

One of the SIMPO models (FATES) has been adapted and is available to users of the MILPERCEN computers. Army personnel management may use FATES to estimate promotion and replacement capability within career management fields.

Mrs. Olson is a member of the Operations Research Society of America and the American Statistical Association. She has authored or coauthored 10 scientific reports and was research task leader during preparation of 10 additional reports. She formerly supervised the statistical section of the Fort Knox (KY) Human Resources Research Unit.

Mrs. Olson graduated with distinction with a BS degree in mathematics from the University of Kentucky where she was a member of several scholastic honoraries, including Phi Beta Kappa.

This limited look at women working at ARI (about 10 percent of the female professional staff) has shown their involvement in a wide range of research activities — many worthy of recognition for outstanding personal achievements and contributions to advances in Army science.

Reader's Guide . . .

ARI Report Assesses Prevalence of Illicit Drug Use

Assessing the Prevalence of Illicit Drug Use in the Army, Technical Paper 264, is a new report by the U.S. Army Research Institute for the Behavioral and Social Sciences which examines numerous potential indicators of illicit drug use.

This research is part of a larger effort designed to identify social and organizational differences between Army units with high drug use and those with low drug use. In-house Army research was augmented by private contract effort.

Data gathering was achieved through random urinalysis and brief anonymous self-report questionnaires. Questionnaires were administered to Army units in the U.S., Germany and Korea. Urinalysis studies were made of six U.S. posts and a division in Germany.

HumRRO Bibliography Lists FY 75 Research Reports

Published research and technical reports and professional presentations by personnel of the Human Resources Research Organization during FY 1975 are listed in a recently issued pamphlet.

Bibliography of Publications and Presentations During FY 1975 lists work units and research projects under their code names or the type of effort such as Basic Research. A General section includes nonspecific research items.

Abstracts are provided for most items and appendices include an author index, a sponsor index and a subject index.

Copies of this bibliography are available from: HumRRO, 300 North Washington St., Alexandria, VA 22314.

New Map Details Gulf States Inland Waterways

Available free upon request to the U.S. Army Corps of Engineers is a newly published map of the Mississippi River inland waterways system and principal inland waterways throughout the Gulf Coast states.

Printed in black and white, the map shows 18,800 miles of major waterways currently in operation, under construction, or authorized for later development.

The maps are available in sizes 32 by 44 inches (1:2.5 million), 17 by 34 inches (1:5 million), or 8 by 10½ inches (1:12 million). Copies may be obtained from any of the following Corps of Engineers Public Affairs Offices.

U.S. Army Engineer Division, Lower Mississippi Valley, P.O. Box 80, Vicksburg, MS 39180; U.S. Army Engineer Division, Missouri River, P.O. Box 103, Downtown Station, Omaha, NB 68101; U.S. Army Engineer Division, North Central, 536 South Clark Street, Chicago, IL 60605; U.S. Army Engineer Division, South Atlantic, 510 Title Bldg., 30 Pryor Street, S.W., Atlanta, GA 30303; and U.S. Army Engineer Division, Southwestern, Main Tower Bldg., 1200 Main Street, Dallas, TX 75202.

Conferences & Symposia . . .

Army Scientific Advisory Panel . . .

Convenes at AMRDL for Aviation Review

Army Aviation Development was reviewed in depth by the Army Scientific Advisory Panel (ASAP), Feb. 2-3, at the U.S. Army Air Mobility Research and Development Laboratory, NASA/Ames Research Center, Moffett Field, CA. More than 80 members, consultants and Army R&D leaders attended.

Assistant Secretary of the Army (R&D) Edward A. Miller made his first appearance before the ASAP as the dinner speaker. Featured also was MG William J. Maddox Jr., commander, U.S. Army Aviation Researeh Center, Fort Rucker, AL, and former HQ DA Director of Army Aviation. His topic was "Army Air Mobility Requirements."

AVSCOM Commander MG Eivind H. Johansen gave the welcoming address. Dr. Hans Mark, director, NASA/Ames RC, and ASAP Chairman Lawrence O'Neill followed with introductory remarks.

Dignitaries attending included GEN John R. Deane Jr., commander, U.S. Army Materiel Development and Readiness Command; LTG Howard H. Cooksey, Deputy Chief of Staff for Research, Development, and Acquisition (DCSRDA), HQ DA; MG Jerry B. Lauer, project manager for UTTAS (Utility Tactical Transport Aircraft System); MG John H. Neiler, U.S. Army Reserve; and

MG Donald R. Keith, director, Weapons Systems, DCSRDA; MG Samuel G. Cockerham, project manager, Advanced Attack Helicopter, HQ Army Aviation Systems Command; BG Harry A. Griffith, director, Development and Engineering, Army Materiel Development and Readiness Command; BG Charles E. Canedy, deputy director, Operations Directorate and Army Aviation Office, HQ DA; and BG Kenneth R. Dirks, Army Assistant Surgeon General for R&D.

Presentations by representatives of AVSCOM included "Utility Tactical Transport Aircraft System," Advanced Attack Helicopter," "A/C Survivability Equipment," "AH-1Q Advanced Blade," and "Manufacturing Methods and Technology Program."

Dr. Richard Carlson, AMRDL director, accompanied attendees on tours of AMRDL's laser velocimeter, water tunnel, acoustics and simulation facilities.

Principal topics of discussion presented by AMRDL personnel included the "Advancing Blade Concept," "Tilt Rotor," "Rotor Systems Research Aircraft," "Controllable Twist Rotor," and "Propulsion, Structures, and Aerodynamics."

A report on the Army Materiel Acquisition Review Committee was presented by Manfred Gale, assistant director, Laboratory Activities, Army Research Directorate, ODCSRDA.

Tactical Air Concept for Close Air Suppport 1980-85 was the title of a presentation by the Tactical Air Command, U.S. Air Force.

ASAP Ad Hoc Group reports and their chairmen include: Army Security Agency Programs, Burton P. Brown, systems consultant, General Electric Co.; Fire Safe Fuels, Dr. Robert L. Hess, director, Highway Safety Institute, University of Michigan; Nap of the Earth (NOE) Simulation, Prof. Howard C. Curtiss Jr., Department of Aerospace and Mechanical Sciences, Princeton University; and 1974 Summer Study Review, Jack Hope, General Electric Co.

Dr. Marvin D. Dunnette, professor of psychology, University of Minnesota, and LTG James M. Gavin (USA, Ret.), former Army Chief of R&D, were sworn in as new ASAP members.

Eight new ASAP consultants introduced at the meeting are: Dr. William B. Cottingham, dean of Academic Affairs, General Motors Institute; Dr. Donald M. Kerr Jr., alternate energy division leader, Los Alamos Scientific Laboratory; Dr. Cora B. Marrett, associate professor of sociology, University of Wisconsin; Dr. Ronald F. Scott, professor of civil engineering, California Institute of Technology; and

Dr. Alan S. Tetelman, professor of engineering and chairman, Material Department, University of California; Dr. Jack R. Tooley, dean, School of Engineering, University of Evansville, IN; Dr. Richard L. Wagner Jr., Lawrence Livermore Laboratory, CA; and Dr. M. Frederick Hawthorne, professor of chemistry, University of California.

Composed of 24 members and 35 consultants, ASAP provides advice and long-range guidance to the Secretary of the Army, Chief of Staff, ASA (R&D) and the DCSRDA on scientific and technical matters relative to the Army research, development, test and evaluation program.

ASAP Chairman Lawrence O'Neill and Vice Chairman Dr. Richard A. Montgomery, counted as members, also serve on the ASAP Executive Committee. O'Neill is president of Riverside Research Institute and Dr. Montgomery is director of Corporate Development, R&D Associates.

Other executive committee members are ASA (R&D) Miller, chairman; GEN William E. Depuy, commander, Army Training and Doctrine Command; GEN John R. Deane Jr., commander, Army Materiel Development and Readiness Command; LTG Howard H. Cooksey, DCSRDA; Dr. Marvin E. Lasser, Army chief scientist, director of Army Research, and ASAP executive director; and Dr. K. C. Emerson, deputy for Science and Technology, Office of the ASA (R&D).

GEN Kirwin Heads U.S. Delegation . . .

ABCA Nations to Meet on TEAL in Canada

Army Vice Chief of Staff GEN Walter T. Kerwin Jr. will head the United States delegation to the TEAL (Tactics, Equipment, Logistics) meeting of Quadripartite Standardization Agreement nations in Montreal, Canada, Feb. 23-27. British, Canadian and Australian Army representatives will attend.

Programed as the 19th meeting of the ABCA nations since the agreement on standardization was signed Oct. 1, 1964, the conference will focus on the primary purpose of the ABCA program — that of considering cooperation and collaboration to achieve the highest feasible degree of operational compatibility among the forces. Meeting sites rotate among member nations.

Another ABCA objective assuming increasing importance, in view of budget cuts and inflation effects, is that of achieving the greatest possible economy through use of combined combat resources. New Zealand has been an associate ABCA member since 1965.

Assistant Deputy Chief of Staff for Research, Development, and Acquisition (International Programs) MG Philip R. Feir will participate as the Washington standardization officer and representative to the ABCA conference.

Topics scheduled for discussion include new emphasis on concept standardization as regards interoperability and use of materiel items; also, increased educational effort and dissemination of information to provide understanding of the ABCA Standardization Program and current goals.

The U.S. delegation will include senior officer representatives from the Office of the Deputy Chief of Staff for Operations, the Office of the Deputy Chief of Staff for Research, Development, and Acquisition, Army Materiel Development and Readiness Command and the Training and Doctrine Command.

14 Lectures Programed . . .

Classification/Clustering Seminar Slated for MRC

Fourteen distinguished lecturers in Europe, Asia and the United States are programed for presentations at an Advanced Seminar on Classification and Clustering at the Mathematics Research Center (MRC), Madison, WI, May 3-5.

Among the speakers will be Prof. J. A. Hartigan, Yale University, whose subject is Clustering Algorithms; Prof. H. Solomon, Stanford University, Clustering Techniques; Prof. Semour Geisser, University of Minnesota, Linear Aspects of Discrimination; and Dr. J. B. Kruskal, Bell Telephone Laboratories, Multidimensional Scaling and Its Relation to Clustering.

Additional guest lecturers will be representative of disciplines such as statistics, computer sciences, biology, social science, engineering, mathematics, and various others. Numerous U.S. Army mathematicians and statisticians also are programed for brief presentations to provide a basis for questions, answers and general discussion.

Among the topics will be methods of cluster analysis, grouping, clumping, classification, numerical taxonomy, identification, and pattern recognition. Applications of and the need for advanced knowledge in these areas abound in the biological, medical, sociological, psychological, engineering and other fields.

Further information can be obtained by writing Prof. John Van Ryzin, Advanced Seminar Chairman, Mathematics Research Center, University of Wisconsin-Madison, 610 Walnut St., Madison, WI 53706.

Career Programs . . .

DARCOM Announces Executive Development Program

Preparation of employes whose records indicate high potential for management responsibilities is the purpose of a newly established Army Materiel Development and Readiness Command Materiel Acquisition and Readiness Executive Development (MARED) Program.

Announced late in January, the MARED Program is open for nomination of all DARCOM employes in grades GS-13, GS-14 and GS-15 who are registered in Department of Army career programs for scientists, engineers, procurement, quality assurance, supply management, and materiel maintenance management.

Initial applications must be submitted through supervisory channels to HQ DARCOM, ATTN: DRXMM-AM, to arrive not later than Feb. 27. The address is 5001 Eisenhower Ave., Alexandria, VA 22333. Details regarding MARED, application forms and instructions have been forwarded to all DARCOM commanders and civilian personnel officers.

Filing of an application at the employe's initiative requires submission of an Individual Development Plan (IDP) in support of established potential for executive development. Agreement to accept temporary duty and permanent change-of-station assignments is required, along with a supervisor's appraisal of the applicant's management qualities, and nomination by the activity commander.

Program participants will be selected competitively by an Executive Development Board (MARED Board), a panel of top career-management officials representing materiel acquisition and readiness-related fields.

The board also will review and approve proposed IDPs for selected employes, based on the participant's specific background and goals. The review of IDPs is to insure that the planned training will broaden occupational and organizational perspectives, and increase the employe's management and technical abilities.

Southern Association Accredits DoD/DA Schools

Technical and vocational accreditation of nine Department of the Army schools and one Department of Defense school by the Southern Association of Colleges and Schools was announced in January.

U.S. Army Training and Doctrine Command (TRADOC) officials termed the action a "major step" in the Army's over-all goal to achieve recognition of military training by civilian industry, unions and educational institutions.

Accreditation means that a soldier who is enrolled in a degree program may be permitted to apply military time training toward credit hours at a cooperating civilian school. Technical and vocational accreditation was granted because the military schools do not grant degrees.

Army schools granted accreditation are: Transportation School, Fort Eustis, VA; Quartermaster School, Fort Lee, VA; Engineer School, Fort Belvoir, VA; WAC School, Fort McClellan, AL; Infantry School, Fort Benning, GA; Missile and Munitions School, Redstone Arsenal, AL; Aviation School, Fort Rucker, AL; and the Air Defense School and Sergeants Major Academy, Fort Bliss, TX.

The Defense Mapping School, Fort Belvoir, VA, also was accredited.

Under evaluation for possible accreditation are the Armor School, Fort Knox, KY; Institute for Military Assistance, Fort Bragg, NC; Signal School, Fort Gordon, GA; and the MP School, Fort McClellan, AL.

USUHS Medical School Calls for Applications

Applications for admission to the charter class of the School of Medicine of the Uniformed Services University of the Health Sciences are being accepted for review.

Enrollment is scheduled for August 1976 pending provisional school accreditation from the Liaison Committee on Medical Education, expected in June. Enrollment may be delayed if accreditation is delayed.

A 4-year comprehensive medical education is offered to men and women who, in addition to being qualified for medical school, demonstrate potential for, and commitment to, careers in the Army, Navy, Air Force and Public Health Service.

Successful applicants will be commissioned as Reserve second lieutenants in the Army or Air Force, or ensigns in the Navy or Public Health Service. They will be on active duty status during their education while receiving full pay and benefits.

Clinical training will be provided at the National Naval Medical Center, Walter Reed Army Medical Center and Malcolm Grow U.S. Air Force Medical Center.

Other learning facilities will include the National Institutes of Health, Armed Forces Institute of Pathology, Walter Reed Army Institute of Research, Naval Medical Research Institute, Center for Disease Control, and the Army Medical Research Institute of Infectious Diseases.

Students can expect to receive regular commissions upon graduation with a 7-year active duty obligation. Intern or residency training time is not creditable toward satisfying this requirement.

Basic admission requirements for civilian and military personnel include a bachelor's degree and completion of one academic year each of general chemistry, organic chemistry, physics, biology, mathematics, and six semester-hours of college-level English.

Applicants must be U.S. citizens, no older than 28 years as of June 30, 1976, must meet physical and personal qualifications for a commission, and must take the Medical College Admission Test (MCAT).

Application materials may be obtained from the Director of Admissions, Uniformed Services University of the Health Sciences, 6917 Arlington Road, Bethesda, MD 20014.

Reenlistment Meet Stresses Total End Strength

Among the conclusions of a Reenlistment Conference at HQ U.S. Army Training and Doctrine Command announced recently is that the Department of the Army's mission is to maintain the total end strength at a steady state.

The required enlisted end strength will be controlled by proper distribution of soldiers by grade and years of service. A pyramid structure is believed the best approach in maintaining Career Management Fields (CMF) at required numbers.

Relative to a review of the top six enlisted grades (E4-E9), it was noted that they comprise 71 percent of the total enlisted strength. The required percentage for these grades will be stabilized at 63 percent by 1978.

Other topics of discussion included reenlistment restrictions, goals, reporting statistics, year group management plans, establishment of goal criteria, waiver codes, leave sell-back limits and the DARCOM Reenlistment Award Program.

TACOM Interns Believed First for DARCOM PMs

Two recent assignees to the Mechanized Infantry Combat Vehicle (MICV) Project Manager's Office at the Tank-Automotive Materiel Readiness Command, Warren, MI, are believed the first intern trainees selected for duty in a U.S. Army Materiel Development and Readiness Command PMO.

John Strathman assumed his new duties after an assignment with the U.S. Army Management Engineering Training Agency (AMETA), Rock Island, IL. He has a bachelor's degree in economics from the University of Iowa. Thomas Huczek joined the MICV Office following duty as a maintenance trainee with the Red River Army Depot, Texarkana, TX. He has a bachelor's degree in mathematics from Western Michigan University.

The interns will receive two years on-the-job and classroom training while assigned to TAMRC. Formal instruction will be at the Army Logistics Management Center, Fort Lee, VA, and AMETA.

Logistics Management Center Renames School

Reorganization changes within the U.S. Army Materiel Development and Readiness Command, including a recently assigned Deputy CG for Materiel Readiness, account for redesignation of the U.S. Army Logistics Management Center's School of Assets Management at Fort Lee, VA, as the School of Materiel Readiness (SMR).

SMR responsibilities include educational programs in maintenance, provisioning, depot operations, inventory and materiel, international logistics, disposal operations and environmental management.

In addition to monitoring 17 civilian career intern training programs of the U.S. Army Materiel Development and Readiness Command, ALMC also conducts the Schools of Acquisition Management, Logistics Science, and Management Information Systems, all designed to meet requirements of military and civilian personnel for career advancement by continually upgrading performance capabilities.

Personnel Actions . . .

Secretary Rumsfeld Administers Oath . . .

5 Officials Take Key Defense Positions

FROM LEFT: Secretary Rumsfeld, Robert Ellsworth, Thomas C. Reed, William I. Greener Jr., Richard A. Wiley, M. Alan Woods.

Secretary of Defense Donald H. Rumsfeld administered the oath of office to four Department of Defense officials and a presidential assistant assigned to different positions on his staff at a Pentagon ceremony.

Robert Ellsworth was sworn in to fill a slot left vacant in recent years but provided for by statute, at the discretion of the Secretary of Defense, as a second Deputy Secretary of Defense. William P. Clements has served solely in that office since 1973.

Formerly the Assistant Secretary of Defense for International Security Affairs, Ellsworth was a general partner with Lazard Freres and Co., NY, prior to his Department of Defense appointment June 5, 1974 as Assistant Secretary of Defense (International Security Affairs).

During 1969-71 he was United States permanent representative, with rank of ambassador, on the Council of the North Atlantic Treaty Organization after serving in 1969 as assistant to the President. He was national political director of the presential campaign in 1968.

As a U.S. Congressman from Kansas (1961-67), he served on the Joint Economic Committee, Veterans Affairs Committee, Post Office and Civil Service Committee, and House Republican Task Force on NATO.

Ellsworth has a 1945 BS degree from the University of Kansas, a JD degree from the University of Michigan Law School and has been admitted for legal practice in the U.S. Supreme Court and highest courts of Kansas, Massachusetts and the District of Columbia. He also served in the Navy, 1944-46 and 1950-53, attaining rank of lieutenant commander.

Thomas C. Reed, director, Telecommunications and Command and Control Systems, Office, Secretary of Defense since 1974, has succeeded John L. McLucas as Secretary of the Air Force.

During duty with the U.S. Air Force, 1956-59, he was a technical project officer on the Minuteman re-entry vehicle system and continued as a civilian, 1961-62, engaged in thermonuclear weapons physics research at the Lawrence Radiation Laboratory, University of California. He continued as a consultant until 1967.

Reed joined the Department of Defense as an assistant to the Secretary and Deputy Secretary of Defense in 1973 after organizing Supercon Ltd, TX, in 1962 as managing partner. He organized Quaker Hill Development Corp., San Rafael, CA, serving as president and chairman of the board.

He earned a BS degree from Cornell University, graduating first in his class in 1956 and as an ROTC student was commissioned a second lieutenant in the Air Force. He received an MS degree in electrical engineering from the University of California in 1959 by attending off-duty courses. He is a member of Tau Beta Pi Engineering Honorary Society.

William I. Greener Jr., deputy press secretary to President Ford since April 1975, is the new Assistant Secretary of Defense for Public Affairs, following the resignation of Joseph Laitin.

During 1972-75 Greener served assignments as assistant director of the Cost of Living Council for Congressional and Public Affairs and assistant to the Secretary for Public Affairs, U.S. Department of Housing and Urban Development.

Other non-Department of Defense assignments have included assistant to the Director, Office of Management and Budget for Public Affairs and assistant to the Commissioner for Public Affairs, U.S. Internal Revenue Service.

He has a 1947 BS degree from the University of Missouri and a 1967 master's degree from Boston University.

Richard A. Wiley was sworn in as the new General Counsel of the Department of Defense, succeeding Martin R. Hoffmann who took over as Secretary of the Army in August.

Wiley was associated as an attorney, partner and managing partner with the firm of Bingham, Dana and Gould, Boston, MA, 1959-74, and was with the John Hancock Mutual Life Insurance Co., 1956-58.

From 1948-50 he served in the U.S. Marine Corps Reserve and was on active duty, 1952-56, with the U.S. Air Force at Wright-Patterson AFB, OH, including service as a legal officer.

Wiley has a 1948 AB degree with highest honors from Bowdoin College, a 1951 BCL degree with honors from Oxford University, England, where he was a Rhodes scholar, and a 1959 LLM degree from Harvard University Law School.

His professional affiliations have included the American, Massachusetts and Boston Bar Associations; Foreign and International Business Law Committee of the American Bar Association; and the Anti-Trust and Executive Committees of the Boston Bar. He has authored numerous articles for law reviews and has published a law school text titled *Cases and Materials on Law of International Trade and Investment.*

M. Alan Woods, former Principal Deputy Assistant Secretary of Defense for Public Affairs, vacated that position to become special assistant to the Secretary and Deputy Secretaries of Defense.

Graduated with a BA degree in political science from American University, Woods was deputy director, Presidential Personnel Office, 1974-75, and in 1973-74 the chief of staff to Missouri Governor Christopher S. Bond.

He has served as vice president, Bradley, Woods and Co., NY; assistant press secretary to the President; and administrative assistant and press aide, Republican Presidential Campaign Committee.

Eicher Selected as ARMCOM Deputy Commander

Deputy commander, U.S. Army Armament R&D Command, Rock Island Arsenal, IL, is the new title of BG William Edward Eicher, former director of Maintenance, HQ U.S. Army Materiel Command.

BG Eicher served during 1972 as chief, Installation Program Team, Office, Deputy Chief of Staff for Logistics, Department of the Army. In Vietnam he commanded the 26th General Support Group and was later acting chief of staff, G-4 HQ XXIV Corps.

Other key assignments include J-4, Office of the Joint Chiefs of Staff; commander, 3d Ordnance Branch, Vietnam; chief, Data Collection Division, White Sands (NM) Missile Range; and comptroller, Army General Depot, U.S. Army Europe.

BG Eicher has a 1950 BS degree from the State College of Washington and a 1960 master's degree in business administration from Syracuse University. He has attended the U.S. Army Infantry School, Ordnance School, U.S. Army Command and General Staff College and the Industrial College of the Armed Forces.

BG William E. Eicher

His military honors include the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star Medal with "V" device and three OLC, Joint Service Commendation Medal, Army Commendation Medal with OLC, and the Purple Heart.

MICOM Selects Gojsza as MRD&E Lab Director

COL William P. Gojsza, former deputy to the Army Section, Military Assistance Advisory Group, Iran, is the new deputy director of the Missile Research, Development and Engineering Laboratory, U.S. Army Missile R&D Command, Redstone Arsenal, AL.

COL Gojsza has a BS degree in mechanical engineering from Case Institute of Technology and a master's degree in logistics from the U.S. Air Force Institute of Technology. His military honors include the Legion of Merit, Meritorious Service Medal and Army Commendation Medal.

Previous tours of duty have included service in Korea, France, Japan, Turkey and assignments involving new equipment training on missiles at Redstone Arsenal during 1960-63.

Joy Succeeds Buescher as WRAIR Director

COL Robert J. T. Joy, former deputy director of the Walter Reed Army Institute of Research, Washington, DC, has succeeded COL Edward L. Buescher as director.

Graduated with a BS degree from the University of Rhode Island in 1950, he earned his MD from Yale University School of Medicine in 1954 and an MA degree in physiology from Harvard University in 1965.

COL Joy served in 1969 as deputy for Medical and Life Sciences, Office, Director of Defense Research and Engineering, Office, Secretary of Defense, following duty as chief, Medical Research Division, Army Medical R&D Command.

Other key assignments have included deputy director for Field Research, U.S. Army Research Institute of Environmental Medicine, Natick (MA) Development Center; and chief, Medical Research Team, Vietnam.

COL Joy is a Fellow of the American College of Physicians and is a member of the American Physiological Society, Society for Experimental Biology and Medicine, and the American Federation for Clinical Research.

Among his awards are the Legion of Merit with two Oak Leaf Clusters, Air Medal, Army Commendation Medal, William Osler Medal, Hoff Memorial Medal for Achievement in Military Medicine and the John Shaw Billings Award.

COL Robert J. T. Joy

Danzeisen Installed as Army Container Systems PM

COL William H. Danzeisen Jr., former deputy director of Transportation and Services, Office, Deputy Chief of Staff for Logistics, is the new project manager, Army Container Oriented Distribution Systems, HQ U.S. Army Materiel Development and Readiness Command.

A veteran of 24 years of Army service, COL Danzeisen began his military career with air defense and field artillery assignments in the U.S. and Germany. Other major assignments have included commander, U.S. Army Movements Control Agency, Europe; assistant chief of staff, Security, Plans and Operations, U.S. Army Transportation Command, Europe; and commander, 106th Transportation Battalion, Europe.

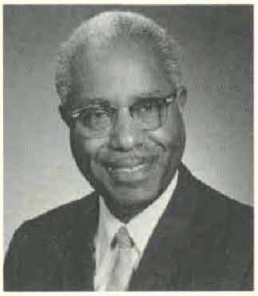
COL Danzeisen has a BS degree from Temple University and a master's degree from the College of William and Mary, both in education. He has completed the Army Command and General Staff College and the Army War College nonresident course.

COL W. H. Danzeisen

Dr. McAfee Chairs Brookdale College Trustees

Dr. Walter S. McAfee, scientific adviser to the Army Electronics Command's Director of Laboratories since Jan. 15, 1971, has been unanimously elected chairman of the Board of Trustees of Brookdale Community College, Lincroft, NJ.

Famed for his contributions as an astro-physicist to the historic success of Project Diana — presaging the success of Space Age communications by transmission of a radar signal to the moon and back in 2½ seconds — Dr. McAfee succeeded MG Preston Corderman (USA Ret.) who recently resigned. He has been serving as vice chairman of the Board of Trustees, and has been with the Fort Monmouth research and development laboratories since 1942.



Dr. W. S. McAfee

Frye Installed as ACC Personnel Chief of Staff

COL John W. Frye, former director, Department of Civil-Military Engineering, Army Institute of Military Assistance, is newly assigned as assistant chief of staff for Personnel and Administration, HQ U.S. Army Communications Command, Fort Huachuca, AZ.

COL Frye enlisted in the Army in 1942 and served in nine campaigns in the European Theater during World War II, earning two Bronze Star Medals (BSM) with "V" device. Service in Korea won him a third BSM. During the Vietnam conflict two tours of duty in Laos earned him the Legion of Merit and the Air Medal.

COL Frye has a BS degree in electrical engineering from Southern Methodist University. His military schooling includes graduation from the U.S. Marine Corps Command and General Staff College, the Air Defense School, and the Defense Language Institute. He is a flight and instrument instructor and a rated commercial pilot.

COL John W. Frye

Evans Directs ECOM Combat Surveillance Lab

Assignment of COL Winston K. Evans, a field artillery officer, as director of the Army Electronics Command's Combat Surveillance and Target Acquisition Laboratory was announced Jan. 26.

Assigned since 1973 at Fort Leavenworth, KS, he served successively in the Department of Tactics, in the Special Readiness Study Group, and recently as chief, Staff Operations Committee, Command and General Staff College.

He has served in Europe, Korea twice, Vietnam, Fort Bliss, TX, Fort Sill, OK, Fort Benning, GA, and with the Office of the Chief of Research and Development at HQDA in the Pentagon, Washington, DC.

Graduated from The Citadel, where he received a bachelor's degree in civil engineering in 1952, COL Evans has a master's degree in electronic engineering from Georgia Institute of Technology. He graduated from the Command and General Staff College in 1968.

COL Evans is the son of Chaplain (COL) Luther W. Evans, who at the time of his death in 1962 was chaplain to the Seventh Army. His awards include the Bronze Star, Meritorious Service Medal and the Army Commendation Medal.

COL Winston K. Evans

Marrella Named PM for Commercial Truck Systems

LTC Leonard S. Marrella, a recent graduate of the Program Manager's Course, Defense Systems Management School, Fort Belvoir, VA, has been named product manager, 1¼-Ton Commercial Truck Systems, U.S. Army Tank Automotive Materiel Readiness Command, Warren, MI.

Formerly assigned as chief, Cost Performance Reporting Division, Directorate for Requirements and Procurement, HQ U.S. Army Materiel Command, he has also served tours of duty in Vietnam and Europe.

His academic credentials include a 1957 BS degree in military engineering from the U.S. Military Academy, a 1965 MBA degree from the University of Oklahoma and a PhD in business administration from George Washington University. He has completed the Army Command and General Staff College.

LTC Marrella has received the Legion of Merit, Bronze Star Medal, Joint Services Commendation Medal, and Secretary of the Army Award for Outstanding Achievement in Materiel Acquisition.

Rhea Chosen First OCHAMPUS Civilian Director

Joseph C. Rhea, former executive assistant to the executive vice president, Health Care Service Corp., has been named the first civilian director of the Office of the Civilian Health and Medical Program of the Uniformed Services (OCHAMPUS).

Involved in health care management since 1961, Rhea has an MA degree from Michigan State University and has been associated with the American Academy of Family Physicians and the National Association of Blue Shield Plans.

OCHAMPUS was established in 1974 as an Office, Secretary of Defense Field Activity. Policy, guidance and operational directions are assigned from the Assistant Secretary of Defense (Health and Environment).

Awards . . .

4 Major Awards Recognize MERDC 1975 Achievements

MOST IMPROVED ARMY LABORATORY Award is presented to MERDC Commander COL T. R. Hukkala and Technical Director Terence G. Kirkland by Dr. K. C. Emerson, deputy for Science and Technology, Office of the Assistant Secretary of the Army for R&D.

Achievements of the U.S. Army Mobility Equipment Research and Development Command during the past year were recognized by presentation of four major awards during a January ceremony at Fort Belvoir, VA. About 150 employes and senior officials from Army and Department of Defense agencies attended.

Dr. K. C. Emerson, deputy for Science and Technology in the Office of the Assistant Secretary of the Army for Research and Development, presented the top award for Special Accomplishment as the Most Improved Army Laboratory. (Selection of MERDC for this honor was announced in our 15th Anniversary Edition shortly before Christmas.)

Army Materiel Development and Readiness Command Deputy CG for Materiel Development MG George Sammet Jr. presented three additional honors including a Laboratory Excellence Award. This is presented annually by the U.S. Army Materiel Development and Readiness Command based on an evaluation of all 21 of its laboratories. DARCOM Deputy for Science and Technology Norman L. Klein headed the selection committee.

MERDC also was recognized with the National Safety Council's Award of Honor, its highest, and DARCOM Safety Award of Honor.

ARMY VALUE ENGINEERING Coordinator Jack C. Strickland presents Certificate of Achievement to August F. DeSantolo, AMC Research, Development and Engineering Directorate, for "exemplary professionalism and leadership" in directing FY 1975 DARCOM VE Program. Director of D&E BG Harry Griffith observes.

Value Engineering Program savings during FY 1975 of $106.5 million by the Army Materiel Command and $20.6 by the Corps of Engineers were recognized recently by presentation of Department of the Army Certificates of Achievement.

Department of the Army Value Engineering Program Manager Jack C. Strickland presented the awards. The AMC citation stated that 645 change proposals by contractors was 108 percent of the assigned goal, and that AMC in-house activity VE proposals totaled 1,892.

Corps of Engineers contractors originated 319 proposals for 139 percent of the goal and in-house activities accounted for 151 proposals.

Army R&D — 15 Years Ago

The Army R&D Newsmagazine reported on . . .

3 Cold Weather Test Centers Plan Relocation

Relocation of three major U.S. Army cold weather environmental research facilities, aimed at speeding up development by placing engineering and user test activities closer together, is scheduled for completion by late 1961.

Testing activities at Fort Churchill, Canada, except for continued upper atmosphere experiments with rockets and balloons started during the International Geophysical Year, will be moved to Fort Greely, AK.

The Corps of Engineers' Snow, Ice and Permafrost Research Establishment (SIPRE) at Wilmette, IL, and the Arctic Construction and Frost Effects Laboratory (ACFEL), Waltham, MA, will be merged into a new facility named the Cold Regions Research Engineering Laboratory (CRREL) at Hanover, NH.

Theme of the Month Author Stresses R&D Challenge

Army Director of R&D Richard S. Morse stated: "The present expanding rate of scientific progress and its military implications place before the Army R&D team one of the most challenging tasks in history.

"Technological explosions are promising to reshape our world either for good or for bad. World leadership unquestionably will rest with that nation which excels in, and has the leadership to utilize most effectively, science and technology . . . If America is to survive, we must constantly improve the effectiveness of our over-all R&D efforts. . . ."

Fort Detrick Links East Coast With STARCOM

The world's largest automatic communications relay station, capable of handling 275,000 messages a day, began operations at Fort Detrick, MD, home of the Chemical Corps Biological Research Laboratories.

Designated the East Coast Relay Station, the $25 million installation is the control station for the Strategic Army Communications System (STARCOM), the Army's worldwide network. With the Midwest Relay Station at Fort Leavenworth, KS, and the West Coast Relay Station at Davis, CA, the East Coast Relay Station completes STARCOM in the U.S.

ARO Reorganization Changes OOR Control

Direct administrative, funding and policy control exercised by the Chief of Research and Development over all Department of the Army basic research activities is strengthened by reorganization of the Army Research Office, including transfer of the Office of Ordnance Research.

Aimed at improved management of the Army's expanding, diffused and widely dispersed basic research program, the revised framework of the Army Research Office is in line with recommendations of the Roderick Board, as approved in August 1960.

OOR was redesignated Army Research Office-Durham and will receive personnel and funding increases commensurate with a projected substantial growth of its functions. The present staff consists of 109 employes with technical interests in mathematics, chemistry, physics, engineering sciences, and metallurgy. Oversea offices will be renamed ARO-Frankford and ARO-Tokyo.

Dr. Siu Initiates T-Thoughts on R&D Management

Dr. Ralph G. H. Siu, technical director, Office of the Army Quartermaster General, known for his wit, wisdom and abilities as a scientist, began a series of T-Thoughts, a new bylined column in the *Army Research and Development Newsmagazine*, in which he expounded on a statement formulated by the Cadillac Motor Co., on "The Penalty of Leadership," (Excerpts follow).

"In every field of human endeavor, he that is first must perpetually live in the white light of publicity. Whether the leadership be vested in a man or in a manufactured product, emulation and envy are ever at work . . .

"If the leader truly leads, he remains — the leader. Master-poet, master-painter, master-workman, each in his turn is assailed, and each holds his laurels through the ages. That which is good or great makes itself known, no matter how loud the clamor of denial. That which deserves to live — lives."

Working Conditions of Soviet Scientists

By Dr. Robert L. O'Connell
U.S. Army Foreign Science and Technology Center

Soviet Union scientists enjoy, in many ways, the status of a privileged class. In a society governed largely by engineers, inspired by a Marxist-Leninist philosophy uncritical in its admiration for science, professional personnel in this field occupy what is literally a pinnacle of prestige in the occupational hierachy. Despite recent selected cutbacks, funding for the sciences in the USSR remains lavish and has been increasing at a rate of well over 10 percent annually for 15 years.

Western world researchers, plagued by shortages of money and often unappreciated by society-at-large, might view such an atmosphere as ideal, a virtual technocratic paradise. Closer examination, however, reveals that the Soviet scientist is not without his problems.

Foremost on his list of troubles, in many instances, is a basic lack of computer support for research. In almost every field of scientific endeavor, the computer has become a vital tool, particularly in theoretical modeling and in the processing of experimental data. Yet the Soviet system has proved incapable of mass-producing the third-generation machines able to carry on this work.

Although there are a few examples of handmade computers with fully integrated circuitry within the Soviet Union, almost invariably they have found their way into high-priority military programs, leaving the rest of the scientific community to make do with what else is available.

The precedence of military-oriented research over its civilian counterpart is not evidenced solely in access to electronic hardware, but is, in fact, a major reality of Soviet science. Should a researcher find himself working for the military, it is probable that he and his coworkers represent the best scientific talent available in the USSR, and that his research equipment is the most modern that rubles can buy.

Indeed, the members of the military research and development community are among the most pampered members of Soviet society. However, these scientists pay a price for their good treatment in the certainty that their work will be applied to specific military ends, regardless of whatever research preferences they might have.

Scientists in the civilian community are given more freedom of inquiry, but less to work with in terms of money and equipment. However, it would be a mistake to assume that civilian scientists work under anything approaching intellectual autonomy, or that this branch is free from favored enclaves. To understand how this works, it is necessary to recognize that the administration of civilian science in the USSR is shared by two separate authorities, the Academy of Sciences and the "Ministerial System" (i.e., those bureaucratic organs charged with production responsibility).

Functionally, this division corresponds to the difference between basic and applied research. The "Ministerial System" receives somewhat greater funding and employs more scientists, but the Academy staff maintains considerably more prestige. This, in turn, translates into a fundamental disparity between basic research, generally of a high quality, and applied science which often has been neglected.

Consequently, the level of innovation in the civilian sector of the economy has remained low — a fact which stands in stark contradiction to the stated promise of the Communist Party of the Soviet Union (CPSU) to upgrade sharply the quality and availability of consumer goods.

The Communist Party has sought to remedy this situation in recent years by taking a much more active role in the determination of scientific and technological goals. Differential incentives for product development and creation of various administrative bodies to examine technological alternatives have succeeded in shifting priorities to some extent.

Still, the policy has left a number of scientists worried over the fate of pure science and doubtful about their ability to pursue freely the applications of their discoveries. This sort of constraint, however, is probably less significant than the pressure generated by army functionaries anxious to provide the scientist with helpful ideological hints.

Maintenance of doctrinal purity and consistency, even if it interferes with valid scientific findings, has been a long-established CPSU policy.

From the Lysenko affair (1920s through 1940s) — which caused the study of genetics to be suspended in Russia until 1965 — to the banning of Einstein's "bourgeois" theories of physics, to the 1968 decree "On Measures for Raising the Work of Scientific Organizations," the Communist Party has made absolutely clear its intention to guide and supervise scientific research.

While this type of ideological policing might not appear to have the direct impact that it would upon the work of a writer or an historian, scientific inquiry, in fact, is often extremely vulnerable to political pressure.

An example is provided by the sorry fate of cybernetics during the regime of Nikita S. Khrushchev. The Soviet definition of this term implies considerably more than the narrow American definition, which is used mainly to describe closed-loop systems.

Because the Soviet premier was temperamentally opposed to the kind of scientific control implied by cybernetics, its study was virtually halted during his tenure. Funds were cut off, experimentation on human performance was prohibited, and men like Viktor M. Glushkov, the leading Soviet computer cyberneticist, found themselves without work to do.

Another individual who ran afoul of the Soviet system and soon found himself under-employed was Andrei Sakharov, the so-called "Father of the Soviet H-bomb." Despite his enormous prestige in the USSR scientific community, his career took a nosedive when he began making public his dissatisfaction with the Communist system.

Fired in 1968 from his position in the Soviet nuclear program and rehired only after a full year at a much lower occupational level, Sakharov found himself shunned by both family and friends.

Doubtless compounding the scientist's difficulties is the fact that he has been designated the recipient of the 1975 Nobel Peace Prize, awarded primarily because of his crusade against Soviet nuclear testing and the repression of dissidents at home. Although his eminence probably protects him from imprisonment, Sakharov finds his scientific career brought virtually to a standstill by bureaucratic intervention.

While the harassment of individual dissenters is more common, the CPSU has shown its willingness to discipline whole groups of scientific workers when it suits its purposes. A case in point is the plight of Jewish scientists within the USSR. Accounting for 7.5 percent of Soviet research workers in 1971, these people find themselves a suspect minority due to their country's hostile attitude toward the State of Israel.

Since 1961, practically no Jews have been allowed to attend a first-rate university in the USSR and few have found employment on high-priority scientific programs. But if the Soviet Union refuses to trust its Jewish scientists, it is also reluctant to allow them to emigrate to a more congenial political climate. Instead, they remain in limbo, their careers dangling in a state of suspended animation.

Illustrating the travails of a few dissidents does not, of course, prove that the life of the average apolitical Soviet scientist is intolerable or even unpleasant. Nevertheless, it should be noted that every Soviet researcher, regardless of politics, exists under a system of security so strict that it leaves him in a state of considerable intellectual isolation.

The fear of giving away state secrets often supersedes, in practical terms, the desire to share discoveries and learn from others. Compounding this sense of solitude are the restrictions on travel both inside and outside of Russia which have been an annoying feature of Soviet life.

All told, it seems likely that Western scientists would find working conditions under such a system somewhat less than utopian.

ROBERT L. O'CONNELL joined the Army Foreign Science and Technology Center at Charlottesville, VA, as an analyst in June 1975 and is currently studying the Soviet science infrastructure. He received his BS from Colgate University and MA and PhD degrees, all in history, from the University of Virginia.

Dr. O'Connell's primary research interest is the technological innovative process as influenced by cultural and political factors. He has just completed a book on the dreadnought battleship which examines the history of this weapon in the light of the preconceptions held by naval officers.

Dr. Salant Named Natick Food Laboratory Director

Appointment of Dr. Abner S. Salant as director of the Food Engineering Laboratory, U.S. Army Natick (MA) Development Center (NDC), has been announced by COL Rufus E. Lester Jr., commander.

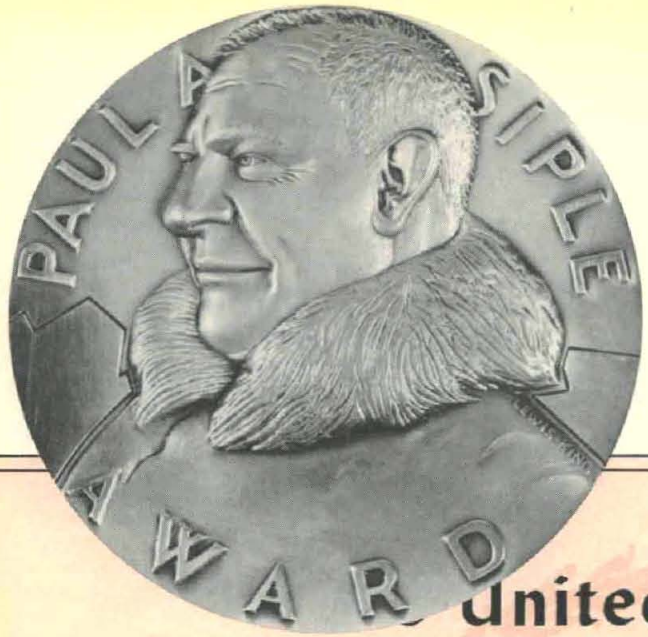
Dr. Salant will assume responsibility for all research, design and developments of military rations, food products, food processes and preservation techniques and feeding systems for the Department of Defense and other government agencies.

A graduate of New York University with a degree in chemistry and a PhD from Rutgers University in food technology and chemistry, Dr. Salant has 25 years of extensive professional experience in his field.

Vice president since 1962 of Product Development and International at Monsanto Flavor/Essence, Inc., NY, he has been responsible for managing all flavor and fragrance application R&D programs.

While with the Tenco Division of Coca-Cola Co., 1956-62, Dr. Salant managed product process developments in instant coffee, tea and other powder beverages. Earlier, with the General Foods Corp., he directed development activities for dessert products and dry beverages.

Dr. Salant is a member of American Institute of Chemists, American Association for Advancement of Science, American Chemical Society, Institute of Food Technologists, Society of Flavor Chemists, and the Society of Cosmetic Chemists.



Dr. Siple Award Winners

1970 — Picatinny Arsenal: Drs. Samuel F. Trevino, Henry J. Prask, Chang S. Choi, Zafar Iqbal, Krishnarao R. Rao; and Richard D. Mical. 1972 — Edgewood Arsenal: Drs. Ludwig A. Sternberger, Van M. Sim, David E. Lenz, Dennis M. Hinton; CPT William G. Kavanagh, John J. Cuculis and Howard G. Meyer. 1974 — Walter Reed Army Institute of Research: COL Philip K. Russell, LTC Bruce F. Eldridge, CPT James W. LeDuc and William Suyemoto.

Feature article on selection of 96 technical papers for 1976 Army Science Conference, June 22-25 — page 10.

United States Army
1976 Science Conference

Is awarded this Certificate of Outstanding Achievement for a commendable contribution to science and to the furtherance of the United States Army's research and development program. As an author of a paper presented at this conference, he has demonstrated a high degree of professional knowledge and skill, and a profound appreciation of the objectives of the program, reflecting great credit upon himself and the organization he represents.

U.S. Military Academy, West Point, N.Y.

22-25 JUNE 1976

Assistant Secretary of the Army
(Research & Development)

Bronze Medallion Winners

1970 — Dr. T. Davidson, J. F. Throop, A. N. Reiner; MAJ J. J. Amato, LTC N. M. Rich, MAJ N. S. Lawson, CPTs R. P. Gruber and L. J. Billy; J. M. Regan, G. H. Jonas; J. J. Baranowski, V. J. Higgins; A. O. Ramsley; Dr. T. G. Roberts; J. A. Kohn, C. F. Cook, D. W. Eckart; COL R. H. Herman, N. S. Rosensweig, CPT F. B. Stifel, Y. F. Herman. 1972 — Dr. F. E. Hahn, J. Ciak; Dr. R. E. Ormiston, W. G. Bousman; C. S. Choi, Z. Iqbal, H. J. Prask, S. F. Trevino; R. L. Wintermyer, L. Szafraniec, H. R. Bradford, H. Klapper; BG S. N. Bhaskar, COL D. E. Cutright, LTC A. Gross; Abraham Flatau; G. Randers-Pehrson, B. G. Knutelsky; V. I. Siele, M. Warman, J. Leccacorvi, E. E. Gilbert. 1974 — Dr. J. R. Gonano; Dr. A. M. Dietrich, Dr. V. Greenhut, S. K. Golaski; L. J. Jasper; Dr. D. S. Downs, Dr. W. Garrett, Dr. Donald A. Wiegand, Dr. T. Gora, Dr. H. D. Fair, M. Blais, A. C. Forsyth; Dr. C. E. Hammond; Dr. H. A. Leupold, Dr. F. Rothwarf; Dr. C. J. Campagnoula, J. E. Fine, H. Lee; LTC D. W. Wilmore, MAJ J. M. Long, SP4 R. W. Skreen, Dr. A. D. Mason, COL B. A. Pruitt.