ARMY

R,D&A

• RESEARCH
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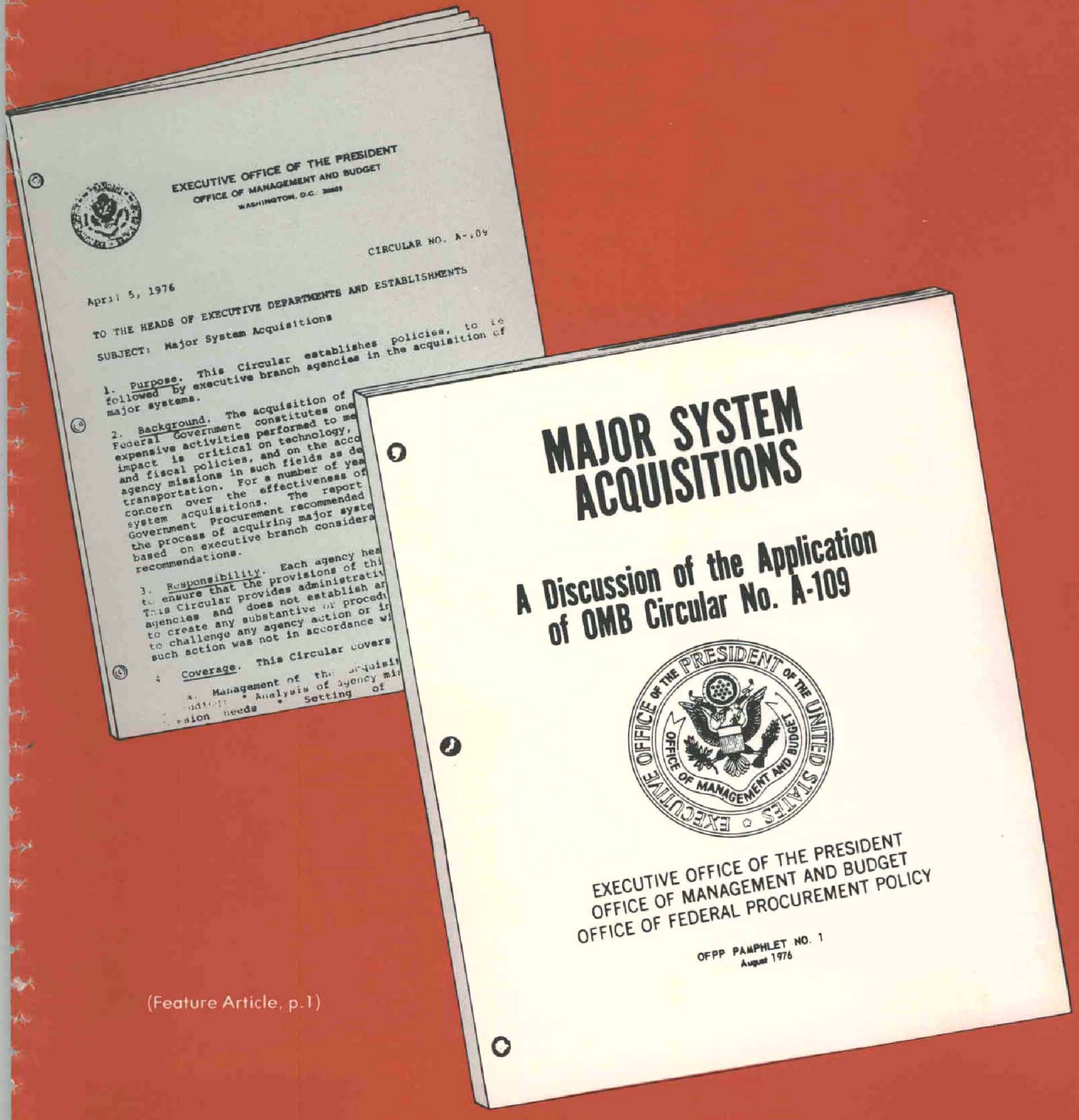
• ACQUISITION

MAY-JUNE 1978



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

CIRCULAR NO. A-109

April 5, 1976

TO THE HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS

SUBJECT: Major System Acquisitions

1. Purpose. This Circular establishes policies, to be followed by executive branch agencies in the acquisition of major systems.

2. Background. The acquisition of

Federal Government constitutes one

expensive activities performed to me

impact is critical on technology,

and fiscal policies, and on the acco

agency missions in such fields as de

transportation. For a number of yea

concern over the effectiveness of

system acquisitions. The report

Government Procurement recommended

the process of acquiring major syste

based on executive branch considera

recommendations.

3. Responsibility. Each agency hea

to ensure that the provisions of thi

This Circular provides administrati

agencies and does not establish ar

to create any substantive or procedu

to challenge any agency action or ir

such action was not in accordance wi

4. Coverage. This Circular covers

a. Management of the acquisit

b. Analysis of agency mi

c. Setting of

ration needs

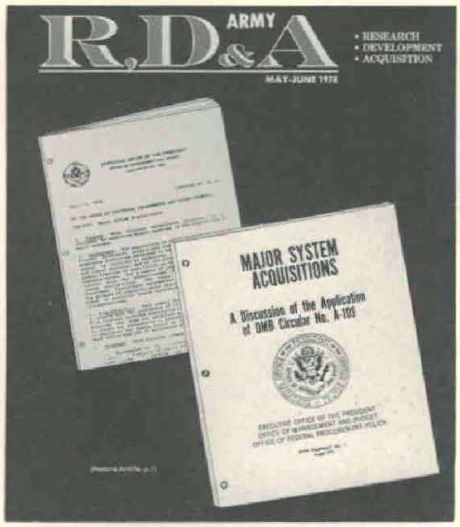
MAJOR SYSTEM ACQUISITIONS

A Discussion of the Application of OMB Circular No. A-109

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
OFFICE OF FEDERAL PROCUREMENT POLICY

OFPP PAMPHLET NO. 1
August 1976

(Feature Article, p.1)



ABOUT THE COVER:

Office of Management and Budget Circular A-109, published on 5 April 1976, provides new policy for the acquisition of major systems by all executive branch agencies. It is intended to institute reforms that will reduce cost overruns and diminish the past two decades of controversy relative to whether new systems are needed. A-109 policy applies to such acquisitions as federal office buildings, hospitals, energy demonstration programs, transportation systems and national defense and space systems. Featured in this edition, are two recent speeches on defense acquisition policies and OMB Circular A-109.

Editor . . . . . L. VanLoan Naisawald
Associate Editor George J. Makuta
Assistant Editor . . Harvey Bleicher
Staff Assistant Mrs. Thelma Heisler

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FEATURES

DEPARTMENTS

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DOD Compliance With OMB Acquisition Circular Is Topic of Speech

U.S. Department of Defense compliance with the Office of Management and Budget's Circular A-109, "Major Systems Acquisition," and the impact of requirements of this circular on Defense-related R&D and Independent R&D (IR&D) activities was the subject of a recent address by Paul R. Calaway, assistant for Program Planning, Office of the Under Secretary of Defense for Research and Engineering.

Calaway is the focal point, within the Office of the Under Secretary of Defense (R&E), for all activities regarding implementation of OMB's Circular A-109. He also has responsibilities for Defense-related IR&D, and serves as action officer for the IR&D Policy Council, an organization tasked with developing, securing Secretary of Defense approval, and disseminating DOD policy and guidance relative to administration of the DOD IR&D program and related bid and proposal activities.

His address was presented at a meeting of the National Security Industrial Association. A summary of his remarks follow:

Calaway stated in his introduction that there should be no doubt concerning DOD's commitment or support for A-109 and its precepts. "We think that it makes sense and offers the potential for shortening the acquisition cycle and getting more capability for the dollar," said Calaway.

Key provisions of A-109 call for formalizing the front-end of the acquisition process; getting early-on high-level affirmation of mission-oriented needs; tapping a wide variety of sources to competitively derive system designs; maintaining integrity of competing designs; and extending competition during the process.

Calaway noted that attempts are being made to avoid bureaucratizing implementation of A-109. Provisions of the circular, he said, have been incorporated into DOD Directives 5000.1 and 5000.2, which describe the basic policy and process for major DOD systems acquisitions.

One of the major problems associated with implementating the new requirements of the circular is educating the personnel who will be affected by the requirements. These persons include program managers, and headquarters staffers in the Services up through the OSD staffs.

Some of the approaches being used to enhance this educational process include new seminar courses, acquisition system briefing teams, government/industry forums, and greater communication with program managers and their staffs.

Relative to improvement of the overall acquisition process, Calaway said that DOD must first be sure of the validity and priority of the mission task DOD wants to perform and, equally important, determine whether we can afford it.

At stake, he pointed out, is the premature commitment to a false and costly start, an unproductive industry buildup, and injury to government-industry relationships.

The key to whether a program will be given a "go" decision, said Calaway, is approval by the Secretary of Defense of a mission need document. Termed "Mission Element Need Statement" (MENS), this document will form the basis for advising industry and academia of DOD's mission deficiencies and requesting alternative approaches.

The MENS approach formalizes the acquisition process so that program initiation, operational need date, and affordability are highlighted. Alternate conceptual solutions will be identified *early*.

The new front-end policy will also require a very careful assessment of design and manufacturing technologies, logistics factors, and an early, aggressive pursuit of program voids and deficiencies.

Calaway stressed that candidness in facing up to the problem of affordability was reflected in the Mission Element Need Statement. The DOD, he said, was also coupling a tentative decision to produce and deploy with the decision to enter full-scale development.

"Hopefully," he added, "the affordability issue will be faced early enough to prevent the government and industry from committing resources to the full-scale development of a system which will never be produced."

Growing concern for the DOD to present its annual budget in a mission-oriented structure, said Calaway, is closely related to the "Mission Budgeting" requirement specified in the 1974 Congressional Budget Act.

In effect, mission budgeting, the A-109, and implementating DOD directives require justification of resource requirements on the basis of the end purposes of requested acquisitions, noted Calaway.

"Our current budget presentation," said Calaway, "does not really show why an item is needed, and there is no apparent relationship between the various procurement/development items in the budget."

Calaway explained that this same relationship existed within the acquisition process itself, where individual acquisition programs often proceeded without regard to other developments which could contribute to satisfying the same needs.

Referring again to the growing emphasis on the front-end portion of the acquisition process, required by new procedures, Calaway said that it was paramount to develop a common structure for use by the DOD and the Services to eliminate the need to translate from one system to another.

When establishing an acquisition program, based on a need to fill a known deficiency, Calaway said that DOD Directives 5000.1 and 5000.2 apply. A Mission Element Need Statement will be developed by the requesting component.

If the Secretary of Defense approves the need, he will authorize the component agency to investigate various alternatives to satisfy the need. Although 5000.1 and 5000.2 are specifically for major programs, it is expected that the same principles be applied to *all* acquisition programs.

One of the implications of the front-end changes is that greater emphasis will be placed on a viable technology base. Said Calaway: "We have to reverse the trend of serious erosion in our Science and Technology program which has occurred over the last 10-15 years. We have requested a seven percent real increase in FY79 S&T program funding."

Additionally, emphasis will be placed on maintaining a sufficient separation between technology base R&D and R&D devoted to solutions of specific needs. Similar emphasis, he said, applies to separation of Independent R&D from solution-oriented activity.

Generally speaking, there should be no impact on *genuine* IR&D by A-109. Calaway explained that IR&D is contractor initiated and performed, product-oriented R&D that is not sponsored by contract, is not required in the performance of a contract or grant, and is not required for the preparation of a specific bid or proposal.

Independent R&D, stressed Calaway, will continue to be a major source for building technological strength. The DOD has, he said, benefitted by obtaining original technical approaches, concepts, and inventories which apply to their needs.

Cited as recent contributions of this effort were development of laser gyroscopes and charge-coupled devices. In both cases, the S&T program was expanded and significant systems applications were accelerated. Calaway said that IR&D and other technology base efforts must maintain their own identity.

Calaway indicated that three facets of current policy which will help to ensure IR&D and technology base identity are: focusing attention on long-range technology deficiencies; increased funding for the front-end of the acquisition programs; and expectations of a clearly defined starting point.

In summary, Calaway reemphasized that the features of A-109 and DOD's resulting policies should not have any negative impact on basic R&D and Independent R&D activities. He concluded: "Because the keystone of our investments strategy is to build on our technological lead, it is vital to avoid focusing on near-term solutions to our need."

DARCOM Commander Discusses Army Acquisition Policies

Addressing the Philadelphia Chapter of the National Security Industrial Association on 7 Apr. 1978, GEN John R. Guthrie, DARCOM commander, noted that he had been asked to talk about what was new in Army procurement policies. After studying the theme a bit, he said, "I realized that, after almost . . . 25 years of close association with this business, there really isn't a great deal that's new."

The one new aspect that is significant, he continued, is the changing of the name of the subject he was to talk about, the change from *procurement* to *acquisition.*

The term acquisition is far broader, more inclusive than procurement, said the General. "Acquisition includes procurement, but extends also," he continued, "to related functions such as the determination of the existence of a particular requirement or need, solicitation, source selection, contract award, contract financing, contract performance, and contract administration."

The significance of this change in terminology is reflected in the new Federal Acquisition Regulations which are being developed to replace the current Armed Services Procurement Regulation, Guthrie noted. This action, he pointed out, is part of an effort to develop a single acquisition regulation for use throughout the Federal Government. The General pointed out that today this task has become part of a broader effort to simplify Federal regulations and reduce delays and excess paper work.

In March, he continued, at the request of the newly Congressionally-created Office of Federal Procurement Policy, an office within the Office of Management and Budget, the Defense Department and the General Services Administration began a joint effort to draft the new Federal Acquisition Regulations. The goal is to have them published by the fall of 1979.

Closely tied into this effort is an earlier action, said Guthrie, by the new Office of Federal Procurement Policy and the Office of Management and Budget. This was the publication of the new OMB Circular A-109, titled Major Systems Acquisitions. Published in 1976, GEN Guthrie said it applies throughout the Federal Government, and it is applicable to all federal acquisitions, from hospitals to weapons, to experimental transportation systems.

This new circular, along with its implementing Department of Defense directives and the new Army Regulation 1000-1, have caused changes in emphasis, and it was this change of emphasis theme that was the heart of the General's talk.

Of particular note concerning OMB Circular A-109, remarked GEN Guthrie, was the effort to make the early part of the materiel acquisition process more formal by requiring approval of a Mission Element Need Statement, whose acronym is MENS, before a program may be initiated. Approval by the Secretary of Defense of a Service Need Statement only establishes the need formally, said Guthrie; it does not determine how the need is to be satisfied. (See Page 1 of this issue for further discussion on this subject.)

Continuing on the theme of changed emphasis, the General noted the major attention and effort being devoted to NATO Rationalization, Standardization, and Interoperability.* "In the long run," he noted, "RSI may have a greater impact on the way we do business than almost anything else." Noting that the Congress and the White House have both given unmistakable evidence of their intent and desires that U.S. Armed Forces attain a higher degree of standardization with NATO forces, he stated that there was no question in his mind that the current Administration "is determined to make a stronger effort than in the past" to achieve this goal.

However, Guthrie noted, a number of formidable hurdles exist to be overcome before the political resolve becomes reality. A recent General Accounting Office study, he said, cited some of the more difficult ones. Among them were: the varying perceptions by the NATO forces of military needs and equipment requirements; the primacy of national interests, particularly political and economic considerations; and, the lack within the NATO organization itself of an acceptable organization "that can plan and direct its standardization efforts and differences in cost effectiveness and competitiveness among NATO nations." Noting that while there are problems that are serious and sensitive, "the need for solutions is the best assurance that they will be found."

The magnitude of these RSI problems, said the DARCOM commander, has not precluded progress. He had recently attended several meetings across the country and he had always come away, he said, encouraged by the growing awareness at all levels, that "we must 'eat the elephant bite by bite' rather than trying to swallow it all in one gulp." There is a general concensus, he believes, on both sides of the Atlantic, that the first steps should be "toward attaining interoperability in the immediate future with standardization a longer term objective."

Efforts to attain this first goal, as well as maintaining those already achieved, should focus primarily, he felt, on consumable items and on the command, control, and communications aspects of NATO. "If we can fire each other's ammunition and share each other's fuel, and at the same time communicate effectively, we will improve NATO's ability to wage coalition warfare should the need arise."

DARCOM, as an agency responsible for executing RSI policies formulated at higher levels "faces an impressive array of operating level challenges," said Guthrie. Some of these are the mechanics of international technology transfer, the how-to-do of data rights, licensing and royalty agreements, training and logistic support considerations, and configuration management responsibilities." Elimination of these is essential, he continued, before DARCOM can undertake materiel acquisition with confidence that the Army will obtain the desired equipment on time and within cost constraints.

He noted that last year DARCOM began a study of these problem areas. The idea or purpose was to have the DARCOM acquisition community become involved in thinking about RSI in order to identify and then solve obstacles. The initial effort is being followed up by bringing in to Headquarters, DARCOM, people from each of DARCOM's major subordinate commands to work on earlier identified problem areas. Following the development of specific solutions as well as a strategy applicable to flexible, case-by-case use, industry will be consulted.

Citing the Roland air defense system, the Belgian MAG-58 machinegun, and the 120mm German tank gun as examples of RSI, the General noted that "RSI must become an integral and essential part of our daily way of doing business."

The General then talked about a second area of changed emphasis—that of increasing the number of minority business contracts. He told the group that President Carter's goal was a doubling of federal minority contracts by the end of Fiscal Year 1979. Noting that the Army has traditionally led the way in federal minority contracting, with about one quarter of the federal total, the General pointed out that DARCOM is responsible for nearly half of the Army effort. Last year, he said, DARCOM had a target of $49 million; this was increased to $54 million during the fourth quarter. Even so, said the DARCOM commander, his command attained 107 percent of its quota. This year the goal has risen 50 percent, to a figure of $81 million, but he expects DARCOM, with some help from the Army's prime contractors, to meet the goal.

The third area of new emphasis GEN Guthrie discussed was the reduction in the use of and in the number of letter contracts. He noted that both industry and the Army have reason to be concerned about such contracts. For the Army's part, said the General, if it has committed funds to a program without a definite con-

(Continued on page 3)

*See end of article for NATO definition of these terms.

DARCOM Commander Discusses Acquisition Policies

(Continued from page 2)

tract, the Army will lose much of our flexibility in negotiating the details of a final contract. For industry, it does not know, said Guthrie, whether the government will obligate funds beyond the 50 percent limitation of a letter contract.

The number of outstanding letter contracts, said Guthrie, had risen markedly between 1973 and 1977. Since this time there has been about a 62 percent reduction in dollar amount of outstanding letter contracts. But there are still, to his mind, too many letter contracts that have gone beyond their intended time period.

Letter contracts, said Guthrie, should be used only when absolutely necessary. When they are used, they must be definitized within 180 days or when 40 percent of the work has been completed, though exceptions are possible. GEN Guthrie appealed to industry to support his efforts in this area.

The increased use of technology to reduce cost was a fourth area of increased emphasis. This was an area, he said, where he felt that success was not too great, despite his efforts at stressing its desirability. Technology, he noted, has provided a many-fold increase in battlefield capabilities, albeit at unfortunate increased costs. Yet there is the example, he cited, where technology has reduced the cost of calculators from hundreds of dollars to a price as low as $9.95. "We must look for ways to reduce cost while maintaining the same level of performance."

Integrated Logistic Support or ILS is another new emphasis program, said Guthrie. ILS requires that readiness considerations, such as increased reliability and maintainability be designed into a system, and that logistic support considerations be developed concurrently with the system itself. Here again, said the General, past progress has not been as hoped for. However, materiel developers are now required to demonstrate that they have met ILS requirements during DT/OT-II, or the program will not proceed further.

The final area of emphasis discussed by GEN Guthrie was that of transition. "Transition is a new wrinkle in the [Army's] acquisition process, since we did not have to do it under [previous to 1974] commodity command structure. Under the new DARCOM structure, with its separate R&D and readiness commands, there is a definite need for a transition process system that passes a system from the R&D command where it has been produced and is ready to be fielded and supported, to the readiness command.

"We have developed transition concepts," said Guthrie, "designed to insure that the systems that come from follow-on procurements are as reliable and maintainable as those initially produced, tested and fielded . . . ."

Conceding that the Army has yet to transition a major system, he noted the need for extensive coordination between all elements involved. There is a growing realization, he felt, that there are no hard and fast rules, nor are all the answers known. However, the area was receiving his personal attention and "I am insisting that we must shape the cloth to the model, and not make the model fit the cloth."

The NATO Glossary defines standardization as the process by which member nations achieve the closest practicable cooperation among forces, the most efficient use of research, development and production resources, and agree to adopt on the broadest possible basis the use of:

• Common or compatible operational, administrative and logistic or technical procedures and criteria. • Common, compatible or interchangeable supplies, components, weapons or equipment. • Common or compatible tactical doctrine with corresponding organizational compatibility.

Standardization of specific materiel or tactical items in NATO is sought at one of three levels, depending upon need and other factors. These are *interchangeability, interoperability, compatibility.* Interchangeability exists when two or more items can be exchanged for each other between NATO armed forces. Interoperability is the ability of systems, units or forces to provide services and to accept services from other NATO armed forces. Compatibility is the capability of two or more items or components of equipment to exist or function in the same system with other NATO armed forces.

Army May Procure Swedish Small Unit Support Vehicles

Small Unit Support Vehicles (SUSVs) are being evaluated for possible procurement from Sweden, following a recent 3-day field exercise conducted as part of a test for the Cold Regions Test Center, Fort Greely, AK.

Bravo Company, 4th Battalion, 23d Infantry from Fort Richardson, AK, participated in the training exercise, which was the first time the BV 202, manufactured by Volvo, and the BV 206, made by Hagglunds, were used in a tactical setting in the United States.

The SUSVs were tested for their ability to transport a platoon load and a complete mortar squad, evacuate casualties, serve as a communications platform and supply vehicle, and transport a mortar fire direction control center.

The operational exercise was designed and controlled by the Combat Development Activity at Fort Richardson.

According to COL Robert Looney, head of the Combat Development Activity, the exercise went very well, with Bravo Company and the reconnaissance platoon of the 23d Infantry (opposition force) exhibiting very active parts. "The troops were very impressed by the maneuverability of the SUSV," he said.

CPT William D. James, commander of Bravo Company, 4th Battalion, 23d Infantry "loved the hell out of them. We moved much farther, quicker and with fresher troops when we got there," he said.

CPT James noted that during other Army Training and Evaluation Program exercises, "We've waited six hours for rucksacks carried by support vehicles; here we had them in just 25 minutes. The SUSVs were extremely reliable . . . they never got stuck; close once, but never stuck."

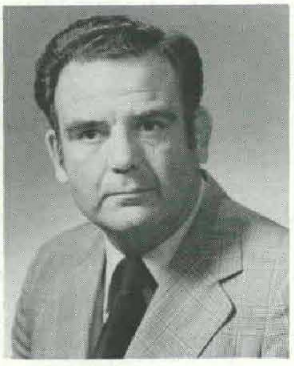
Evaluation of the SUSVs, which are already used by several Nordic and European countries, will continue through the spring until break-up of the ice and snow in Alaska.

BV 202 and BV 206 (background) Small Unit Support Vehicles

Top RDA Officials Review Major Army Electronics Programs

U.S. Army Materiel Development and Readiness Command Assistant Deputy for Materiel Development John D. Blanchard presented an overview of "Major Army Electronics Programs—FY79 and Beyond" at the spring meeting of the Electronic Industries Association in Washington, DC. Highlights of his address are reported here.

Army Deputy Chief of Staff for Research, Development, and Acquisition LTG Donald R. Keith also presented a separate address focusing on the areas of command and control, communications, and intelligence. He noted that these programs, termed C³I, comprise the largest part of expenditures in electronics.



John D. Blanchard

Mr. Blanchard prefaced his remarks by stating that technology is now at a stage where electronics play a major part in weapon and support systems that have traditionally been purely mechanical. The initial portion of Blanchard's presentation dealt with programs which he termed have not had difficulty in obtaining funds:

SINCGARS–V. The Single Channel Ground and Airborne Radio System high frequency program, said Blanchard, is being planned as a rugged, highly portable, combat net radio subsystem. It is intended as the primary means for command and control of infantry artillery and armor units on the battlefield.

Designed to replace current vehicular aircraft and manpack radios, the single channel radio features a push-to-talk technique over a particular frequency, with the primary mode being net operations. It will also be operable as a basic radio with COMSEC and/or an electronic counter-countermeasures module.

Blanchard acknowledged that one of the primary goals of the single channel radio is achievement of interoperability with NATO allies. Award of development contracts should occur shortly, and development work will continue through FY81.

Relative to the procurement aspect of the single channel radio program, Blanchard said that the development contractor will be required to assist a second source. Production for all Services is estimated at 240,000 radios in vehicular, aircraft, and manpack configurations.

DCS (Army). In the area of communications, Blanchard noted that the Defense Communications System Project Manager (Army) Communications Systems Program currently encompasses about 190 active tasks, of which some 90 are considered significant.

Eleven major project efforts will be initiated under Defense Communications System (Army) over the next few years, stated Blanchard. Five of those, he said, will fall under the heading of command and control; one will be a technical support services contract; and another will probably be an Engineer, Furnish, and Install (EF&I) contract for various communications/electronics subsystems.

During FY78, management services for the Worldwide Military Command and Control System will be provided by a support services contract, and procurement of a secure voice and graphics system is planned for the FY80-85 time frame.

Four of the major contractual efforts under Defense Communication System (Army), during FY78-80, are in the area of transmission systems. Three of these will probably be Engineer, Furnish, and Install efforts (or variations), while a fourth will be for hardware procurement.

Specific Engineer, Furnish and Install efforts, identified by Blanchard, included upgrading of the Fiesta microwave facilities; the European Wideband Communications Systems; and digital microwave radio links, electronic switches, and construction site preparation in the Panama Canal Zone.

Blanchard also stated that another Defense Communications System (Army) major effort will be the Dial Central Office Program. The objective of this project will be low-cost improvement of communication services at Army installations.

Initial funding, programed for FY79 with additional funds in succeeding years, will call for replacement of obsolete equipment with state-of-the-art electronic digital switches, and upgrading or replacement of cable facilities.

SATCOM. Programs of the U.S. Army Satellite Communications Agency, said Blanchard, have not been as fortunate as others in securing funding. RDT&E funding for the Satellite Communications Agency is divided into satellite communications and navigations systems (using global positioning).

Relative to the satellite RDT&E effort, a major FY79 activity will be continued development of pseudo noise/time division multiple access techniques and equipment. This program was initiated in FY77 and will continue to FY83/84.

Another FY79 major effort in satellite communications (tactical) will be initiation of engineering development of an anti-jamming/control device. This effort is projected for completion in FY81.

Blanchard noted that in the category of satellite communications supporting R&D, the only FY79 planned effort will be a frequency study to determine the interaction of satellite communications devices with other emitters in the same and related frequency ranges.

Emphasis in the navigation systems area, said Blanchard, is proceeding with advanced development of a family of ground terminals to fill requirements of all of the Services. During FY79 emphasis will be placed on testing man transportable terminals with available global positioning systems and test transponders.

Blanchard indicated that a significant program impact will result from the Satellite Communication Agency's FY79 R&D budget cut from $16 million to $7 million.

One of the programs being affected by the funding cut is development of a system to provide control of a network of satellite communication terminals. The second phase of the program was due to begin in FY79 but has been delayed for at least a year.

The budget pinch has also delayed developments with respect to the multibeam antenna; the hardened antenna; a buffer to enable the synchronous tactical satellite terminal to operate with the tritac switch; and the phased array antenna.

ATE. One of the electronics programs that holds great promise for U.S. Army logistics support, stated Blanchard, is automatic test support equipment. Automatic test equipment, he added, will relieve the field soldier of one of his most difficult tasks—troubleshooting. This equipment will reportedly permit the soldier to quickly isolate defective electronic components and replace them without need of technical manuals, or system-peculiar training.

Blanchard noted that the government's experience to date with automatic test equipment indicates that industry's technological base is sufficient to meet some Army needs without heavy investment of additional development.

During FY79 the government will begin development of standardized automatic test equipment, with procurement scheduled for FY83 and beyond. Standardized test equipment will be geared so that many developers can use it for logistics support, and possibly for different levels of maintenance.

Blanchard stressed that particular effort should be directed to generating automatic test equipment software efficiency,

since program software requires a greater Army investment than the automatic test equipment itself.

This means, he said, using low cost programing language, using automatic test program generation, and looking ahead to ensure that future automatic test equipment is compatible with Army's test program inventory.

Blanchard explained that hardware and software problems of automatic test equipment have been under study by an ad hoc industry group, first for the Navy and now for all the Services, with DARCOM spearheading the Army's participation in the study.

MRTT. Blanchard concluded his presentation with a discussion of the Modular Record Traffic Terminals. This equipment will replace the standard teletypewriter which has been in Service inventories for more than 30 years.

Two configurations for using the new Modular Traffic Terminals have been identified—single subscriber terminals and tactical communications centers. The single terminal is projected for use by all of the Services, while the tactical center will be used for high message volume.

Blanchard indicated that development contracts may be awarded as early as FY79, and that the overall Modular Traffic Terminals program calls for completion of development in FY81 and an initial production award in FY82.

LTG Donald R. Keith

LTG Keith began his address with a discussion of the Standoff Target Acquisition System. This is a revolving side looking radar system which is mounted on a helicopter. It is expected to provide the capability to track moving targets in real time at extended ranges.

Information will be displayed at ground stations and will reveal enemy movement while providing the basis for attack of enemy targets. Keith indicated that the Army will field an interim capability of the Standoff Target Acquisition System and enter final development in FY78.

RPV. The Remotely Piloted Vehicle is under development to fulfill Army requirements for unmanned aerial reconnaissance. It is expected to provide surveillance, target acquisition, and designation for prevision munitions. Engineering development will begin in FY79.

Radars. Major electronics programs in the area of radar include the TPQ-36 Counter Mortar Radar, and the TPQ-37 Counter Battery Radar. The TPQ-36 will automatically detect and locate hostile mortars, and rockets at short and mid-ranges. It will be used primarily in support of front line units.

The TPQ-37 is intended for use in locating artillery and long-range rocket sites at extended ranges. Both the TPQ-36 and TPQ-37 are entering production and should be fielded during the 1980s.

Communications. Keith emphasized that after the enemy's intention has been determined, it is imperative that Army field forces and weapon systems be properly positioned. This is best achieved, he said, by a first class command and control and communications system.

Keith stated that the Integrated Tactical Communications System Study, commonly known as INTACS, developed the most cost effective tactical communications system for the Army in the field for the 1976-1991 time frame. The Department of the Army approved implementation of the study in 1976.

The INTACS implementation plan, Keith explained, is directed at equipping the total Army force of 24 Divisions. If projected development programs and hardware delivery schedules are maintained, the 24-Division force can obtain the system by 1990.

Major items under development to implement the Integrated Tactical Communications System, are the Single Channel Ground and Airborne Radio System (see John Blanchard's presentation); the Mobile Subscriber Access Subsystem (a fully automatic radio/telephone switching system); and Multichannel Tactical Satellite Terminals and Automatic Voice and Teletypewriter Switching.

Command and Control. The next major area discussed by Keith was that of Command and Control. These systems, he said, provide the commander the means by which he can better control his forces. Major efforts in this area include:

- Tactical Operations Systems. Experimented with since the 60s, its purpose is to increase capabilities to receive, store, display and retrieve up-to-date information upon which to make plans.
- TSQ-73 Missile Minder. Designed to better control U.S. air defenses, the Missile Minder consists of a computer, an electronic display, and internal communications, all in a transportable shelter.
- TACFIRE. Initiated in the mid-60s and now in limited production, TACFIRE is a fire support command and control system designed to improve effectiveness and responsiveness of field artillery fires through automation of technical and tactical fire direction functions.
- Battery Computer System. Located at the artillery battery level, the computer system will compute firing data, store and apply non-standard ballistic data, and perform moving target predictions.

Keith closed his address by stressing the importance of interoperability; encouraging designs that allow modular improvement over the life of a major system; and calling for an adequate balance between quick fielding of a system and proper testing.

Index Lists Top 100 Defense Contractors of FY77

The following list is an index, in decending order, of 100 parent organizations which, with their subsidiaries, received the largest dollar volume of U.S. military prime contract awards during fiscal year 1977:

McDonnell Douglas Corp., Lockheed Corp., United Technologies Corp., Boeing Co., General Electric Co., Rockwell International Corp., Grumman Corp., General Dynamics Corp., Hughes Aircraft Co., Northrop Corp., Raytheon Co., Westinghouse Electric Corp., Tenneco Inc., Sperry Rand Corp., Chrysler Corp., Litton Industries Inc., International Business Machines Co., Todd Shipyards Corp., American Telephone and Telegraph Co., Honeywell Inc., and

Textron Inc., Fairchild Industries Inc., Martin Marietta Corp., General Motors Corp., RCA Corp., TRW Inc., Ford Motor Co., Singer Co., Texas Instruments Inc., Teledyne Inc., Amereda Hess Corp., Standard Oil Co. of California, LTV Corp., Morrison Knudsen USS F&M JV, Congoleum Corp., International Telephone and Telegraph Corp., FMC Corp., Exxon Corp., Bendix Corp., General Telephone and Electronics Corp., and

Mobile Corp., General Tire and Rubber Co., American Motors Corp., Harsco Corp., E Systems Corp., Thiokol Corp., North American Philips Corp., Goodyear Tire and Rubber Co., Pan American World Airways Inc., MI Ryung Construction Co. Ltd, Control Data Corp., Chamberlain Mfg Corp., Standard Oil of Indiana, Guam Oil and Refining Co. Inc., Royal Dutch Shell Group, Signal Companies Inc. (THE), Johns Hopkins University (N), Hercules Inc., Kaiser Industries Corp., Avco Corp., and

Norris Industries, Massachusetts Institute of Technology, You One Construction Co. Ltd, British Petroleum Co. Ltd, Aerospace Corp. (N), Automation Industries Inc., Lear Siegler Inc., Peterson Builders Inc., Gould Inc., Texaco Inc., Morrison-Knudsen Co. Inc., Transamerica Corp., Harris Corp., Beech Aircraft Corp., Coastal States Gas Corp., Motorola Inc., Sverdrup and Parcel and Associates Inc., Eastman Kodak Co., Algernon Blair Inc., Day and Zimmerman Inc., and

Gulf Oil Corp., Saudi Tarmac Ltd Tarmac OS Ltd, International Harvester Co., Cutler- Hammer Inc., Loral Corp., U.S. and South American Enterprises Inc., Emerson Electric Co., Engelhard Minerals and Chemicals Corp., Computer Sciences Corp., Hewlett Packard Co., Pacific Resources Inc., Dupont E. I. De Nemours and Co., Ogden Corp., Burroughs Corp., General Foods Corp., Sun Co. Inc., Sanders Associates Inc., ATO Inc., Tacoma Boatbuilding Co. Inc., and Proctor and Gamble Co.

Army Plans Modernization of CH-47 Helicopter Fleet

How can the U.S. Army meet its requirements for a medium lift helicopter in the post 1980 time frame? That is the arduous task facing COL James M. Hesson, project manager for the CH-47D Advanced Flight Control System.

To accomplish this, the aging CH-47A/B/C fleet will be modernized to the CH-47D configuration. The new "D" model will not only meet, but is expected to exceed the current capabilities.

The modernization program, according to James Winkeler of the CH-47 Project Manager's Office, U.S. Army Troop Support and Aviation Materiel Readiness Command, St. Louis, MO, consists of engineering, test and manufacturing, and will utilize proven technology derived from earlier R&D programs to improve each of the aircraft major systems.

These improvements, Winkeler says, are directed at tangible benefits in reliability, maintainability, safety, survivability and vulnerability, which will reduce operating and support costs.

One of the major improvements, incorporation of the Advanced Flight Control System, is being designed and developed by Boeing-Vertol in conjunction with Honeywell Corp.

It is an outgrowth of a system which was designed and tested in the early 1970s in Boeing's Model 347 technology demonstrator, and is now in production for the Canadian CH-147, the Spanish CH-47, and the proposed buy of 30 aircraft by the Royal Air Force.

Basically, the Advanced Flight Control System provides the flight control inputs necessary for simultaneous stability about the craft's pitch, roll, and yaw axes.

If, during cruise in level flight, an air gust upsets the attitude of the aircraft, the system will automatically dampen the effects of the gust and return the aircraft to its original attitude.

This is considered a significant improvement over the existing U.S. Army CH-47 stability system which could only dampen the effects of the gust. The new approach also enhances the controlability of the aircraft by distinguishing between a pilot commanded maneuver and an external gust upset. Primary features of the new system are:

- Altitude hold responds to either barometric pressure signals associated with altitude or radar altimeter signals to maintain the altitude selected by the pilot.
- Heading hold obtains yaw attitude signals and inputs from the directional gyro to provide long term retention of an aircraft heading selected by the pilot.
- Bank angle hold responds to roll attitude signals from the attitude gyro to maintain any selected bank angle.
- Pitch attitude and airspeed hold responds to signals from the differential airspeed hold system, the attitude gyro, and airspeed signals to provide positive speed stability and attitude hold.
- Automatic turns respond to changes by the pilot in the selected aircraft heading and automatically turn the aircraft to the new heading.
- Built-in test equipment permits quick checkout. A numerical readout indicates a fault has occurred and isolates it to a specific component of the new system.
- Reliability, availability and maintainability of the new system have been important with respect to previous stability/flight control systems. Two interchangeable circuit boxes are used along with state-of-the-art components and proven circuitry to significantly reduce parts but increase use of MIL SPEC parts.

With incorporation of the Advanced Flight Control System, the modernized CH-47D will reportedly acquire a much improved capability to operate effectively under night conditions, hover, confined area operations, and adverse weather.

Finally, these improvements in aircraft stability, maneuverability and control will hopefully result in reduced cockpit workloads, thereby enabling the pilot and the aircraft to achieve higher performance.

British 81mm Mortar Tests Planned Under RSI Program

Tests to determine if the British lightweight 81mm mortar can meet U.S. standards and requirements will begin this fall, under management of the Large Caliber Weapons Systems Laboratory, Dover, NJ,and the Benet Weapons Laboratory, Watervliet (NY) Arsenal.

Development II tests are scheduled to begin in September at Aberdeen (MD) Proving Ground and the Cold Regions Test Center, Fort Greely, AK. Operational II testing will be carried out at Fort Stewart, GA. The testing program calls for procurement of 18 mortars and 16,000 rounds of ammunition.

The new British system is being considered for possible replacement of the Standard M29A1 81mm mortar, over which it is reported to have an increased range and rate of fire.

Dependent upon completion of the testing, initial procurement of 300 mortars and 150,000 high-explosive rounds is planned for FY79, in line with the Army's RSI (Rationalization, Standardization and Interoperability) Program.

British 81mm Mortar

New Facility Will Expand Fuels/Lubricants Research

A new chemical and analytical facility, designed to expand fuels and lubricants research, was dedicated recently at the U.S. Army Mobility Equipment R&D Command's (MERADCOM) contractor-operated Army Fuels and Lubricants Research Laboratory, Southwest Research Institute, San Antonio, TX.

Occupying about 7,200 square feet, the new addition contains an analytical instrumentation laboratory, a rheological laboratory and 15 offices that provide MERADCOM with a greater capability to respond to a broad range of needs during this time of worldwide energy shortages.

The instrumentation laboratory complements analytical equipment at the 20-year-old plant and contains latest devices to determine chemical composition, structure and characteristics of petroleum compounds, as well as fuel and lubricant additives and combustion products.

The rheological laboratory provides a capability for investigations in the science of flow, which adds a new dimension to the research ranging from field application studies to fundamentals of lubrication and combustion.

Part of MERADCOM since 1971, the Army-owned, Southwest Research Institute-operated laboratory is staffed by 36 administrative, professional and support personnel. It was established in 1957 to define the fuels and lubricants needs of the Army and to provide a means of working with industry to provide products to meet these needs. Its research program is administered by the MERADCOM Energy and Water Resources Laboratory.

MERADCOM Commander COL Bernard C. Hughes dedicates new facility at the Command's Army Fuels and Lubricants Research Laboratory, San Antonio, TX.

Ballistic Lab Installs New Computer Facility

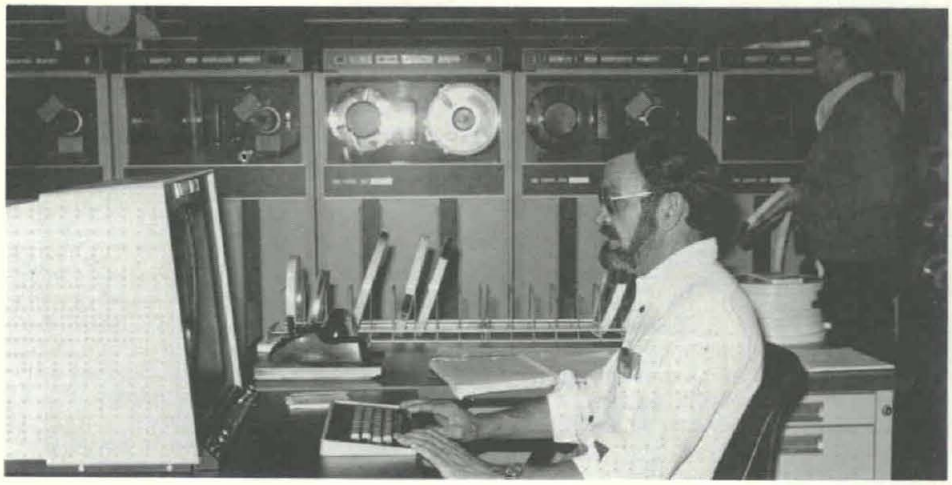
A new $9.1 million computer center is gradually taking over computer requirements at the Ballistic Research Laboratory (BRL), ARRADCOM, Aberdeen Proving Ground, MD, with the BRL Electronic-Scientific Computer (BRLESC) II scheduled for shutdown on 1 July.

BRLESC I was shut down 3 Apr. 1978, after 16 years of round-the-clock operation; BRLESC II has been in operation for 12 years, and is the last in the series of BRL's historical computer developments to be replaced at the central facility. Earlier retirees are the ORDVAC, the EDVAC, and ENIAC — the world's first electronic computer.

ENIAC was developed for BRL during World War II through a contract to the Moore School of Electrical Engineering at the University of Pennsylvania. Mr. Michael J. Romanelli, chief of Management Information Support Division, U.S. Army Armament R&D Command, was a member of the team of mathematicians, engineers and technicians who first worked with ENIAC.

According to Romanelli, over 300 items of hardware representing the "top of the line in computer technology" comprise the new system consisting of a large central facility with 76 remote terminals at 25 sites. Five additional remote sites will be added in the future to serve BRL, the U.S. Army Materiel Systems Analysis Agency and the U.S. Army Human Engineering Laboratory.

The control facility consists of two major Control Data Corp. processors. A CYBER 170/173 provides host communications processors, data channels, card readers, punches, high-speed printers, magnetic-tape handlers, control consoles, and immediate-access storage devices.



TELEVISED READOUT is studied by BRL computer operator seated at instruction console of one of the new computers which are taking over computer requirements at the Ballistic Research Laboratory, Aberdeen Proving Ground, MD.

A CYBER 70/76, with control console, can provide 131,000 words of small semiconductor memory, 512,000 words of large-core memory, and 1,200,000 characters of immediate-access storage. The remote facilities include a variety of interactive, batch, data-acquisition, and graphic terminals.

In layman's terms, the CYBER 70/76 is the heart and brain of the system. "It's the real number cruncher," Romanelli said, "capable of handling 15 million instructions per second."

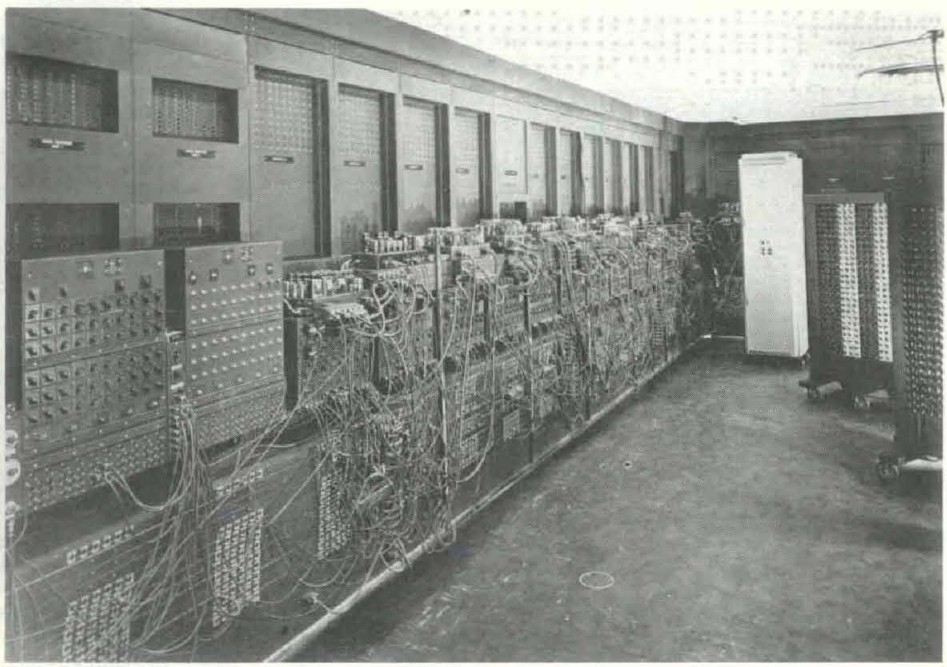
Procurement of the new facility was a 5-year process involving definition of requirements, detailed specifications, requests for proposals, evaluation of proposals, site preparation, cost analyses, negotiations, and Army approval and awards.

The competitive procurement resulted in contract awards to Control Data Corp. of Minneapolis and Vector General, Inc., Woodland Hills, CA. Control Data provided four additional remote graphics terminals and an interface to the central site.

Acceptance testing of the computer began in October 1977 and initial operation began in November. All 72 terminals were operational by the middle of February.

A projected expansion of the central-site computers and an additional 76 remote terminals will bring the total cost of the system to $18 million. Installation of the additional computer equipment will ensue as demands increase, and the Army will dispose of the old computers as salvage.

The new system will provide users with interactive computing, remote job-entry operations, large computation-bound applications, and interactive graphics applications that will include dynamic multidimensioinal line drawing, data acquisition and analysis, file management, and network interfacing.



ENIAC, World's First Electronic Computer

PARDON OUR MISTAKE . . .

In our December 1977 issue of the *Army R&D Newsmagazine*, p. 14, the lead agency within the Department of Defense for R&D activities to improve the environment was mistakingly credited to the U.S. Army Environmental Hygiene Agency (AEHA). This responsibility is within the mission of the U.S. Army Medical Research and Development Command, a sister command of the U.S. Army Health Services Command to which AEHA belongs.

The mission of AEHA is to provide worldwide support of the health and environmental programs of the Army through consultations, supportive services, investigations and training.

Also, on p. 32, COL Charles M. Dettor is assigned to the U.S. Army Medical Bioengineering Research and Development Laboratory (USAMBRDL) (not Command). USAMBRDL is one of the eight Medical R&D laboratories under the U.S. Army Medical Research and Development Command.

Department of Army Publishes New Energy Plan

Near and long-term objectives, strategies and policies related to improved use of energy sources are contained in a new Department of the Army Energy Plan. Distributed by the Army Deputy Chief of Staff for Logistics, the energy plan has received strong endorsement from Army Chief of Staff GEN Bernard W. Rogers.

GEN Rogers stated, in his endorsement, that the Army has reduced its energy consumption by more than 27 percent since 1973. It is essential, he stressed, that the Army continue this momentum.

The energy plan notes that the Arab oil embargo of 1973 served to drive home a number of points, key among them being that the world's principal oil consumers are not the major oil producers. An estimated 67 percent of petroleum reserves are located in the Middle East and Africa, while only 19 percent are in Western Europe and the Western Hemisphere.

Although the U.S. contains only 6 percent of the world's population, states the energy plan, it consumes more than 30 percent of the world's energy, and the U.S. uses more energy per dollar of the gross national product than any other industrialized nation.

The energy plan indicates that many analysts predict that U.S. petroleum reserves will be exhausted before the year 2000, thereby creating a significant potential problem for the Department of Defense. Coal constitutes 90 percent of U.S. energy reserves but supplies only 18 percent of the energy consumed.

By 1985, the President has called for reducing energy usage growth to 2 percent per year; reducing gasoline consumption by 10 percent; increase coal production by two-thirds, use solar energy in 2½ million homes; and reduce energy consumption in federal buildings by 20 percent and in new buildings by 45 percent.

Relative to the Department of Defense, the energy plan states that the DOD consumes 1.9 percent of the nation's energy but consumes more than 3 percent of the total petroleum used by the U.S.

The Army's portion of DOD energy consumption is 18 percent and, of that amount, 84 percent is consumed in installation or facilities operations and 16 percent in mobility operations.

The Army energy plan identifies the following objectives and goals:

Reduce energy consumption by 45 percent by the year 2000; reduce consumption in facilities operations by 25 percent by FY85 and 50 percent by the year 2000; expand conservation education/information and incentive programs for all military and civilian personnel and dependents; reduce dependence on non-renewable and scarce fuels by the year 2000; and

Eliminate use of natural gas and reduce use of petroleum fuels in facilities operations by 75 percent by the year 2000; convert 20 percent of mobility operations petroleum requirements to synthetic or alternate fuels by the year 2000; increase efficiency of non-renewable energy dependent mobility systems by 15 percent with no degradation to readiness; and attain a position of leadership in pursuit of national energy goals.

If the Army is successful in meeting its newly adopted goals of reducing overall energy comsumption by 45 percent, states the energy plan, the costs are expected to be $1.8 billion in FY2000, resulting in a cost avoidance of $1.3 billion.

In order to meet its long term energy conservation goals, the Army is placing specific emphasis in the areas of installation operations, mobility operations, training, and research and development. A summary of current and proposed activities in each of these areas follows:

• **Installation Operations.** Energy is presently being conserved in installation operations by reducing heating to 65 degrees, keeping cooling temperatures no lower than 78 degrees in working and living areas, increasing insulation, reducing lighting levels, reducing water temperatures and fine tuning equipment.

Comprehensive basewide energy conservation studies and tests of alternate energy sources such as solar and refuse- derived fuel will also be conducted by the Army to meet its long term goal of a 50 percent reduction in energy consumption in facilities operations.

By the year 2000, much of the Army's real property is expected to be replaced with new buildings which employ more energy efficient design. These efforts will be directed at innovative construction methods, improved utility systems and better energy management.

• **Mobility Operations.** Energy conservation is now being achieved through adherence to the 55 mph speed limit and improved petroleum, traffic and transportation management.

The Army energy plan states that the greatest challenge facing Army mobility programs is to maximize fuel economy without impacting on readiness. Long range programs will emphasize electric powered vehicles and synthetic fuels.

• **Training.** Current conservation efforts include consolidation of field and firing range training, use of dismounted troop movement (when feasible) and incorporating conservation into individual and unit training. Another key program is increased use of training devices.

• **Research and Development.** R&D efforts include cooperative programs with the Department of Energy, the Navy and the Air Force, monitoring commercial developments and demonstration projects, and Army initiated R&D.

R&D in mobility will be directed toward new or improved aircraft, ground propulsion systems and alternate energy sources. Emphasis will also be placed on developing more fuel efficient engines and transmissions and fuels and lubricants.

Ongoing research also includes computer-aided evaluation of building energy loads, energy carrier and storage and distribution concepts. A data system to predict, report and analyze energy consumption is now under development.

Procurement specifications for solar energy systems for heating, cooling and hot water are also being developed, and R&D is being conducted to convert waste products into usable fuel sources.

The Army energy plan notes that an Information Mini Plan on Energy Conservation has been established by the Office of the Chief of Public Affairs. Its purpose is to create awareness among all military, civilian and Army National Guard and Reserve personnel as to the importance of energy conservation.

Finally, the Army energy plan states that national legislation in the following areas would greatly assist the Army in meeting its energy goals:

• Enactment of a 4-day work week as a means of conservation. • Authorize extended operation and maintenance funded contracts to permit refuse-derived final usage at installations retrofitted at no cost to the Army. • Clarify nuclear powerplant licensing and operating regulations. • Additional incentives for development of additional coal supplies. For example, alleviate environmental restrictions in strip mining and permit burning of higher sulfur content coal.

DURING RECENT VISIT to ERADCOM's Night Vision & Electro-Optics Laboratories (NV&EOL) at Fort Belvoir, VA, Army Chief of Staff GEN Bernard Rogers, and Deputy Chief of Staff for R,D&A LTG Donald Keith were briefed on such systems as TOW and Dragon night sights, fire control equipment for combat vehicles, and the newly developed image intensifiers. Welcoming the Generals is NV&EOL Director Edward J. Sheehan.

MG Lunn Reflects on First 8 Months as DARCOM D&E Director

MG Robert J. Lunn, director for Development and Engineering, HQ DARCOM, addressed an audience of the American Defense Preparedness Association on his perceptions after eight months on the job.

Speaking to the association's Military Vehicle Readiness Conference at Monterey, CA, on 12 Apr. 1978, MG Lunn introduced his remarks by saying that in his capacity as the "new guy on the block" he had the chance to form some observations that he would now pass on to the group. He noted that he had in GEN Guthrie and LTG Baer, "two great bosses and they let me run with the ball. Sometimes I run the wrong direction but I have a great staff who quickly puts me in the right direction."

His first perception was his strong belief in the need for the Army to retain a strong in-house design and development competence within its R&D commands. The Army cannot afford to serve just as reviewer, tester, and approver of contractor efforts; the Army must acquire, he continued, detailed technical knowledge in order to influence the direction of development. "We must remain co-equal with industry in the various technical disciplines," said Lunn.

MG Robert J. Lunn

He cited recent senior level future budget deliberations as evidence of Army recognition of this need. Where the pattern of the past 5-10 years has been to provide the R&D centers with minimal research and exploratory development funds, the recent budget deliberations have turned this trend about. Nonetheless, he continued, there will be the danger of a reduction of such funds in a budget cutting exercise, for it is always difficult to pin a high priority on work that is not as yet critical to a priority development project. There must be, therefore, said Lunn, a conscious selling process of the vital worth of technological base efforts.

"We have great ideas being explored in our technology base program. We have systems that are innovative and geared to meet specific threats, on the drawing boards and under test. . . . We know that the next few years will see us field the largest array of major weapon systems than at any comparable time in our history."

MG Lunn noted that such an approach seemed to be in conflict with the current trend of using the so-called contractor "skunk works" approach. With this method, the Army selects a proven contractor, gives him an important development job, funds the project, then leaves the contractor alone while the contractor locks people up in a building till they arrive at an answer. The Hughes Aircraft Co. "chain gun" project to provide a competitive model for the Bushmaster automatic gun, was a good example of a "skunk works" approach, said the General.

The DARCOM D&E director continued by saying that he likes the idea of the "skunk works" approach, under certain selected conditions. However, he was quick to add that the "skunk works" concept requires an excellent in-house Army capability—a capability attainable only by adequate technological base funding.

Another perception that MG Lunn noted since his assumption of the development and engineering directorship at DARCOM was the prominence of the program called "Itty Ditty," standing for Integrated Technical Documentation and Training. "If the phrase is new to you I assure you it will not be for long." He explained that for the first time the Army is attempting to integrate technical documentation and training. The documentation in the new "Itty Ditty' approach is to be carefully planned in advance and presented in such a simplified way as to allow a novice to perform some pretty complex maintenance tasks. It will be a self-paced, self-teaching format, useable by the soldier anywhere in the field. While there are still aspects of the program to be worked out, said Lunn, the Vice Chief of Staff has approved the concept, and considerable funds have been allocated in the FY80 budget for the program.

A much greater trend by the Army toward "affordability," was another of the General's perceptions. The question "Can the Army afford to pay for this [new] capability?" is becoming increasingly important; the issue of operating and support costs of programed new systems is rivalling the capability aspect in importance. "Every decision," said Lunn, "must be bounced against its impact on manpower and operating costs.

Citing the Patriot air defense missile system as an example, Lunn pointed out that its great value to the Army was not just the major combat capability increase Patriot provides, but savings of critical manpower spaces urgently needed elsewhere, savings that were deliberately designed into Patriot. For that reason the Army is putting a great deal of money on reliability and integrated logistics support on Patriot.

Conceding that change is inevitable, that threats change and technology change, MG Lunn expressed the belief that once the Army decides a system is needed, that there should be a deliberate effort to resist nice-to-have changes. He noted that AR 1000-1 recognizes this and reminds the project manager that he is to lead the fight in resisting such proposed changes.

The failure to terminate unproductive programs is another area that MG Lunn observed needs greater attention. "All too frequently when funding cuts come, we 'salami' our programs to death," remarked the General, saying that perhaps a better approach is to terminate some of those so that surviving programs may remain viable. "It just doesn't make sense to carry programs for years, only to cut them when the end is in sight." But, he admitted, this was a difficult thing to do.

MG Lunn concluded his address by saying that these were interesting and challenging times for the Army's materiel acquisition community. "We have great ideas being explored in our technology base program. We have systems that are innovative and geared to meet specific threats, on the drawing boards and under test. . . . We know that the next few years will see us field the largest array of major weapon systems than at any comparable time in our history."

Interview With DARCOM Assistant Deputy for International R&D

U. S. Army Materiel Development and Readiness Command Assistant Deputy for International Research and Development Bryant R. Dunetz was interviewed recently by a staff member of the Army Research, Development and Acquisition Magazine. His responsibilities also include the NATO Rationalization, Standardization and Interoperability (RSI) program within DARCOM. The questions posed to him, and his responses are as follows:

Q. Rationalization, standardization and interoperability (RSI) are buzz words which are being heard more frequently through the R&D community.

What do these terms really mean in relation to DARCOM's mission?

A. Buzz words have always been a part of the Research and Development community. It's a form of subtle advertising. However, in the case of RSI it is far from a slogan. The terms rationalization, standardization and interoperability have a very deep and real meaning and they have had that meaning for some 30 years, since the beginnings of the NATO organization. If one were to perform a historical analysis, I think you would find that these terms even go back far beyond the origination of NATO.

Today, they have a new significance and a renewed emphasis, and are very definitely keyed to the viability of a credible NATO organization. There are standard definitions for these terms which can be found in official NATO documents as well as DOD directives and policies. Let me just provide a lay definition of these terms.

I view rationalization as the umbrella which encompasses a process by which we try to maximize the effective use of the combined NATO resources for the common objective of defending the alliance. Standardization and interoperability, on the other hand, might be viewed as a subset of the rationalization process. In the broadest terms, rationalization could include: structural and organizational aspects of NATO, force deployments, armaments cooperation, and other SI considerations.

Although the official definition of standardization is far more involved, I prefer to limit the term to situations where identical items, techniques, and procedures have been adopted by several nations. There are some who would be willing to accept degrees of standardization or something less than total. In my view, at that point, a better choice of words would be interoperability.

This term relates more to the immediate military imperative—that is tactical and operational interoperability and equipment interoperability. A graphic example of this interoperability is simply being able to communicate across corps boundaries, being able to draw ammunition stocks from a common source and then being able to fire that ammunition from similar caliber weapons of different national origin.

All of these terms and their meanings cut across the organizational fabric of DARCOM and have significant implications on our way of doing business. In the U.S. Army, the responsibility for NATO RSI is spread throughout the many major Army commands, but DARCOM clearly bears the lion's share of the action. This is recognized by GEN Guthrie and all his commanders and thus, they have all involved themselves. We don't think that the DARCOM mission of supporting the soldier in the field has changed. Our focus and emphasis, however, are directed much more toward the exigencies of NATO and needs of the alliance.

Q. The Culver-Nunn Amendment to the 1977 DOD appropriation requires standardization within the North Atlantic Treaty Organization to the maximum extent possible. How effective do you believe DARCOM has been in achieving this goal thus far?

A. It is important to understand the meaning and intent of the public law. One must also be sensitive to the spirit of what is said. Let me quote: "It is the policy of the U.S. that equipment for U.S. forces stationed in NATO Europe should be standardized or interoperable with equipment of other NATO members."

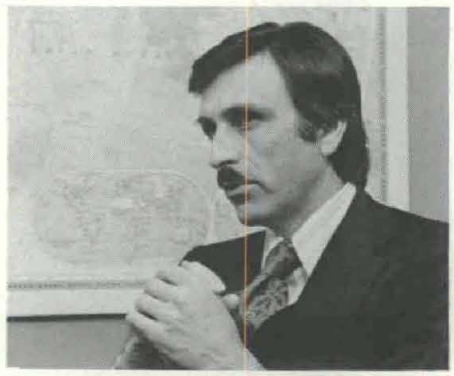
The logic and purpose behind this law was an overwhelming concern in the Congress that much waste and duplication were inherent in parallel national programs and that such programs, in fact, lead to destandardization in NATO. The result would be a lack of tactical interoperability. Along with the problem of near term readiness in NATO, these two areas have been identified by military and civilian strategists as the weakest links in the NATO coalition force. In order to enforce this legislation, Congress has requested Representative Jack Brooks to review compliance with this law through his Oversight Committee on Government Operations.

For the past four years, the Secretary of Defense has been required to provide Congress with a report on the progress being made in the DOD Standardization Program. This report is commonly referred to as the Nunn Report.

By any standards, DARCOM has made great strides towards the long standing objectives of standardization, as well as responding to the current NATO defense initiatives. I would also be the first to say that much more needs to be done and DARCOM cannot do it alone. The new defense initiatives are not without their considerable demands on resources and this is a very real problem for today's Army.

As recent accomplishments that contribute significantly to the overall goal, I would cite our achievements in artillery/ammunition interoperability, logistics support, and the numerous efforts which will lead to cooperation on equipment with our allies. Many of these accomplishments are cited in the Secretary of Defense's report to Congress.

Q. There are some people who believe that the real objectives of RSI within NATO can be best made initial-



ly by stressing commonality of consumables rather than cooperative materiel development itself. How do you view this argument?

A. NATO needs many things to be a credible deterrent to the Warsaw Pact. The NATO nations need many things to be full-fledged contributing partners in the *acquisition of defense.*

The composition of these needs goes far beyond the direct chartered mission of the Army and include social, economic and military-political needs. In the case of many European countries, their needs also include some element of technological/industrial growth and a fair share of the export market.

These needs are basic and fundamental to any sovereign nation. To say that any one is more important than the other is difficult. However, from the military perspective alone, I would select tactical interoperability and commonality in con-

sumables as the highest priority.

Q. One of the results of a recent high-level meeting at HQ DARCOM was agreement for implementation of a Department of Army RSI Master Plan. What do you see as the primary impact of this plan.

A. In the fall of last year, it was recognized that an initiative of the magnitude which was developing in the NATO RSI area, and that which was forecasted for the future, needed intensive management at the highest levels of the Department of the Army. This initially lead to the establishment of the Department of the Army Office for International Rationalization.

It was further recognized that all of the on-going activities in the Army needed to be brought together to identify important priority tasks. Thus, DARCOM hosted a conference on 7 December for the Under Secretary of the Army and the Vice Chief of Staff. Its purpose was to identify the issues and actions required to develop a workable, integrated Army plan.

The conference was basically organized into the five major areas of combat developments and requirements, materiel acquisition, testing and evaluation of foreign systems, foreign military sales, and logistics. Reports were presented by five general officers who were responsible for each area and that provided the basis for developing a workable plan.

This plan is called the Department of the Army NATO RSI Management Plan. DARCOM is assessing the resource requirements for its implementation. The next phase will be the formal implementation of the plan. We have strongly encouraged that all of our commands and HQ staff elements involve themselves in the formulation as well as the evaluation of that plan. However, it is very difficult to measure the impact on DARCOM. I am in hope that the negative impact will be minimal. Positively, it will be the ground work for all future Army activities related to RSI in NATO.

Q. What are the major barriers which you believe must be overcome in achieving greater standardization with NATO?

A. There are several kinds of barriers that need to be overcome and I won't address them in any kind of priority order, but just provide you with some examples. The European negative and extremely pessimistic attitude on continuing to buy U.S. equipment will have to be brought back into perspective. Traffic must be balanced in both directions on the infamous 2-way street, and this will take time.

Next, experience, confidence and trust need to be developed in the U.S. sector, i.e., government and industry, that we can cooperate in ways beneficial to both partners in Trans-Atlantic cooperative programs. There also needs to be a willingness to exercise strong configuration management throughout the life cycle of developed and fielded systems, even at the sacrifice, sometimes, of our own national interest. However, that may be the hardest bullet of all.

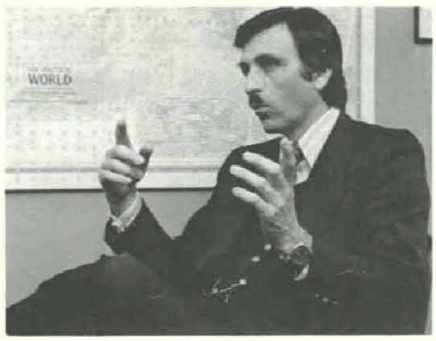
Q. How important is metrication to the RSI objective?

A. In terms of developing or coproducing and procuring identical items of military hardware, one could conclude that metrication would be a mandate. However, in examining several coproduction programs which have been undertaken in the past, you find that Europe has produced U.S. systems to English units which have maintained a standard product for that item only. I would therefore not view it as an overwhelming necessity for standardization, but one which makes a certain amount of sense in the long term in development of new items.

The automotive industry is already beginning to make the shift on a voluntary basis. This is being done in the interest of commonality and interchangeability of parts, economics of scale and production, and minimizing the need for dual specifications and standards.

DARCOM has an active metric program which I believe is beginning to take hold in all of our development programs. However, we must also be cognizant of the various types of metric standards which exist throughout Europe. It's interesting that we find even metrics is not a completely standardized system.

Q. What are your views relative to what DARCOM should be stressing in international R&D that is not now being stressed? Are some areas being given too much emphasis?



A. I would say first that DARCOM has done quite a lot to stress the importance of international R&D ever since the mission was transferred to us in 1975. NATO RSI has now further expanded our interest and activity, but there is always more to do. For example, I would like to see our development commands and laboratories become more aware of the technological capability and expertise that exist within the alliance countries. Secondly, I would stress, at every level, that when looking for technological solutions, that a fair and objective assessment be made of existing NATO capabilities. And lastly, when formulating a program for acquisition of a new item, it should be required that one give consideration to all available options.

I should also point out that in doing business this way, it introduces a whole raft of new problems which our people need to be sensitive to. These problems include contrasting national laws, special interests, and simply the techniques and procedures that one needs to follow in dealing with a foreign partner.

However, one needs to look for the identifiable patterns which were successful in the past and attempt to repeat that success in your own program. I don't underestimate the complexities of doing business in the international arena, but I think one should approach this problem with an open mind.

Q. There are those who contend that RSI must really be preceded by a standardization of operational and logistics doctrine. When this happens then standardization of materiel becomes more simple. Would you agree?

A. I think I would agree with this logic. I think this logic is currently being tested. It's specifically being tested in a forum referred to as the US/GE Bilateral Staff Talks. These are talks which have been going on for about 2½ years between the military staffs of the U.S. and Germany. They are directed to development of joint concepts, doctrine and requirements associated with fighting a conventional war in Western Europe. It was always intended that this approach would be the precursor to the development of standard and interoperable equipment. I can't necessarily agree that this is a simple process, because it is a very long process.

Nevertheless, I would agree that joint concepts and doctrine should precede the materiel development process. However, using that procedure, you must also be willing to accept the penalties of time, and possibly, resources.

Q. What milestone events have occurred recently as far as NATO standardization is concerned?

A. The most important milestone occurred in May. That was the convening of a summit conference in Washington, DC. It was hosted by President Carter and attended by the Heads of State of NATO nations, as well as their Ministers of Defense. The purpose of the meeting was to evaluate the activities of the past year regarding a NATO Long-Term Defense Program. In May of last year, President Carter attended a London summit at which time he expressed his commitment to a stronger NATO. That was followed by a presentation of the Secretary of Defense to NATO on a proposal to study and plan a long-term program. The results of those studies provided the basis for discussions at the recent summit in Washington.

I believe that this meeting was the single, most important recent event that will affect standardization in NATO.

Wide-Angle Visual Systems for Military Training Applications

By COL (P) Joseph J. Leszczynski & Carl R. Driskell

Development of alternate approaches to a wide-angle visual system, which will determine feasibility of using scanned lasers to display real-world scenes for military training applications, is being managed by the Office of the Project Manager for Training Devices (PM TRADE), Orlando, FL.

Two competing systems are being pursued to enable selection of the best means of meeting the important military need of providing high-resolution tactical scenes over a wide field-of- view.

The first approach is a system in which scanned laser beams generate and display a 175-degree tactical scene. A breadboard model is being developed by American Airlines, Inc. Subcontractor Redifon Flight Simulation Limited is conducting much of the work in England, and the Sira Institute of England is providing expertise on optical and electronic systems. Support for this system is being provided by the U.S. Army and Air Force.

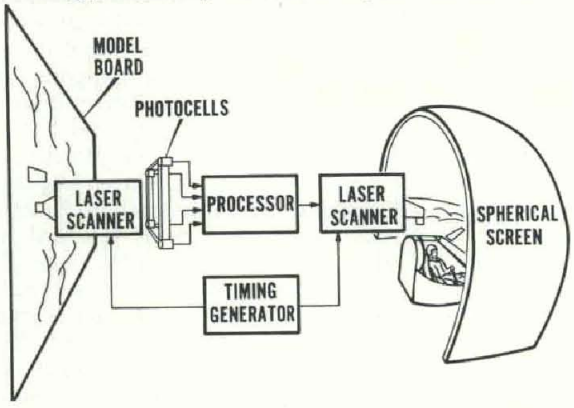


Fig. 1. Scanned Laser Visual System

The second approach is an annular system in which optics are used to generate and display a 360-degree tactical scene. A breadboard model is being developed by the Advanced Simulation Concepts Laboratory at the Naval Training Equipment Center, Orlando, FL, with support from the Army and Navy.

Models of each system are scheduled to be completed in the third quarter of 1978.

SCANNED-LASER VISUAL SYSTEM. Basic components of the scanned-laser system are illustrated in the conceptual diagram of Fig. 1. In the image generator, the laser scans the portion of the model board to be presented to the pilot. In response to pilot-control inputs, the scanner is moved along the simulated flight-path across the model board.

The laser light reflected from the model board is collected by photocells mounted parallel to the model board. These sensors convert the light to video signals that are summed into a processor that provides blanking, gamma correction, aperture correction and special effects such as clouds, fog and haze.

The processor feeds a composite video signal to a laser beam modulator in the display laser scanner, which scans the visual scene onto a spherical projection screen. The timing generator provides line- and frame-scan synchronization to the image- generation and display-laser scanners.

Image Generation. The basic principle of the wide-angle scanning system is illustrated in Fig. 2. The laser beam is passed through a line scanner that uses a rotating mirror drum to deflect the beam in a sawtooth deflection approximately 132,000 times per second. The deflected beam is then passed through a pechan prism, which provides derotation and a wide-angle lens that expands the vertical angle to 60 degrees.

Finally, the beam is deflected by the rotating frame-scan prism to emerge as a raster of 5280 vertical scan lines. The derotation prism runs at one-half the speed of the final prism, to keep the scanned line vertical as the final prism rotates.

Using a single frame-scan prism would produce a 360-degree frame scan, but a nominal 180-degree scan is obtained by using two prisms. To allow for a small percentage of dead time, during which the black level of the video signals is established, the actual horizontal field-of-view will be 175 degrees.

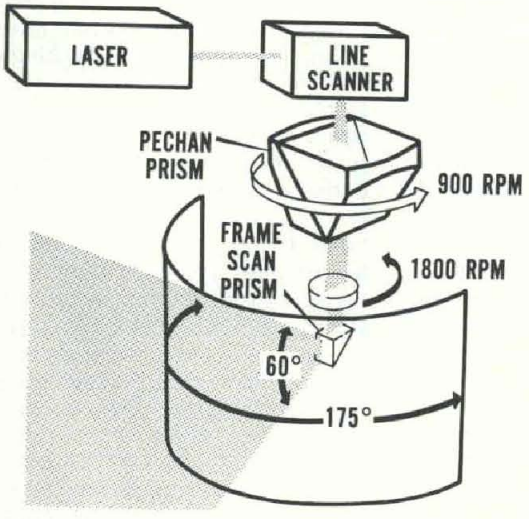


Fig. 2. Laser Wide-Angle Scanning System

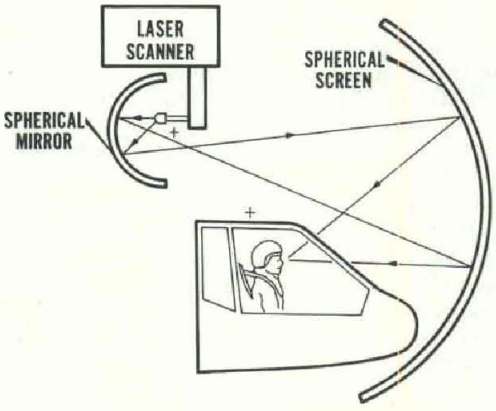


Fig. 3. Scanned Laser Display

At the end of each 180-degree rotation of the prisms, the line-scanned beam is switched rapidly by a galvanometer mirror between the two frame-scan prisms to keep the emerging beam in the forward direction. This process of changing the beam from one prism to the next inverts the line scan so that the beam deflected by the galvanometer must be taken through an additional prism for correction.

Scene Display. The optical layout of the display laser scanner is similar to that of the model board laser scanner, as far as the line and frame processes are concerned. However, some provision is needed in the display to prevent geometric distortions that result from a projection point that is offset from the pilot's head.

As illustrated in Fig. 3, the laser beam emerging from the scanner is reflected first from a spherical mirror and then to the screen to give overall correct display geometry in the scene.

Resolution. The 175 x 60-degree field-of-view selected for the experimental breadboard model was based upon current military training requirements and reasonable development goals. With this field-of-view and a 100-Megahertz video bandwith, a resolution of 5 arc minutes should be achieved. Various tradeoffs are possible between field-of-view and resolution; the higher the

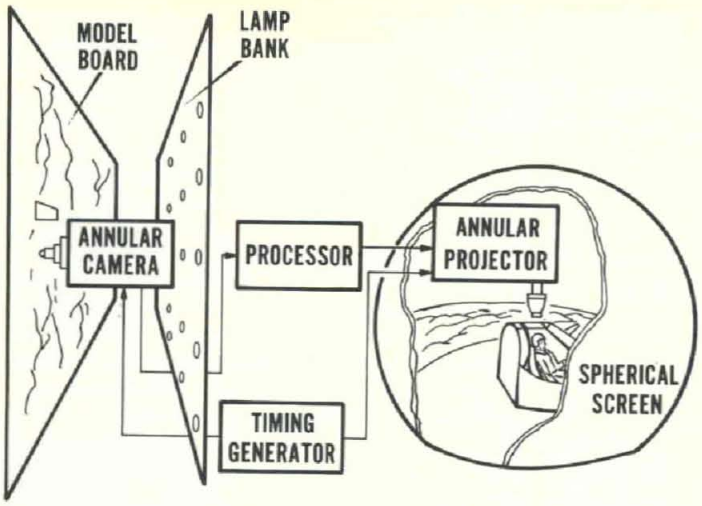


Fig. 4. 360-degree Annular Visual System

field-of-view, the lower the resolution, and vice versa.

Color. The system described so far is a monochrome system that will be used to demonstrate feasibility. A full-color scene can be provided with additional lasers, light sensors and video channels. In a full-color system, the lasers must produce the three primary colors. An argon laser would provide green and blue colors, while a krypton gas laser would provide the red.

360-DEGREE ANNULAR VISUAL SYSTEM. The second approach, a 360-degree annular visual system, is based upon recent developments in annular optics and charge-coupled devices.

Basic components of this system are illustrated in the conceptual diagram of Fig. 4. In the image generator, the annular camera views a terrain model board through a 360-degree annular lens probe that is moved along the simulated flight path. The annular image is illustrated in Fig. 5.

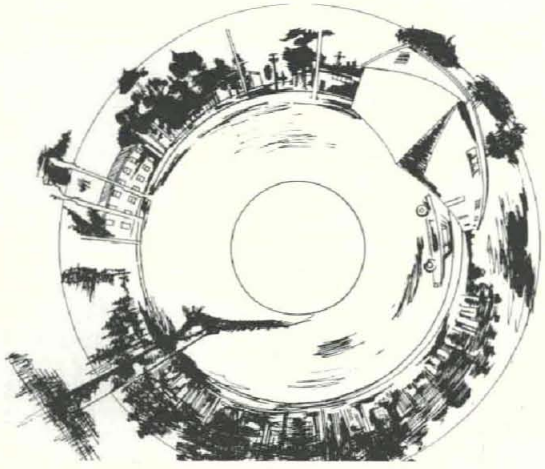


Fig. 5. 360-degree Annular Image

Radial lines in the annular image cover the vertical field-of-view, while concentric circles in the annular image cover the horizontal field-of-view. The full 360-degree horizon falls on an intermediate concentric circle.

The annular image from the optical probe is scanned onto a radial array of 12 charge-coupled devices that converts the annular image into 12 video signals. Twelve channels were selected to reduce the scan rates and video bandwidth of each channel.

The 12 video signals are fed to a processor that provides gamma correction, aperture correction and special effects in a manner similar to the scanned-laser visual system. The processed video signals then modulate laser beams in the annular projector that scans the scene onto a spherical viewing screen.

Image Generation. The image transfer system of Fig. 6 illustrates the manner in which the annular probe image is scanned onto the array of charge-coupled devices, and then reconstructed into an identical annular image for the projection lens to display. Readout of each linear charge-coupled device is equivalent to one vertical scan line in the probe field-of-view.

The horizontal scan of the probe field-of-view is accomplished with a pechan prism which rotates the annular image about its center. As the annular image is rotated, each charge-coupled device is exposed to the entire image. The 12 video signals derived from the array are used to modulate 12 laser beams in the annular projector.

In the projector, the modulated laser beams are scanned in a radial pattern corresponding to the array. Rotation of the image in the probe and derotation in the projector are accomplished by the rotation of identical, synchronized pechan prisms.

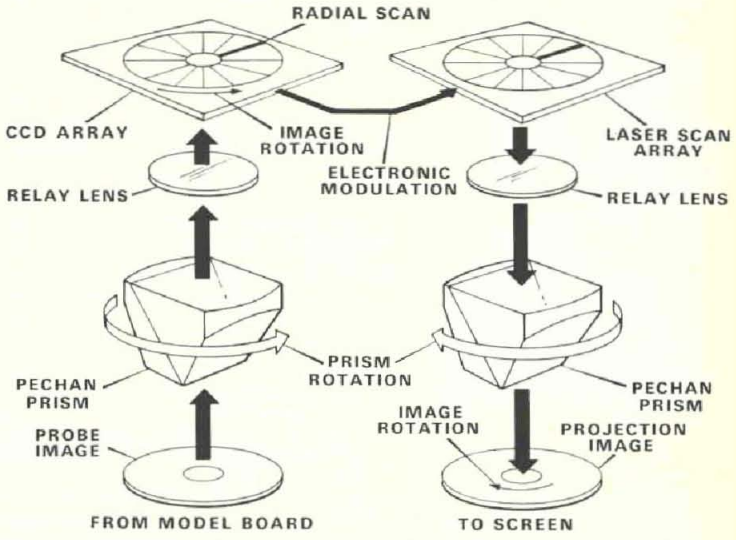


Fig. 6. Image Transfer System

Since the line spacing over the 360-degree display is 2 arc minutes, a total of 7200 scan lines are required for each frame. The 12 laser channels scanned by a 24-facet mirror provides 288 scan lines for each rotation of the mirror. Hence, for a 30-Hertz frame refresh rate, a mirror rotation rate of 45,000 revolutions per minute is required. This rate of rotation automatically produces a two-to-one interlace at 60 fields per second.

Scene Display. The optical layout and light path of the annular projector are illustrated in Fig. 7. To simplify the diagram, only two of the 12 lasers and modulators, which are arranged radially around the mirror scanner, are shown. The optics between the

(Continued on page 14)

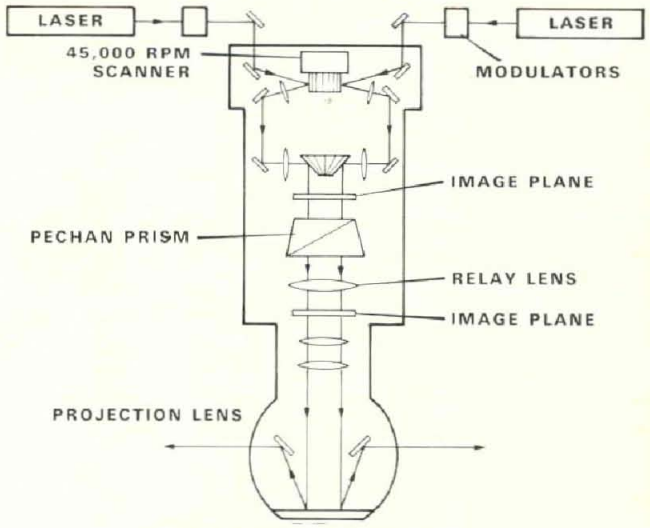


Fig. 7. Projector Arrangement

Wide-Angle Visual Training Systems

(Continued from page 13)

mirror scanner and the first image plane convert the tangential laser-scan pattern into a radial-scan pattern that scans the scene with vertical scan lines onto the spherical viewing screen.

Resolution. Based upon a video bandwidth of nine Megahertz and the scan rates cited earlier, the nominal resolution of the breadboard model is computed to be approximately 9 arc minutes. However, for angles of depression below the horizon, the vertical resolution will be degraded to about 14 arc minutes, due to the nonlinear mapping of vertical lines in the probe and display annular optics.

Color. The system described so far will use 12 argon lasers to demonstrate feasibility of the system with a monochrome display. A full-color, field- sequential system may be constructed by replacing four of the argon lasers with krypton lasers, and placing appropriate color filters over the charge-coupled devices.

Conclusion. The basic feasability of each system has been established through studies and subsystem demonstrations, but the practical realization of each total system design remains to be proven. Satisfactory completion of either approach will meet a military need and provide an advance in visual simulation.

Acknowledgements. The authors wish to thank Dr. A. M. Spooner, chief scientist, Redifon Flight Simulation Limited, and F. J. Oharek, project engineer of the Naval Training Equipment Center, for their generous contribution of illustrations, graphs and technical details in support of this paper, which is excerpted from a longer technical paper prepared for a NATO conference.

COL P. JOSEPH J. LESZCZYNSKI has served since 1977 as U.S. Army project manager for Training Devices (PM TRADE). During 1976 he was artillery commander, 2d Infantry Division, Korea, following assignments as commander, U.S. Army Training Device Agency, and executive officer to the deputy commanding general for Materiel Acquisition, HQ DARCOM. Graduated from Park College with a BA degree, and from Shippensburg State College with an MS degree, he has completed courses at the Army Command and General Staff College, and Army War College.

CARL R. DRISKELL is project director, PM TRADE, where he is responsible for development of advanced training devices. His special interest in visual simulation began in 1968 as a research electronics engineer at the Naval Training Equipment Center. During an earlier assignment as a research engineer at the Georgia Institute of Technology he conducted studies of electromagnetic compatability, acoustic-radio interaction of doppler radar, and piezo-electric network design. He holds bachelor's and master's degrees in electrical engineering from Georgia Institute of Technology.

Prototype Wire Obstacle Sensor Nears Completion

Prototype delivery of a charge coupled device sensor, designed for "Nap of the Earth" helicopter operation, particularly as a Wire Obstacle Warning System, is scheduled in November 1978. Flight testing is programed to begin in March 1979.

Details of the system were described comprehensive by Alfred L. Kleider, a physicist in the Communications and Sensors Division of the U.S. Army Aviation Research and Development Command (AVRADCOM), in a technical paper presented in Ottawa, Canada. The report was made to a meeting of the Advisory Group for Aerospace R&D, North Atlantic Treaty Organization.

Detection of wire obstacles by low-flying aircraft has been a problem since the early days of aviation, Kleider stated, especially in helicopter operations because of their delicate stability. Contact with larger wires such as power lines usually causes catastrophic crashes. Numerous accidents to helicopters during the war in Veitnam were due to lighter wires.

Despite the long-continued civilian and military effort to develop reliable detection systems for protection against power lines, Kleider stated that they still cause about four accidents a month to military and civilian aircraft. Needed is a system effective in all weather conditions.

Use of a charge couple device for such a purpose is termed a "significant technological breakthrough" in that the system is small, light weight and producible at low cost—characteristics considered favorable for widespread use—Kleider explains in his paper:

"In the case of wire obstacles, the physical size of the objects and distances at which detection and recognition must occur if an avoidance maneuver is to be accomplished not only makes the problem a difficult one but also limits the applied techniques to achieve desired ends.

"Practical dictates for the parameters of concern provide for wires as small as three millimeters at ranges of 300 to 500 meters . . . . It is imperative that a reliable means of detecting, recognizing and avoiding wire and wire-like objects be developed. Such a device is an absolute necessity if the Army is to have the capability of using helicopters in a war-time situation— and equally necessary if real-time training of pilots for NOE/nighttime operations is to be accomplished with any margin of safety . . . ."

The contract for prototype production of the Wire Obstacle Warning System is with Fairchild Camera Corp., which completed the critical design and review process. Kleider says results have demonstrated a wire-recognition capability.

The system . . . "can reasonably be projected to provide this wire-avoidance function in a small, lightweight and low-cost system. [It] has the advantage of being totally independent of human variables association with object recognition."

New Yarn Improves Efficiency of Protective Garments

Good prospects for increasing the efficiency of protective garments—particularly in absorbing toxic gases, vapors, and liquids—is reportedly provided by a new multi-fiber yarn developed at the Natick (MA) R&D Command.

Developed by Natick scientists Richard N. MacNair, Laurance G. Coffin, and Gilbert N. Arons, the new yarn combines activated carbon fibers with stronger fibers to support protective carbon elements during exposure to wear.

Conventional protective garments require use of activated charcoal powder as a sorptive barrier to chemicals. However, this method means that carbon must be trapped in the fabric, thus slowing the sorption of vapors and necessitating use of additional carbon.

These problems are hopefully eliminated with the new fiber yarn, which permits greater availability of the carbon to chemical vapors, and offers higher air permeability, reduced weight and thickness, and less heat stress.

During experimental studies, a combination of carbon, cotton, and Nomex aramid yarns were evaluated with a variety of construction patterns. Protection from abrasion and flexing is provided by a cotton covering which is applied so as to leave a portion of the carbon surface exposed and receptive to sorption.

Earlier abrasion tests indicated that a Weftmatic knit with braid covered carbon yarn held up the best and lost less carbon than all other fabrics examined.

The ultimate goal of Natick scientists is to develop a material which has sufficient air permeability for comfortable wear in a variety of climates, and to incorporate it in designs of future battlefield dress to provide protection against toxic chemicals.

Currently used protective clothing is not considered comfortable even in temperatures of 60 to 70 degrees Fahrenheit if periods of physical work are required, due to low air permeability.

Other applications of the new multi-fiber yarn may include use by industry to protect maintenance personnel from toxic agents, and for individuals engaged in the manufacture or use of pesticides.

AR 95-20—The Unknown Aviation Regulation

By MAJ Samuel G. Bracken

What is comparatively short in length, virtually unknown in the aviation community, but has monumental implications for all Department of Defense aircraft procurement activities and elements? Simply stated, it is *Army Regulation 95-20, Contractor's Flight Operations.*

AR 95-20 establishes requirements and procedures that the U.S. Army, Navy, Air Force, and Defense Logistics Agency follow with regard to the government's liability for losses or damage to U.S. aircraft operated by a contractor.

All government contracts that require procurement or use of aircraft include the "Ground and Flight Risk" clause, which defines the extent and condition of liability which the government assumes. The government assumes this liability due to the vast number of aircraft procured by the Department of Defense, and the astronomical cost to a contract if commercial insurance was purchased.

As a result of this liability, the government imposes stringent requirements and procedures on a contractor by including AR 95-20 as part of the ground and flight risk clause to minimize its risk.

How does this system work and what are the requirements that the government uses to protect its interests? First, the government requires the contractor to develop detailed procedures for its flight operations prior to initiation of any flight. These procedures must be extensive and cover such areas as: crew qualification and training, pilot proficiency requirements, safety programs, flight planning and mission procedures and records.

These are by no means the only areas covered, but are shown as an example of the major topics that require detailed procedures. The procedures are then submitted for approval to the Government Flight Representative, who is the aviator designated by the Head of the Procurement Activity as the approving authority for Contractor Flight Operating procedures and flight crews.

Assuming that the flight operating procedures meet the requirements of AR 95-20, the GFR grants approval for the contractor to begin flight operations. This approval would be valid for six months, after which the Representative would review them and reissue approval if they are still adequate, or require modification.

Following approval of these procedures, the contractor must submit a request for each individual who will be flying in government aircraft for the approval of the Government Flight Representative. The requirements for approval, as a functional pilot, are: commercial aircraft and instrument rating, Class II flight physical, minimum of 1,000 hours of first pilot time, and highly qualified in mission, design, and series of aircraft.

There are different requirements for experimental pilots or co-pilots, but the overall basis for approval is that the government is insuring that only fully qualified individuals are flying in their aircraft. This does not preclude a contractor from hiring less qualified pilots, but it does prevent them from flying the government's aircraft.

Now that the contractor has obtained approval for his flight procedures and pilots, his operation can proceed and the duties of the Representative and the full impact of AR 95-20 come into focus. The Representative begins surveillance of the contractor to insure operations are in accordance with his written procedures.

This surveillance has no impact on the contractual requirement of the ground and flight risk clause. It is still the contractor's responsibility to comply with the previously discussed requirements.

If an aircraft should be damaged or destroyed outside established parameters, the contractor could be responsible for its repair or replacement.

During this surveillance, many areas may come to the attention of the Government Representative that require his decisions. If, for instance, the contractor has a task that is outside of the approved operating procedures, then a separate request must be submitted for his approval.

Additionally, if the Representative should discover what he feels to be a dangerous practice, he must notify the contractor in writing of the hazard. If the situation is not corrected in a reasonable time, the Government Representative may suspend the contractor's flight crew or revoke his approval.

At this point the following major aspects of AR 95-20 have been discussed: the initial approvals, the surveillance, and subsequent modifications of procedures. As in other aspects of the aircraft procurement business, however, this is an ever changing area.

Any major contractor's operation is constantly changing due to new aircraft, new pilots, or changing or upgrading of its procedures. The Representative, through AR 95-20, must monitor these changes and insure that the government's position is not compromised.

In conclusion, the purpose of AR 95-20 is to help implement a government approved program at any contractor's facility to insure basic management and safety of government aircraft. The true purpose of AR 95-20 is not to interfere with a contractor's operation, but to insure that the government assumes the minimum risk under its "Ground and Flight Risk" clause.

MAJ SAMUEL G. BRACKEN is chief, Flight Test Division, U.S. Army Plant Representative Office, Bell Helicopter Textron, Fort Worth, TX. Earlier assignments included commander, 461st Transportation Co., Fort Story, VA; and aviation maintenance management instructor, Fort Eustis, VA. He graduated with a BA degree in business administration from the University of Miami, and has completed the Defense Procurement Management Course, Transportation Officer Advanced Course, and Rotary Wing Flight School.

XV-15 Aircraft Undergoes Wind Tests at NASA/Ames

The Army-NASA-Bell Helicopter Textron XV-15 Research Aircraft was delivered recently aboard an Air Force C-5A Galaxy, to begin a series of 40 x 80-foot wind tunnel tests at the NASA/Ames Research Center, Moffett Field, CA.

Funded by NASA and the U.S. Army Research and Technology Laboratories, AVRADCOM, also located at the Center, the aircraft has a 42-foot-long, 32-foot wingspan, wingtip-mounted engines, transmissions and 25-foot prop rotors that tilt from a helicopter position for hover, vertical takeoffs and landings, to a horizontal position for forward flight.

In the airplane mode, the tilt rotor can fly more than 300 mph, or twice the speed of current helicopters. It also is much quieter than today's helicopters and turboprop planes.

Powered by two Lycoming 1500-hp turbine engines, the 13,000-pound XV-15 has military and civilian potential. In a future design for the Army, the aircraft could carry 13 troops. Two of the research aircraft have been built to test feasibility of the advanced aircraft concept.

XV-15 Tilt-Rotor Aircraft (minus engines and blades during shipment)

Programs Attest to Growing Importance . . .

Army Research Office Serves Many Needs as Major Interface Agency

Importance of the U.S. Army Research Office in Research Triangle Park near Durham, NC, is expanding as a planning, programing, monitoring, contracting and interface agency for in-house laboratories with academic, nonprofit and industrial research organizations.

Convincing validity for that statement was evidenced during presentations for the U.S. Army Materiel Development and Readiness Command's recent 3-day FY 1979 program review of proposed research tasks (6.1 funding category), combined with the DARCOM laboratory commanders and tech directors meeting.

Dr. George Gamota, Acting Assistant for Research to Deputy Under Secretary of Defense Research and Engineering (Research and Advanced Technology), was a featured speaker on ARO's growing mission (summary on page 17).

ARO is advantageously situated (since April 1975) in a research park 10 miles from Durham, readily accessible by air to the Raleigh-Durham Airport, and roughly equidistant in the triangle formed by the University of North Carolina, Duke University and North Carolina State University. It is believed to be the largest research enterprise of its kind in the United States (more than 6,500 acres).

The ARO headquarters building was dedicated in September 1975 and named as a memorial to Dr. Richard A. Weiss. Known as the "founding father" of the Army Science Conference, Dr. Weiss was deputy and technical director of Army Research until he retired in 1972. He died in March 1974.

ARO's major mission areas are described as: manage research grants and contracts program in areas of Army-wide interest; assist DARCOM in management and planning of laboratory research program; provide scientific assistance to Army commands and laboratories.

The ARO program is responsive to the current areas of emphasis which include research in ignition/combustion of gun propellants, target and background signatures, millimeter and submillimeter waves, gun tube wear and erosion, smokes/aerosols, and armor penetration (mechanics and materials). Additional ARO research program formulation guides include the Science and Technology Objectives Guide (STOG) and Army laboratory priorities. Also, the program is based on consideration of scientific progress and opportunities, and research capabilities.

Traditions that are a prideful, motivating force are deeply rooted in the history of the Army Research Office-Durham (ARO-D). With the phaseout of the Army Research Office, Washington (ARO-W), early in 1973, the D was droppped from ARO-D and ARO inherited the functions of ARO-W, along with some of the personnel of ARO-W.

ARO-D evolved from the Office of Ordnance Research, initiated on the campus of Duke University in June of 1951. It was relocated in a new building on the campus of Duke University, dedicated 14 May 1959. The Office of Ordnance Research was redesignated ARO-D on 16 January 1961.

ARO functioned until 20 May 1974 under the direction of the Chief of Research & Development of the Army, and later under the Deputy Chief of Staff for Research, Development, and Acquisition (DCSRDA). Transferred then to the Army Materiel Command (since February 1975 renamed the Army Materiel Development and Readiness Command), ARO operates under direct supervision of the DARCOM Deputy for Science and Technology.

ARO is provided guidance in policy statements and directives issued by the Deputy Under Secretary of Defense for Research and Advanced Technology and by the DCSRDA. Results of ARO-funded research are published in professional journals. Rapid, efficient technology transfer to potential users in the Army is of primary concern to ARO.

The ARO budget was approximately $13 million annually during the FY 1970-75 period. In 1976, a substantial increase to $19 million was approved by the Congress, another strong gain to $23.4 M was achieved in 1977, and in 1978 the budget was upped to $24.9 M. The 1979 guidance calls for $31.5 M.

ARO's FY 78 budgetary breakout, based on a sound investment strategy, provides for major effort in electronics funded at $5.4 M, with the mathematics and physics areas each receiving $3.6 M, mechanics and aeronautics a total of $3.2 M, materials $3.2 M, chemistry $3.1 M, $1.9 going to geosciences, and $0.9 M to biosciences.

Investment Strategy as related to ARO extramural research program funding is based on objectives described as:

- Contributions to the solution of specific Army problems.
- Advancement of science and engineering in areas which are related to current Army requirements.
- Support of fundamental research in areas which are expected to have impact on future Army technology.

A different breakout allocates $20.5 M for ARO's "main program," plus $2.0 M for the Joint Services Electronics Program, $1.6 M for the Mathematics Research Center on the campus of the University of Wisconsin, and $0.8 M to the Army Research and Standardization Group—Europe.

DARCOM as ARO's parent organization is the primary source of funding. In addition, ARO provides contractual services and assists in monitoring research funded by other Army commands, the Defense Advanced Research Projects Agency (DARPA) in selected high-priority areas of advanced technology, and the Defense Nuclear Agency (DNA).

ARO receives hundreds of unsolicited research proposals each year. Each proposal is evaluated thoroughly for its scientific quality and Army relevance.

One of the ARO documents that provides guidance for proponents of proposals is a pamphlet titled *U.S. Army Research Office Program Guide,* designed to stimulate submission of relevant proposals and available upon request to ARO. Inasmuch as available funding permits approval of roughly only one out of every four proposals, careful study of this guide by potential investigators is essential.

Most ARO grants and contracts in recent years have ranged from $30,000 to $50,000 per year, usually funded over a 3-year period. Four large awards were noted, however—$250K to California Institute of Technology for research in solid state electronics; $250K to Georgia Institute of Technology for two-dimensional signal processing and storage; $225K to Stanford University for computer model-

ing of the complete integrated circuit fabrication process, and $250K for research in optical sciences at the University of Arizona.

ARO Technical Director Dr. Hermann Robl stated during his "Overview" briefing for DARCOM laboratory directors that current program trends include: increased funding level per grant/contract; more investment in equipment; and initiation of additional larger programs.

Areas of concern cited by Dr. Robl included: balance between urgent demands and long-range objectives; support of young faculty members in research; funding of high-risk proposals (the kind that may yield the greatest technological breakthroughs); and application of scientific results—more commonly known as technology transfer.

SCIENTIFIC SERVICES PROGRAM. Supplementing the normal ARO program of contracts and grants is a Scientific Services Program (SSP), operated under contract with Battelle Columbus Laboratories through a branch office in Durham, NC, headed by Mr. Richard Thatcher. However, requests for services must be addressed to the ARO Commander, ATTN: DRCRO-PR (SSP).

SSP consists of Short Term Analysis Services (STAS) plus a laboratory Research Cooperative Program (LRCP). The purpose is to contract for highly qualified scientists, engineers and technicians to provide nonpersonal services for solution of problems relevant to performance of the missions of Army research and development organizations.

Stipulated in guidance for SSP contracts is that *under no circumstances* will the program be used for performance of work which can be done by the requiring activity permanent staff or for a better distribution of workload within the Army in-house laboratories. During 1977 the SSP program filled 352 STAS requests, supplemented by 49 LRCP activities.

STAS tasks normally must be completed within six months, although requests for extensions will be considered under special circumstances. No limitation is applied to the number of scientists and engineers involved, but each is restricted to 30 working days at a time (two such periods within a year, three within two years, four within three years or five within five years).

Under the LRCP policies, a task will be performed entirely at the laboratory requiring the service. The time limit normally is three months. Participants typically are university scientists hired during the summer, and no one can perform more than two consecutive tasks at the same activity.

STAS contracts may include furnishing facilities and organizing working conferences, study groups, symposia and similar scientific and technical forums. Listed among ARO examples of recent STAS/tasks are: Missile R&D Command—development of statistical methodology for formulating and optimizing high burning rate propellants; Armament R&D Command—provide an independent evaluation and assessment of the technical merit of the technologies and concepts proposed for a comprehensive Army Fuze Plan.

Similarly, examples of ARO's listing of LRCP tasks include: Electronics R&D Command—determine the point defect structure of silicon dioxide, identify the nature of the oxident species, and deduce a mechanism for a thermal oxidation of silicon on a microscopic scale. Atmospheric Sciences Laboratory, ERADCOM—examine and recommend specific designs and interfaces connected with meteorological satellites and space shuttle utilization.

Part of the ARO mission is accomplished through the U.S. Army Research and Standardization Group (Europe), collocated in London with Navy and Air Force activities. Grants and contracts are awarded to qualified European researchers who can make unique contributions to

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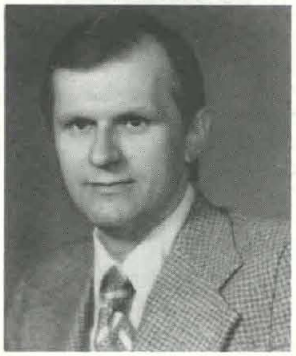
Dr. Gamota Discusses ARO's Expanding Mission

Dr. George Gamota, Acting Assistant for Research to the Deputy Under Secretary of Defense for Research and Engineering (Research and Advanced Technology), was a featured speaker at the recent DARCOM 6.1 budget category (basic research program) review at the Army Research Office, Durham, NC. A summary of his remarks follows.



Dr. George Gamota

It is my real pleasure to be here today. I wish to thank DARCOM for inviting me to this family meeting of the Army Research Community. As you know, this is my third such visit with you and, frankly, I feel like part of the family.

Since my first visit, I note tremendous changes in the Army Research Program. There is now a truly unified and well-coordinated research effort and ARO has taken a true leadership position in the Army Research Community. Much more work must be done, but you have come a long way and we all can be proud today of a better research program.

Credit for this progress should be given not only to the ARO management and staff, who have worked so hard in putting out the DARCOM 6.1 Report and planning their Investment Strategy, but also to the Army laboratory people whose cooperation was vital in this endeavor and without whose help this could not have happened.

In my capacity as the "watchdog" for Research in DoD, let me now turn for a few minutes to my favorite topic: Why should DoD support basic research? Two years ago when I came to DoD I probably would not have used the word "basic" research, but today I feel I should and I must.

The country is concerned about the state of our scientific and technological advantage over our potential adversaries, and our world leadership is questioned in some science areas. The President has made it clear that a healthy R&D program is a national necessity. He also cited problems of lack of young people in academic as well as deteriorating scientific equipment in our research centers.

The Director of the Office of Management and Budget, prior to FY 79 budget time, stressed that critical problems be identified where basic research is needed and asked that all agencies adequately fund such efforts.

We in DoD, as you know, have asked for a seven (7) percent real growth in 6.1 funding and four (4) percent in 6.2 (exploratory development). The President has approved this request and it is now before Congress. We are also planning a new DoD-university initiative to rekindle and strengthen the relationship between DoD and the academic research community.

Let me now address the question: Why should DoD support basic research? To answer this, I could start by listing all the high technology products that we have today, such as lasers, electronic calculators, nuclear power, computers, exotic materials, trips to the moon, etc. We can trace all these engineering feats to basic research ideas generated in a laboratory 10, 20 or 30 years ago. In fact, we are now exploiting the basic research done in the 1950s and early 60s.

What is worrisome to many, however, is that the last decade has not produced an equal number of impressive innovations. There were many contributions, but few appear to have the impact of the earlier era and many are of the evolutionary type rather than revolutionary.

Part of the reason for this paucity of revolutionary ideas is easily seen, even at this gathering. Funds available for "blue sky" work are hardly noticeable. As I heard here, only 20 percent of ARO's budget can be categorized as fundamental long-term research. This, in essence, means that only about 2 cents out of every $10 of the Army RDT&E (Research, Development, Test and Evaluation) budget or 2 cents out of $100 of the total Army defense budget goes for long-term investment. That, gentlemen, is just not enough. Few of us would plan our own future with such a paltry sum.

Now that we are in times of no military conflict, we need to invest more in the future. We need to provide the capable innovative scientists and engineers with the moral support, proper environment and adequate funds to crystalize and test those ideas that today are only dreams.

Let me close by saying that "squeaky wheels" often get greased first. Since long-term investments are not in that category, they are put off. Now is that time, however, when we need to evaluate our situation, look over our "portfolio" and invest more heavily in our own future. Thank you.

Army Research Office Serves Many Needs as Major Interface Agency

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Army technology.

Furthermore, the European program contributes to the exchange of information through support of international conferences, symposia and other scientific meetings. Funds also are provided for European scientists to visit Army laboratories in the United States for lectures or to assist in the solution of problems.

Funded by ARO at about $760K in FY 1978 with $850K projected for 1979, the recent European program report showed 136 grants and contracts in 13 nations: Austria, Belgium, France, Greece, Germany, Ireland, Israel, Italy, Norway, The Netherlands, Sweden, Switzerland and the United Kingdom.

Significance of ARO responsibilities in the total Army research program is emphasized by an FY 1978 pie chart depicting expected dollar distribution. ARO's current budget of $24.9 million is roughly 25 per cent of the total Army 6.1 research funding of $102.0 million.

ARO has published impressive reports on scientific accomplishments, and the transfer of results to Army laboratories exploratory development programs.

Based on this record of achievement, there is confidence in projected accomplishments in FY 1979. These include: high-sensitivity Schottky barrier detectors for obscured atmosphere operations; conversion of infrared images to the visible using 2-photon resonantly pumped metal vapors; real-time correction of optical beams degraded by atmospheric turbulence or optics; laser rangefinders for integration into thermal-imaging systems.

Viewed also as possible results of study of graphite intercalation compounds are compositions with electrical conductivities equal or greater than that for copper—possibly yielding new options for electrical conductors, along with substantial weight reduction.

An ARO report also points to ongoing work that will provide a basis for demonstrating a totally new type of transistor, expected to improve the high-frequency capability of conventional transistors by a factor of four in a Tunnel Triode.

Based on gains made during the past three years, it is expected that during FY 1979 substantial progress will be made in the use of Gallium Arsenide for electron devices.

Numerical procedures are being developed that will greatly assist projectile and gun tube engineers in designing more accurate shells and gun systems, with reduced recoil and muzzle flash. Studies include calculation of muzzle flow before, during and after the projectile emerges from the gun barrel.

Each of ARO's seven scientific divisions—Electronics, Mathematics, Chemical-Biological, Physics, Metallurgy & Materials, Engineering and Geosciences—has listed specific examples of ongoing effort directed to military applications.

In Vivo Determination of Energy Absorption in Biological Tissue, an investigation at Georgia Institute of Technology, has produced "good agreement" in *in vitro* and *in vivo* studies for improved evaluation of biological hazards of nonionizing electromagnetic radiation. Induced heating patterns and the differential absorption of energy by different components of complex organ systems can be determined accurately.

Collaboration between scientists at Wayne State University, Auburn University, and the Electronics Command on masks for integrated circuits has demonstrated the potential for improving the sensitivities of masks by a factor of ten over the standard resists utilized in electron beam lithography. These investigations will make it possible to modify the polymeric resist material so as to enhance the permanent damage induced by the beam. This leaves sharp channels for guidance of deposition of desired materials on the integrated circuit substrate.

Potential for greatly reducing computer time, and hence the expense of design, analysis and performance prediction of air vehicles, is claimed for a new lifting surface theory developed at North Carolina State University. The method is used to reduce integrations to numerical quadratures with remarkable accuracy—in about one- tenth the computational time required for other methods.

Considered of great important for the design of shells is work at Massachusetts Institute of Technology concerned with magnetic suspension for spinning projectiles. Interference-free measurements can be made on various shaped projectiles and small but important Magnus forces can be determined.

Rated among recent major accomplishments are aluminum alloys with minor additions (less than 1 percent) which significantly increase performance of protective coatings for providing protection for turbine blades from degradation by oxidation at high temperature, and which are, at the same time, cost effective. Service life of blades coated with this alloy is expected to be substantially increased. These investigations have been performed at Pratt and Whitney Aircraft Corp.

Beneficial changes in river morphology may prove practicable as a result of research at Colorado State University, on a task funded by ARO and relevant to Corps of Engineer responsibilities. The theory for controlling river flow is being tested in experimentation to promote meandering of the flow to reduce sediment contribution to the Mississippi River.

Possible applications of this knowledge include navigation, channel maintenance, bridging site and river crossing selection, sources of construction material, and numerous others.

Flow Transformation by Terrain Roughness Inhomogeneities is the subject of a study by Oregon State University and the Danish Atomic Energy Commission, under ARO support to develop models for predicting wind field changes resulting from changes in surface roughness such as between water and land.

Militarily important in its relevance to dispersion of objectionable aerosols, permanence of a smoke screen, and the behavior of the atmosphere in the lowest layers, this research task has produced surprising results. During periods of onshore flow, winds near the surface decreased inland, as would be expected, but winds aloft increased inland.

Return on investment in ARO's research program could be attested by many additional examples selected from progress reports on work relevant to military requirements. The examples here offered are considered indicative of the impact of the ARO program.

In addition to its major functions, ARO collaborates with academic and industrial organizations in co-sponsoring the Junior Science and Humanities Symposium (JSHS) Program and the International Science and Engineering Fair (ISEF).

The JSHS program is administered through contract with the Academy of Applied Science and encompasses about 8,000 of the nation's most motivated and gifted high school students in the physical and life sciences. Regional programs are held on 41 university campuses around the United States and one for the Dependent Schools of Europe. The JSHS program has, over its 20-year existence, grown to one of the most prestigious youth science activities in the nation.

Since 1958, ARO has also participated in the ISEF. The ISEF is sponsored by Science Service, Inc., a nonprofit institution whose objective is to stimulate interest in scientific research. In excess of 50,000 students around the United States compete in over 230 regional science fairs for the honor of being selected to present their displays for evaluation and judgment at the annual ISEF. LTG Robert J. Baer, Deputy Commanding General for Materiel Development, Headquarters, U.S. Army Materiel Development and Readiness Command, presented awards at the 1978 National JSHS and the ISEF.

In 1976 ARO began a cooperative program with the Mathematics Association of America in the training and sponsor-

ship of the United States team to the International Mathematical Olympiad (IMO). Developed in Eastern Europe following World War II, the IMO has only recently been open to the Western countries. In the four years the United States has participated in this competition, our team has never finished less than third, and in 1977 received first-place honors among some 20 other competing nations.

Under development at this time are programs to stimulate and motivate minority and female high school students into pursuing careers in science and engineering.

HOW BROAD IS THE IMPACT OF ARO's research grants and contracts program? *The Progress in Research* published by ARO offers a partial answer. A rapid scanning of organizations listed in the 1977 report is impressive.

Involved are more than 40 U.S. Army commands, laboratories and miscellaneous activities; four Department of Defense Major agencies; the Armed Forces Institute of Pathology, three U.S. Navy research organizations; the Air Force Office of Scientific Research; and some elements of NASA.

Pertinent to the ARO factor of Return on Investment is the closing excerpt from the introduction to the Army Materiel Development and Readiness Command 6.1 Research Program document dated March 1978, as follows:

"We recommend that additional in-house efforts or contracts be authorized for the assessment of scientific results, for feasibility studies, and systems analyses, in order to optimize ROI in research, and to increase the lead of U.S. Army technology over that of potential adversaries."

ARO Hosts Semiannual DARCOM Laboratory Directors Conference

PRESIDING CHAIRMAN Joseph Lindwarm, chief, Office of Laboratory and Development Command Management, HQ DARCOM; Army Research Office Commander COL Anthony P. Simkus; ARO Technical Director Dr. Herman Robl; DARCOM Assistant Deputy for Science and Technology Norman L. Klein; DARCOM Deputy CG for Materiel Development LTG Robert J. Baer; Director of Army Research Dr. Marvin E. Lasser, Office of the Deputy Chief of Staff for Research, Development, and Acquisition, HQ DA; Dr. George Gamota, special assistant to the Deputy Director of Defense Research and Engineering (Research and Advanced Technology); Dr. I. R. Hershner, on Dr. Lasser's staff as assistant director, Research Programs, and Chairman, Advisory Group, 1978 Army Science Conference.

Management improvements, manpower and budget problems, use of resources for maximal productivity, and development of acceptable performance indicators for evaluating in-house laboratory effectiveness headed the topics considered at the DARCOM laboratory directors semiannual 2-day conference.

Held at the U.S. Army Research Office in Research Triangle Park, NC, the meeting followed the DARCOM FY 1979 basic and applied research program review.

Considered also were policy guidelines for in-house laboratory operations as well as grants and contracts activities, data requirements for Department of Defense research, development, test and evaluation reports, anticipated future technical information systems, and requirements for long-range technological forecasting.

Presiding chairman Joseph Lindwarm, chief of the DARCOM Office of Laboratory and Development Command Management, opened the meeting with comments on DARCOM Commander GEN John R. Guthrie's stated management philosophy.

DARCOM Deputy Commander for Materiel Development LTG Robert J. Baer later amplified on GEN Guthrie's viewpoints. He said GEN Guthrie is committed to a "balanced program" of research, development, materiel acquisition, and meeting requirements for a combat-ready Army—of clearly setting priorities and determining resources essential for achievement of this objective.

LTG Baer stated that among GEN Guthrie's recent management improvement actions is the assignment of MG Robert L. Bergquist as DARCOM Deputy Commander for Resource Management. A study group is developing guidelines for implementation of this program.

Roy D. Greene, associate director for Programs and Budget in the Directorate of Development and Engineering, HQ DARCOM, discussed FY78-80 Funding Status and Prospects. With respect to current concern about Zero-Based Budgeting, he commented: "In effect, we have had it for 16 years, so what is so different to cause concern now?"

Implementation of MARDIS (Management R&D Information System) appears to be progressing on schedule, Greene said, adding that it is expected to produce rapidly summaries of data to facilitate the task of decision-makers.

Manpower and Grade Control Prospects was the title of a presentation by Joseph Meick, substituting for William S. Charin, deputy director, DARCOM Directorate for Personnel, Training and Force Development.

DARCOM Assistant Deputy for Science and Technology Norman L. Klein spoke on a number of subjects including in-house laboratory guidelines, the project manager functional organization, and a Proposal for DARCOM-West Point (Military Academy) Cooperation for Faculty and Student Assignments.

Interesting comparisons of Soviet Union and United States management of research and development were offered by Dr. Issai Lefkowitz, a member of the staff of the Physical Sciences

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HQ DARCOM Development and Engineering Directorate Associate Director for Systems Development Edward M. Sedlak; Dr. Gordon L. Bushey, Office of Laboratory and Development Command Management; COL Joseph G. Mikula, associate director, Foreign Science and Technology, D&E Directorate, HQ DARCOM; Roy D. Greene, associate director, Program and Budget, D&ED, HQ DARCOM; Edward J. Kolb, Office of Associate Director for Specifications, Standards and Engineering, D&ED, HQ DARCOM; Tamio Shirata and Robert J. Zentner, both in Office of Laboratory and Development Command Management, HQ DARCOM.

ARO Hosts Semiannual DARCOM Laboratory Directors Conference

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Division, Army Research Office. He reported on his observations during a visit to Russia, commenting: "In spite of our current advantage, we may find ourself in deep trouble in maintaining superiority in our military technology base."

U.S. Army Ballistic Research Laboratory Director Dr. Robert J. Eichelberger gave one of the featured presentations on the Future of the Army Lead Laboratory Concept. A lead laboratory, he said, "should lead a collaborative effort by several laboratories to develop a technology of common interest. It should be recognized as a Center of Expertise."

After listing all the DARCOM lead laboratories and their specialty areas, Dr. Eichelberger summarized some of his viewpoints: 1) The Lead Laboratory Concept, properly used, can be very useful; 2) the present lead laboratory structure simply has evolved and needs a thorough overhaul.

Dr. Eichelberger contended that lead laboratories should not be confused with other scientific centers of excellence; also, system-oriented program planning/coordination/management is NOT a function of a lead laboratory.

Dr. Eichelberger also made a presentation on efforts to reduce overhead and paperwork for laboratory management improvement. Long-term planning requirements may suffer, he said, because we are trying to take care of the immediate priorities with reduced manpower. Finally, he offered his views on ROI (Return on Investment) of R&D funding versus effective management evaluation short- and long-term indicators of laboratory performance.

Other main speakers on development of laboratory performance evaluation indicators (aside from many who engaged in lively discussion) were COL Bernard C. Hughes and Dr. Robert Wiseman. COL Hughes spoke as commander of the Army Mobility Equipment R&D Command and Dr. Wiseman as technical director of Electronics R&D Command.

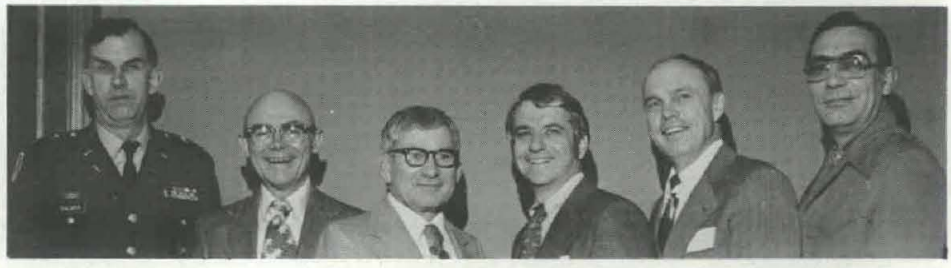
Speakers on Status Reports on Various Army-DARCOM Activities were headed by COL Joseph G. Mikula, acting associate director for Foreign Science and Technology, Directorate of Development and Engineering, HQ DARCOM. COL Mikula described responsibilities of the recently established Counter Measures Counter Counter Measures Center (CM-CCMC) over which he has staff cognizance.

Donald B. Dinger, technical director of the Army Mobility Equipment R&D Command gave two presentations, the first on the Scientific and Engineering Computer Steering Committee. He followed with an explanation of the DARCOM Energy R&D Plan.

Army Missile R&D Command Technical Director Dr. Julian Kobler reported on the Updated Study on Army STINFO (Scientific and Technical Information). Edward J. Kolb, on the staff of the HQ DARCOM Associate Director for Specifications, Standards and Engineering, described Future Technical Information Needs.

The final presentation was made by DARCOM Project Manager for Smoke/Obscurants COL Henry Shelton, whose topic was the DARCOM Smoke-Aerosol Steering Group. He described the rapid progress in technology and program development that has been made since activity was initiated little more than a year ago.

ET&DL Deputy Director S. F. Danko, Electronics R&D Command; COL Wallace H. Dawson III, deputy commander, Army Tank-Automotive R&D Command; Engineer Topographic Laboratories Director Clare Thornton; Electronic Warfare Laboratory Director Clyde D. Hardin, Communications R&D Command; Norman J. Taupeka, chief, Systems Engineering Laboratory, CORADCOM; COL John B. Fitch, deputy director, Army Research and Technology Laboratory, Ames Research Center; LTC Bobby R. Huggins, director, Air Defense Systems Directorate, HQ DARCOM.



DIRECTOR of Tank-Automotive Systems Laboratory, Tank-Automotive R&D Command COL Warren T. Palmer; Director of Army Ballistic Research Laboratory Dr. Robert J. Eichelberger; Dr. Julian S. Kobler, director, Technology Laboratory, Missile R&D Command; Technical Director Donald B. Dinger, Mobility Equipment R&D Command; Technical Director Dr. Robert E. Weigel, Armament R&D Command; Dr. John D. Weisz, director, Human Engineering Laboratory, APG, MD.

COMMANDER COL Bernard C. Hughes, Mobility Equipment R&D Command; Deputy Director Theodore J. Sueta, Avionics R&D Activity, CORADCOM; Technical Director Donald B. Dinger, MERADCOM; Newman E. Thompson, deputy director, CORADCOM; Commander and Deputy Director COL William R. Benoit, Army Materials and Mechanics Research Center; Technical Director Robert A. Macchia, Engineering Technology Laboratories; AMMRC Technical Director Dr. Edward S. Wright; Commander and Director COL Philip R. Hoge, Engineering Technology Laboratories.

COMMANDER/DIRECTOR COL William E. Rawlinson Jr., Atmospheric Sciences Laboratory, ERADCOM, White Sands Missile Range, NM; Dr. Robert E. Wiseman, technical director, Communications R&D Command; Richard B. Lewis II, planning director, HQ Aviation R&D Command; Theodore A. Pfeiffer, deputy for Technical Management, CORADCOM; HDL Technical Director Dr. William W. Carter.

COMMANDER/DIRECTOR COL W. K. Evans, CS&TL, CORADCOM; Tech Director E. J. Sheehan, NV&EOL, ERADCOM; Director Dr. H. S. Hovey, SWL, ERADCOM; Deputy Tech Director Dr. Hamed El-Bisi, NARADCOM.

DARCOM Laboratory Directors Review FY79 Basic Research Program

U.S. Army Materiel Development and Readiness Command laboratory directors reviewed DARCOM's proposed FY 1979 research program, as presented by the Army Research Office staff at Research Triangle Park, NC, and followed with their annual meeting, the first at ARO, 8-10 March 1978.

ARO Commander, COL Anthony P. Simkus, gave the welcoming remarks to open the meeting. Dr. Hermann Robl, technical director, made the 'overview' presentation—including a brief historical background of ARO, its major functions, organizational structure, command relationships, and budget.

Dr. Robl explained DARCOM research program objectives, process of evaluating proposals for research grants and contracts, some of the changing trends, and overall program characteristics. He also listed some outstanding accomplishments by way of Return on Investment (ROI), and current areas of concern.

Among DARCOM laboratory areas of major interest, Dr. Robl listed vehicle mobility, night vision, materials and mechanics, ballistics, air mobility, signal detection, high- and low-energy lasers, electronic devices, electromagnetic generation and detection.

Listed also were fluidics, nuclear effects, ordnance electronics, missiles, combat support, equipment for the individual soldier, atmospheric sciences, large- and small-caliber armaments, electronic warfare, defensive systems for chemical-biological warfare, and human engineering.

Each of ARO's seven scientific division leaders detailed the programs for which they are responsible. Dr. Arthur V. Dodd was first with an explanation of the interdisciplinary characteristics of the Geosciences Division activities in atmospheric and terrestrial investigations. The atmospheric program in general supports research objectives of DARCOM laboratories while the terrestrial program is responsive to the Corps of Engineers' needs.

More than 70 institutions are currently involved in the geosciences program and the FY 78 budget is programed to increase from $1.855 million to $2.485 M in fiscal years 1980-81, excluding funds for research in Europe.

In the Atmospheric Sciences, $400K is programed for research in cloud and aerosol physics transmissions, $400K for battlefield meteorology, $300K for upper atmospheric research and $200K for atmospheric sensing. The allocation in Terrestrial Sciences is $330K for research in properties of earth materials, $125K for sensing, mapping and geodetic studies, and $100K for earth-water dynamic processes.

Chemical and Biological Sciences presentations were made by Dr. Robet Ghirardelli as division director and Dr. F.W. Morthland, program director for the Biological Sciences. Dr. Ghirardelli detailed the broad range of ARO chemistry activities involving an FY 78 budget of $3.06 million and $3.45 M proposed in FY 1979. The chemistry program consists of about 100 efforts which are responsive to high priority development programs at numerous DARCOM installations including the Army Armament Research and Development Command, the Army Materials and Mechanics Research Center, and the Chemical Systems Laboratory.

Investigations include the areas of explosives, propellants and pyrotechnics; chemical agents, aerosols, smoke/obscurants, and pollution abatement; ignition and combustion; fuels, oxidizers, binders and modifiers; plastics, elastomers and fibers; food, clothing and camouflage; fuels, fuel cells, explosive detection, and water purification; batteries and photo resists.

Dr. Morthland listed the objectives of the Biological Sciences program as:

- To provide new data for the technology base to improve functional capabilities and well-being of the soldier.
- To improve reliability and life expectancy of field materiel by elimination of degradation of component materials by biological entities in the operational and storage environment.
- To provide information on the impact of military activities on natural ecosystems and ways to rehabilitate damages. (He also spoke about ongoing tasks in pursuance of these objectives.)

Electronics Division active projects, objectives as related to military requirements, and the broad relationship with Army laboratories, academic institutions and industrial research organizations, were discussed by Dr. Jimmie R. Suttle. The Division has the largest funding responsibility in the DARCOM basic research program, currently about $5 million annually, and is monitoring 79 projects.

Many of the activities involve development of large-scale integrated circuits, expected to have applications during the next decade to computers, communications equipment and signal-processing devices. Much work also is being done in solid state electronics with potential application to micro-electronics to develop advanced technology directed to a broad range of potential Army needs.

Dr. Suttle is the Army member and has served since March 1977 as chairman of the Joint Services Electronics Program Technical Advisory Committee. Fourteen educational institutions, most of them major universities, are involved in JSEP investigations concerned with advanced technology in all aspects of electronics. Much of the work has interdisciplinary relationships.

Mathematics Division objectives, as explained by Dr. Jagdish Chandra, are directed to (1) advancement of the mathematical concepts and tools that are a prerequisite for a strong technology base for the Army; and (2) responsiveness to Army research, development and operational agencies in the solution of their critical problems. These objectives are best accomplished by a judicious mixture of long, medium and short range research projects.

The leading area of concentration is the mathematical analysis of non-linear systems. Progress in this area will facilitate improved understanding of a variety of Army problems such as penetration mechanics, combustion and ignition studies, and aerodynamics of missiles and projectiles. Other areas of concentration include research in stochastic systems, large-scale optimization models, robust statistical procedures. In conjunction with these areas, the Mathematics Division supports various projects concerned with the development and testing of mathematical software. It is recognized that there is a very high cost associated with the production and use of such software so that improvements could have a very high payoff.

The principal objective of the Mathematics Research Center (MRC) is to conduct research in such potentially applicable areas as applied analysis, numerical analysis and computing, statistics and probability, and mathematical programing. MRC operates under the guidance of the Army Mathematics Steering Committee (AMSC). Dr. Chandra is chairman of this Army-wide committee. Under the guidance of this committee, it has been consistently the policy of MRC to concentrate on a small number of areas where they have excellence over a broad range of topics so that they could respond quickly and effectively to external Army requests for advice and assistance in connection with relevant mathematical matters.

Physics Division functions, as explained by Dr. Robert J. Lontz, director, are concerned with discovery and exploitation of concepts, techniques and data that can be expected to improve military materiel, equipment and practices. The program is in the general area of atomic and molecular physics, optics, electrical phenomena, condensed matter and electromagnetic technology.

Opportunities for advances lie in target identification, weapons, guidance, firepower, and combat support. About 45 per cent of the FY 78 budget of $3.5 million (programed in FY 79 for an increase to $4.12 million) is in support of Electronics Command problems; 25 per cent for Armament Command needs; 20 per cent for Missile Command needs. The balance of the program addresses problems of the Mobility, Equipment R&D Command, The Army Mate-

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Army Relocates FAMECE for Operational Testing

FAMECE, the Army's Family of Military Engineer Construction Equipment, following more than 6,000 hours of government qualification tests, has moved from Fort Belvoir, VA, to Fort Bragg, NC, where it will undergo operational tests by the 618th Engineer Light Equipment Company.

Initial operational capability of the highly mobile combat engineer operations family is scheduled for 1981. Developed for helicopter delivery and quick assembly in the field, the sections (weighing 15,000 pounds or less) include a bulldozer, grader, scraper, loader, dumper, distributor, steel drum/pneumatic compactor roller and tamping foot/pneumatic compactor.

Complete combinations, which weigh 30,000 pounds or less, can be paradropped from high altitudes or delviered to the construction site by cargo aircraft flying as low as five feet off the ground at a speed of about 135 mph. With the aid of the low-altitude parachute extraction system (LAPES), pilots can release the equipment about 600 feet from eventual destination.

The family was designed and developed by the Clark Equipment Co. of Benton Harbor, MI, under contract with the Project Manager for FAMECE/UET. Preliminary qualification tests were conducted by the U.S. Army Mobility Equipment R&D Command and monitored by the U.S. Army Test and Evaluation Command.

Despite weight and size restrictions associated with airmobile/airdrop requirements, performance is expected to be equal to or better than the 20 makes and models of wheeled construction equipment destined to be replaced.

Lab Directors Review FY79 Basic Research Program

(Continued from page 21)

rials and Mechanics Research Center, and other installations.

Studies of condensed matter problems account for FY 78 funding of $1,300K with $800K going to electromagnetic technology, $600K to optics (programed for a sharp upward trend in FY 79), $450K to atomic and molecular problem solutions, $250K in the field of electric phenomena, and $100K for staff research and conference support.

Dr. Lontz discussed institutional programs, new materials concepts, some outstanding accomplishments in physics, and other new opportunities.

Metallurgy and Materials Science Division primary objectives were described by Dr. George Mayer as fourfold:

- To gain fundamental knowledge that will enable the Army to synthesize and/or process high-performance materials more readily, at lower cost, and with reproducible properties.
- To provide information that will form the basis for design and selection of materials that are strong and tough, resistant to attack by chemical action, radiation or other severe environmental phenomena.
- To determine the mechanisms and key materials variables that enhance or limit the transmission, storage or conversion of magnetic, electrical and other forms of energy.
- To evolve efficient and reliable tests, both destructive and non-destructive, that will ensure consistent performance and reliability of materials.

Budgeted at $3.07 million in FY77, $3.2 M in FY 78 and $3.54 M (projected) for FY 79, the division was engaged with 88 active projects as of 31 January 1978. Twenty-three percent of FY 79 funding is for studies for new methods of synthesis and processing of materials. Twenty-two percent each will go to studies of factors that affect degradation and reactivity; subjects dealing with mechanical behavior; and effects of structure, defects and composition upon physical and chemical properties. Eleven per cent of the budget is for new concepts in testing, analysis and simulation of materials.

Dr. John Hurt explained the significance and potential application of what he considers five outstanding recent accomplishments resulting from grants and contracts monitored by the M&MS Division: Mechanisms of Fretting, Fracture Mechanism Maps, Early Heating Processes in Laser-supported Shock Wave Initiation on Metals, Mechanisms of Curing Concrete, and Analysis of Environmental Interactions of Composites.

Engineering Sciences Division major research areas were discussed by Mr. James J. Murray, Dr. Robert Singleton, and Dr. Fred Schmiedeshoff under the major topical areas of power, flow mechanics, and materials mechanics, with consideration of Army laboratory-monitored projects, conferences and workshops related to objectives in these areas.

The FY 78 budget allocates $765K for 22 projects in power and propulsion, $1,145K for 43 projects in materials mechanics, and the same amount for 43 efforts in flow mechanics. In FY 79 $900K is projected for 23 power research projects, $1,320K for 45 activities in materials mechanics and $1,320K for 29 efforts in flow mechanics.

Eight projects are listed in the area of propulsion. Thirteen efforts are projected for FY 78 for research on engines and fuel conservation. Forty materials mechanics projects are funded in FY 78 and about the same number is proposed for FY 79.

Considered an outstanding achievement is the work on properties of finite length fiber and platelet reinforced composite materials performed at Lawrence Livermore Laboratory, with potential application to stationary power plants, helicopters, ground vehicles, and a high time-density energy source.

Fluid (Flow) Mechanics major research areas are programed in rotorcraft aerodynamics and acoustics, missile rocket aerodynamics, gun-launched projectiles, and internal flows.

On the second day of the meeting ARO presented an assessment of DARCOM laboratories' 6.1 programs. Dr. Robert Mace, associate technical director of ARO served as chairman for this session. The discussion of program objectives, specific research problems, and long-range plans was indicative of the team spirit of the DARCOM research community.

Automatic Test Equipment Undergoes Field Tests

The U.S. Army Automatic Test Support Systems' prototype Test Equipment and Electronic Repair Facilities, designed to improve maintenance and repair of electronic items at the general support level, have arrived in Pirmasens, Germany for operational testing.

Sixteen hours after departing from Fort Hood, TX, via a U.S. Air Force C5A, the new Test Equipment and Electronic Repair Facilities were on site and operational. This marks the first time that automatic test equipment has been airlifted with school-trained soldiers from CONUS and USAEUR to test the general support concept for increased combat readiness.

The equipment will be used primarily to support early fielding of the AN/TSQ-73 missile minder air defense command and control system and tactical radios. It is the first time that printed circuit boards are being tested and repaired at the general support level. No such capabilities existed in the past.

Automatic test equipment is, in effect, a quality assurance device in that it tests items on a continuing basis, devoid of human error. The equipment is projected for use in testing any electronic component on missiles, tanks, radios, circuit boards, etc.

If failure of an electronic part occurs, general maintenance personnel will simply forward a request for assistance to an automatic test support system facility. An identification will be made of what part needs replacing, and the repair facility will put in the new part.

Responsibilities for Automatic Test Support Systems are assigned to LTC Walter J. Gabrysiak, ATSS PM, at the U.S. Army Communications Research and Development Command, Fort Monmouth, NJ.

Corps of Engineers Battle Erosion at Historic San Juan Fortress

FORTRESS El Morro at San Juan, Puerto Rico, built in the 16th century when Spain owned the Island, is slowly crumbling as waves and ground-water undermine the foundation. As part of a $25 million project to protect El Morro from further uncontrolled wave action that could result in structural failure of the historic site, the National Park Service has asked the U.S. Army Corps of Engineers to help stabilize deterioration and prevent destruction by waves.

ENGINEERS at the Corps's Waterways Experiment Station, Vicksburg, MS, with the use of 20th century engineering technology, have constructed a model of El Morro fortress and the San Juan city wall to study the effects of wave action on the structures. By studying the model, WES engineers can determine the optimum location for and design of an offshore breakwater to protect the fortifications. One foot on the model is equal to 75 feet of the natural structure.

Logistics Study Office:

What is it? What Does it do?

When and by whom should economic life of an item be reevaluated? In which depots should supplies be stored as they move through the distribution system from producers to users? Should there be a civilian career program in International Logistics?

These questions are but a few that have been or are being researched and analyzed by the Logistics Studies Office (LSO) at Fort Lee, VA.

The LSO, an element of the Army Logistics Management Center (ALMC), responds to logistics problems faced by any of the staff elements or subordinate commands, whether development or readiness oriented, of the Army Materiel Development and Readiness Command (DARCOM).

Directed by a colonel, the Office has a staff of one major and nine professional civilians who are either operations research analysts or logistics management specialists. Approximately 20,000 professional man-hours are available each year for problem-solving. On occasion, other ALMC or DARCOM agencies are tasked to assist with particular studies.

Studies are initiated upon receipt of a tasking letter from the Director of Plans and Analysis, DARCOM HQ. He coordinates and evaluates requests for studies submitted by other DARCOM directors who act as study sponsors.

A representative of the sponsor monitors the study progress, provides guidance, and assists in identifying sources of needed information. Study control is exercised through in-process reviews.

The course of a normal study includes bibliographic research, preparation of a study plan and a data collection plan, data collection and analysis, evaluation of findings, and development of alternative problem solutions, conclusions, and recommendations.

As prescribed by AR 5-5, the progress of each study is documented through submission and periodic update of DD Form 1498, Research and Technology Work Unit Summary. These summaries are published in the DARCOM Study Program each year.

Study results are documented in a formal report submitted to the sponsor for approval to publish and distribute. Upon approval, the study is considered complete and the responsibility for implementation rests with the sponsor. Copies of approved reports are then furnished to the Defense Logistics Studies Information Exchange and microfiche copies are made available to qualified requesters. (The Exchange also is located at ALMC.)

Data sources most commonly used in LSO studies include knowledgeable government, business, or industry personnel whose views are garnered either through interviews or questionnaires, previous studies or analyses in related problems, published reports by DOD, DA, or DARCOM, and manual or automated data bases. Visits to DA and DARCOM subordinate commands are required during most studies.

Statistical methods and operations research techniques are used in analyzing study data. On occasion, models are developed to simulate or analyze complex systems. Computer services available to LSO researchers include the UNIVAC 70, the Hewlett-Packard 3000 minicomputer, and the General Electric Time Share System.

Areas of logistics expertise in LSO include supply, maintenance, transportation, and cataloging. Studies are directed to problems in management systems, costs, personnel and training, and economic analysis. Wide experience exists in various aspects of the Foreign Military Sales Program. The questions at the beginning of this article, which are expanded on below, are representative of LSO work.

The need to reevaluate item economic-life estimates arises from the fact that requirement determinations are based in part on these estimates. Since the estimates normally are made during item development, operational use may show the estimate to be inaccurate.

The result is that procurement replacement quantities may be too large, thus wasting resources, or too small, which degrades readiness. At present, reevaluations are made on Army trucks and some other major equipment items. But, there is no current management system to insure reevaluations on a routine basis of all major items; this situation generated a study on the subject underway in LSO.

Linear programing techniques have been incorporated by LSO into models for analyzing the transportation costs of stocking certain supplies at various depots. Results of these analyses form one element in the decision-making process of where to position DARCOM stocks.

Logistics Studies Office Director COL R. A. Meese, and senior operations research analyst Virginia Perry discuss program directed to management systems, costs, personnel and training, and economic analysis.

The models are being used to analyze ammunition distribution. This is of special relevance, since the Army is now the single manager for conventional ammunition and explosives, and Navy storage sites need consideration in ammunition distribution decisions.

The question of whether a special career field is needed for Army civilians working in international logistics was recently studied by LSO. As a result of findings, the question was answered in the negative. Although most personnel so involved recommended such a program, their reasons for desiring a specialized field could be satisfied by an alternate procedure of considerably less impact, and that was the resulting recommendation.

If you have a logistics-related problem that might benefit from an impartial analysis by a dedicated research group, make it known to the Director of Plans and Analysis at DARCOM HQ. He will determine its suitability for analysis using the varied skills and expertise of the Logistics Studies Office.

TARCOM Receives First Pre-Production M915-Series Truck

Availability of the first pre-production M915-series truck, built by AM General Corp. under what is believed to be the largest single Army contract ever awarded for commercial trucks, has been announced by the U.S. Army Tank-Automotive Materiel Readiness Command, Warren, MI.

The entire M915 fleet of 5,507 trucks—expected to be in the Army's inventory by the fall of 1981—will consist of the M915 line haul tractor truck, M916 light equipment transporter, M917 20-ton dump truck, M918 1,500-gallon bituminous distributor for road building, M919 concrete mobile mixer and the M920 medium equipment transporter.

Initial distribution of the trucks to troop units is scheduled to begin in January 1979, following favorable Army evaluation as to the ability of the trucks to meet contract specifications.

M915, Tractor, Truck, 14-Ton

Selective Scanner

Army Relocates ATSS for Additional Testing

The U.S. Army's Automatic Test Support System, consisting of Automatic Test Equipment and an Electronic Repair Facility, was recently transported from Pirmasens, West Germany to the 8th Maintenance Battalion, Hanau, West Germany.

Following successful testing and repair of the first tactical FM field radio (RT524) at V Corps General Support Maintenance Shop, the Automatic Test Equipment was deployed to Nurnberg, West Germany, to support the VII Corps 71st Maintenance Battalion.

The Air Defense Board, representating the U.S. Army Training and Doctrine Command, will conclude phase one Operational Testing on the Automatic Test Support System in July. The entire system will eventually be turned over to U.S. Army Europe.

Used for general support maintenance of the newly deployed AN/TSQ–73 Missile Minder, the Automatic Test Support System is also providing test and repair services for the AN/VRC–12 series radios, the AN/PRC–77 radio, and selected communications-electronics modules.

CPT H. J. Trexler and Mr. R. Burchacki, U.S. Army Communications R&D Command, Fort Monmouth, NJ, are project officers for European fielding of the Automatic Test Support System.

DARCOM Approves MIRADCOM Use of Cost Control

The Cost Schedule Control System, a management tool used by the Army for years on large scale weapons programs, has been approved by the U.S. Army Materiel Development and Readiness Command for use in an in-house exploratory development program.

Commonly termed CS2, the technique is specifically being applied by the U.S. Army Missile R&D Command's Free Flight Rocket Office to streamline management operations and reduce costs in a variety of programs.

CS2, which relates cost, schedule and performance, was previously not used with weapon concepts that were considered vague and subject to change. However, its use will now permit program managers to know where they stand at all times, where they hope to go, and what they are spending.

MIRADCOM Accepts First Production Missile Minder

Receipt of the first full-scale production Missile Minder, a computerized command and fire control system for the Improved Hawk and Nike Hercules missiles, has been announced by the U.S. Army Missile R&D Command, Redstone Arsenal, AL.

Reportedly delivered without a single deficiency or shortcoming, the system was accepted for the Army by COL Eugene Fox, project manager for Missile Minder/Air Defense Command and Control Systems, and Cecil Morgan, chief of the Army Tactical Data Systems Resident Development Office.

The full-scale production Missile Minder was provided under a $25.6 million contract award to Litton Data Systems. It will be used at Redstone in maintenance and diagnostic software development and for field systems support.

Designated as AN/TSQ–73, Missile Minder is capable of controlling surface to air missile batteries and coordinating air defense capabilities and communications with the Navy, Marine Corps and the Air Force. It is housed in a shelter and is transportable by truck, plane or helicopter for quick deployment.

It also features the latest advances in electronic computer technology for receiving, processing and displaying target information from various radars. Missile Minder requires fewer operators, has a faster reaction time and is more reliable than its predecessors.

$24.4 Million Contract Calls for Stinger Production

Production of the Stinger missile, a shoulder-fired weapon for air defense against enemy planes ranging from helicopters to low-level, high-speed jets, has been ordered by the U.S. Army Missile R&D Command under a $24.4 million contract.

General Dynamics Corp. will provide first-year production and engineering services for the man-portable successor to the Army's Redeye. Atlantic Research Corp. will produce the propulsion system, and the Army Armament R&D Command and Magnavox will provide the fuze warhead.

The all-arms, infrared, heat-seeking Stinger will feature improved range and maneuverability, significant countermeasures resistance and a device to identify friendly aircraft. No test equipment is required at supply points or in the field since Stinger is deliverd as a certified round.

Packaged in a disposable launch tube, the missile has a separable, gripstock—containing launch electronics and an IFF antenna—which can be used for multiple firings. The high-explosive, hit-to-kill warhead guides automatically to its target.

COL Vincent P. DeFatta, Stinger project manager at Redstone Arsenal, directs the program for the Army and Marine Corps. His civilian deputy is Adrian Watson.

Study Will Provide Wastewater Effluent Guidelines

Studies of the munitions industry, directed to development of wastewater effluent guidelines for the "best available treatment," have been initiated by a private consulting firm under contract with the U.S. Environmental Protection Agency.

When finalized in late 1979, the guidelines will be utilized by the 50 states as the basis for issuing wastewater discharge permits to U.S. Army Materiel Development and Readiness Command installations. DARCOM's Environmental Quality Office is coordinating visits by Hydroscience, Inc. to Army research, manufacturing and design agencies.

Following completion of the draft guidelines, they will be reviewed by an EPA-designated working group prior to promulgation. Dr. Donald K. Emig, chief of DARCOM's Environmental Office, will serve as a member of this working group.

Natick Studies Resins to Combat Toxic Pollutants

Development of a low cost, more efficient method of eliminating potentially toxic pollutants from streams adjacent to munition manufacturing plants has been announced by the U.S. Army Natick (MA) R&D Command.

Munitions plants often release toxic quantities of TNT, DNT and other nitrobodies in waste waters, which are acidic. When the water is exposed to sunlight, it acquires a pink color and poses a toxic hazard.

Activated carbon is presently the most popular

absorbent in the chemical process industry. However, nitroaromatic pollutants are highly explosive and cannot be safely removed from the carbon beds by thermal processing. Carbon beds only absorb a finite volume of impurities and must continually be replaced.

In an attempt to lower the cost of replacing the active carbon, Army scientists are investigating the use of polymeric absorption resins which can be used repeatedly. One new resin has demonstrated its ecological and economical advantages during a small-scale pilot study at the Burlington Army Ammunition Depot, IA.

That study proved that resins could undergo continuous regeneration by acetone extraction of impurities without decreasing absorption efficiency. Operating costs were reduced by reclaiming the acetone through distillation.

Results of the pilot study are so encouraging that full-scale operations are planned for Army and Navy ammunition plants. The estimated cost of the procedure is between 12 to 15 cents per 1,000 gallons of water.

Army Accepts First Non-Nuclear Lance Warhead

The first production non-nuclear Lance missile warhead, developed to replace the Sergeant and Honest John missiles, was accepted for the Army by Lance Project Manager COL Donald P. Whalen, during ceremonies at Milan Army Ammunition Plant, TN.

Developed by Redstone Arsenal in conjunction with Vought Corp. (prime contractor), Honeywell Corp., and the Army Armament R&D Command, Lance is capable of traveling more than 70 miles under all weather and terrain conditions.

Dignitaries attending the acceptance ceremonies included former Lance PM BG Grayson Tate Jr.; Army Materiel Development and Readiness Command Deputy Director for Development and Engineering Dr. Richard L. Haley; and BG Henry Harper, deputy commander for Conventional Ammunition, Army Armament Materiel Readiness Command.

All Weather Chaparral Intercepts MQM-107 Drone

Successful debut of the U.S. Army's first All Weather Chaparral Missile has been reported, following its interception of a high speed, MQM-107 drone during a recent demonstration at White Sands (NM) Missile Range.

The demonstration was the first flight test in which the Chaparral used a new radio frequency guidance scheme and a smokeless rocket motor. Additional tests against a variety of targets are planned during the coming months.

Chaparral is an infrared heat seeking missile system mounted on a tracked vehicle. During its initial test, it was teamed with British BLINDFIRE tracking radar, and smokeless rocket motor, developed by Hercules Powder Co.

Ford Aerospace and Communications Corp. is prime contractor for the Chaparral demonstration program, which involves modification of the infrared missile to include radio frequency command-to-line-of-sight mode.

New Technique Measures Soy Content in Food

A new method for detecting the exact levels of soy content used as extenders in various food products has been developed by Dr. Leo Holmes of the U.S. Army Natick (MA) R&D Command's Food Science Laboratory.

Dr. Holmes reports that the wavelength intensity of reflected fluorescent light increases in direct proportion to the amount of soy in a food product. His method reads this light and provides feedback on a graduated scale.

Soy substitutes are currently being used in ever increasing proportions to reduce the costs of meat and their cholesterol content. The new technique for measuring soy content is of considerable significance to government inspectors and the food industry because it can be used during the on-site inspection process.

Natick Reports on New Troop Parachute System

A new troop type parachute system, designed to airdrop personnel and their equipment from aircraft traveling at 500-feet altitudes and speeds of 250 knots per hour, is reportedly in advanced development at the U.S. Army Natick (MA) R&D Command.

The planned 2-staged system employs a 4-foot first stage chute which is deployed by a static line. This chute slows the jumper and engages a second stage chute via a time-delay cutter. A 175-foot drop occurs from the time of exit from the aircraft until full opening of the main chute.

Testing of the parachute with volunteer jumpers is programed for FY79. Prototype systems are currently being assembled for airdrop dummy testing.

Roland Intercepts Drone During WSMR Tests

Photo by Boeing Aerospace

In its first flight against a moving target, the supersonic U.S. Roland missile (above) roars from its launch tube to successfully intercept a drone during a test of the short-range, all weather air defense system at White Sands Missile Range, NM.

The tests are designed to evaluate the U.S. Army's role in transferring European Technology to the U.S. for production and deployment.

Hughes Aircraft and Boeing Aerospace Companies are manufacturing the Roland under joint license from Euromissile, a French-German consortium that developed the weapon system.

Conferences & Symposia . . .

Army PM Convenes Smoke Symposium II at HDL

COL Henry R. Shelton

Smoke Symposium II, the second such meeting of its kind to coordinate an Army-wide effort for test and evaluation of electro-optical systems in simulated battlefield environments, was held, 25-26 April at the Harry Diamond Laboratories, Adelphi, MD.

Convened by Army Project Manager for Smoke/Obscurants COL Henry R. Shelton, the meeting was attended by representatives of the U.S. Army, Air Force, Navy, Marine Corps, industry and the academic community.

More than 170 participants, including key personnel from the United Kingdom, Canada and Sweden, reportedly contributed to the success of the symposium goal. The primary goal is to provide progress reports on significant obscurant/electro-optical achievements and to identify areas of concern.

Presentations during the first day and a half of the symposium included the following categories: Tactical Use of Smoke by Field Commanders; Field Characterizations of Natural and Man-Made Aerosols; Methodology/Instrumentations, Effectiveness of U.S. Inventory Smoke Munitions, Basic Technology Programs in Smoke/Obscurants; and DARCOM Policy Related to Evaluation of Electro-optical Systems in Degraded Visibility.

The concluding afternoon session, which was limited to U.S. Government Agency participation, was keyed to the effects of characterized smoke and limited dust on fielded and developmental systems as determined by earlier tests at White Sands Missile Range and Dugway Proving Ground.

Some significant highlights and conclusions of the symposium were:

- Extensive progress has been achieved since the last Smoke Symposium as a result of establishment of an Army Training and Doctrine Command System Manager to insure that user total system efforts are integrated into the acquisition cycle; the numerous TRADOC field experiments; quantitative characterizing smokes and dust in the field through Dugway's application of the Man-portable Common Thermal Night Sight test at WSMR; and Dugway's Smoke Week.
- There is a need to continue improvements in methodology/instrumentation, particularly in the characterization of dust.
- The Smoke Week concept, whereby the PM Smoke makes available to developers of electro-optical devices a characterized smoke/dust environment for evaluation of countermeasuring effects on such systems, has been successful in generating interest, participation, and meaningful data.
- Several noteworthy efforts have been initiated to validate smoke predictive models and to incorporate smoke into force-on-force models. Much work remains to be done to gain confidence in these tools for evaluating electro-optical systems. Expansion of the modeling efforts to include all battlefield aerosols (smoke, dust, natural) remains a technological challenge.
- There is need for continued coordination, exchange of technical data and dialogue among developers and users in the Smoke/Obscurant and electro-optical communities.
- Smoke Week and the Smoke Symposium are being planned as annual events to satisfy the continuing need for data on battlefield obscurants by the electro-optical community.

Proceedings of Smoke Symposium II (classified) will be published and distributed in June.

APG Hosts 23d Electronics Warfare Conference

Ongoing activities related to electronic warfare, infrared, visual and electronic countermeasures and counter-countermeasures developments were discussed by U.S. Army, Navy and Air Force representatives at the 23d Annual Joint Electronic Warfare Conference, 1-5 May, at Aberdeen (MD) Proving Ground.

Attended by more than 200 military and civilian members of the Department of Defense test community, the meeting was coordinated for the Army by the Test and Evaluation Command, headquartered at APG.

Under Secretary of the Army Dr. Walter B. LaBerge delivered a keynote address, and MG Charles D. Daniel Jr., commander of the U.S. Army Electronics Research and Development Command, was banquet speaker. The classified nature of many of the discussion topics precludes publication of their content.

Future Army Requirements Symposium Held

At Fort Benning, GA, 23-25 Apr. 1978, over 500 military and industry representatives met to review the Army's future materiel requirements in a symposium sponsored by the Association of the U.S. Army (AUSA).

In classified sessions held in Infantry Hall, attendees received a series of overview briefings designed to provide industry with guidance as to future Army needs. Initial presentations were framework in nature, covering the probable U.S. strategic course, an assessment of Soviet forces, and review of Soviet doctrine and tactics of the 1980 time frame.

LTG Edward C. Meyer, Deputy Chief of Staff for Operations and Plans, Department of the Army, in giving his assessment of the strategic overview for the 1980s, noted that a crucial concern for the United States in the years ahead will be its ability to continue to project its national military power abroad. The General noted the need for the U.S. to strengthen its total mobilization capability because of the importance it plays as deterrent factor, and the Army's reliance on industry to foresee some of the imponderables and find workable solutions.

A very sobering evaluation of the future of Soviet military strength and the possible projection of this power was presented by LTG Hal Aaron, Deputy Director, Defense Intelligence Agency. This was followed by a discussion of Soviet doctrine and tactics of the 1980s by BG Albert N. Stubblebine III, CG, U.S. Army Intelligence Center.

GEN Donn A. Starry, Commander, Training and Doctrine Command, then provided the audience with a review of U.S. Army concepts, doctrine, and requirements for the 1980s. He pointed out to industry areas where he believed the Army needed their help. To do this it was essential, he said, that industry understand how the Army intends to fight. Such an appreciation will then lead to needed improvements in materiel and training.

The afternoon of the first day was devoted to presentations by teams from the Infantry, Armor, Aviation, Artillery, Engineer, and Air Defense Centers, stressing those areas that each saw as needing industry's support to meet future needs.

The banquet speaker in the evening of 24 Apr. was Vice Chief of Staff, GEN Walter T. Kerwin Jr. He noted that former Chief of Staff Abrams had in 1973, directed a study be done to assist the Army in determining future actions and roles. The study group, said Kerwin, was remarkedly accurate in its perceptions of future events, but one major condition not recognized was the rapid emergence of the Soviet Union as a global power, able to project its will and influence anywhere in the world.

General Kerwin noted that a recent article in *Christian Science Monitor* pointed out that for the past 33 years the U.S. has had its military forces wherever national interests were believed threatened or imperiled. Is it important to civilization and to the United States, the article continued that civilization and the United States continue to enjoy this freedom of deployment? Or will U.S. purposes be served adequately in a world where the Soviets can also protect their power far beyond their own border? The answer, said Kerwin, will form the basis of our overall military strategy.

To retreat to a position of national isolationism, GEN Kerwin noted, would, in his opinion, be far more costly in defense expenditures than the current strategy.

A return to the U.S. as the dominant gobal power also appears unlikely. We have opted for a middle course between dominance and isolation. The President has stated, he continued, that the U.S. will do what it has to do, *in concert with its Allies,* to prevent any other nation gaining military superiority over us.

This means, Kerwin continued, that the most likely threats will be to the U.S. freedom of action rather than national survival. "We will be prepared to fight well forward rather than on our home territory."

To implement such a policy the Army must be a trained, equipped, ready to fight, ready for rapid deployment force in order to protect vital interests wherever they may be threatened.

When talking of the 1980s, GEN Kerwin continued, one is talking about weapons and equipment already in development. Looking further ahead, new equipment and weapons "will be designed as fully integrated systems. We will seek to reduce or limit personnel requirements for the equipment and for maintenance and resupply support. Requirements for individual and unit training will be considered from the outset of the developmental process."

For the future, the Army will focus, he said, on lightweight, easy to maintain weapons and equipment, with reduced demand for ammunition, support, energy, and operator skills.

The next ten years, said Kerwin, may well be like those between 1938-1948, periods of great change. The need for flexibility of mind to cope with unknown changes that lie ahead is vital. We must not be locked in by

"slavish invitation of past tactics and techniques . . . ."

General Kerwin then noted that these challenges are the very reasons the AUSA has sponsored such meetings.

On the following morning, teams from the Intelligence School, Signal Center, and Combined Arms Center reviewed future requirements in their respective areas.

The concluding afternoon session was the witnessing of a live-fire training exercise by a combined arms team. Following the demonstration numerous industry representatives were heard expressing the great value of being able to see at first hand many of the conditions of the battlefield under which their products must operate.

In the wrap-up remarks by LTG William B. Fulton, USA-Ret., Director of Public Affairs, AUSA, the general noted that any questions arising from presentation content could be directed to him at AUSA Headquarters, and he would see that they reached the program answering authority.

Frequency Control Meet Draws More Than 700

The 32d Annual Symposium on Frequency Control, sponsored by the U.S. Army Electronics Research and Development Command's Electronics Technology and Devices Laboratory, Fort Monmouth, NJ, was held 31 May-2 June at Atlantic City, NJ.

The sessions were well received, with more than 700 persons attending. The audience and the presenters represented a broad base of government, industry, academic, civilian and military, U.S. and foreign agencies.

Presentations, all unclassified, covered the following general areas: fundamental properties of quartz, surface acoustic wave devices—properties and applications, resonator theory, SAW materials and resonator observations, crystal filters, atomic and molecular frequency standards—new concepts and devices, resonator design, resonator processing the precision frequency standard as a system, A&M devices—application and evaluation, specification and measurement, frequency generation, and crystal oscillators.

The Electronic Industries Association will print the full Proceedings of the Symposium. Copies are expected to be available for sale in October 1978, at a cost of $10.00. Requests for copies should be accompanied by check or money order made out in that name and addressed to: Electronic Industries Association, Publication Committee, Annual Frequency Control Symposium, 2001 Eye Street, NW, Washington, DC 20006.

CSL Schedules Annual Technical Conference

The U.S. Army Armament R&D Command's Chemical Systems Laboratory, Aberden (MD) Proving Ground, has announced tentative scheduling of its annual technical conference for 23-24 May.

The meeting is designed to provide a forum for CSL's technical program employes, and to permit observation and evaluation of CSL's R&D programs by the U.S. Army, Navy and Air Force officials and staff members of Quadripartite embassy and liaison offices.

CSL Deputy Director Dr. B. L. Harris announcedd that Donald Elder, an engineer assigned to CSL's Programs Office, will serve as action officer and master of ceremonies for the conference.

In addition to the United States, the Quadripartite nations include the United Kingdom, Australia and Canada.

BRL Employe Conceives New Projectile Design

When the U.S. Army Science Conference convenes in June at West Point, NY, one of the featured papers will report on a new projectile design conceived by Anders Platou of the U.S. Army Ballistic Research Laboratory, ARRADCOM, Aberdeen (MD) Proving Ground.

Termed the corkscrew, the projectile design combines a twisted triangular nose with a twisted triangular boattail, or base, resulting in no circular cross sections. Platou, an aerodynamic engineer with BRL's Exterior Ballistics Laboratory, reports that the idea evolved from studies begun in 1944.

The projectile's exterior shape, says Platou, has extremely good aerodynamic qualities, with very low drag, and low pitching and Magnus moments. These characteristics will reportedly yield high gyroscopic and good dynamic stability.

Platou also points out that Magnus moments or force result from spinning, and that the new twisted surfaces provide excellent lifting at all Mach numbers or high speeds.

He also stated that longer projectiles in the 10 and 12 caliber range, of similar shape, can be flown at low angles, thus demonstrating that heavier payloads can be delivered from the gun to the target.

Army to Host Nondestructive Test Conference

The 27th Defense Conference on Nondestructive Testing, hosted this year by the U.S. Army, will be held in Yuma, AZ, from 24-26 Oct. Held annually, the meeting is hosted on a rotational basis by the U.S. Army, Navy and Air Force.

Primary purpose of the conference, which is attended by military and civilian scientists engineers, technicians and managers, is to provide a forum for the exchange of information regarding nondestructive test applications and potential solutions to problems.

Additional conference information may be obtained from: Edward Matzkanin, Host Chairman, Physical Test Section, STEYP-MLS, U.S. Army, Yuma Proving Ground, AZ 85364.

Career Programs . . .

Biomedical Equipment Technicians . . .

2 Army Personnel Earn Special Accreditation

Two military personnel at the U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL, have been awarded the Certified Biomedical Equipment Technician (CBET) qualification from the Association for the Advancement of Medical Instrumentation.

SSGs J. Chase & Martha Narey

Applicants seeking to earn this accreditation must achieve three years of experience in the field of biomedical equipment maintenance and pass a rigorous examination.

SSG Joseph D. Chase, a former Army aviator, was initially exposed to biomedical equipment maintenance through on-the-job training, and later attended the Advanced Biomedical Electronics Equipment Course. Today, he does everything from welding supports to repairing intricate X-ray equipment.

He is believed to be the only biomed repairman on flight status in the U.S. Army, and this makes him of even greater value to his installation because research data is collected in airborne helicopters as well as in the laboratory.

SSG Martha A. Narey is reportedly the first woman to have earned certification as a biomedical equipment technician, and the first woman to graduate from the Advanced Biomedical Electronics Equipment Course.

She is currently assigned as chief repairman of the Aeromedical Research Laboratory's electronic biomedical equipment, but was recently selected as a Warrant Officer in the medical maintenance field. In fact, SSG Narey will shortly become the first woman Warrant Officer medical equipment repair technician.

Backed by nine years of military service, she has previously served assignments as a computer programer, an illustrator, a cartoonist, and a signal electronics communications maintenance person.

103 Personnel Selected for 1978 MARED Program

A total of 103 personnel, representing a variety of career disciplines, have been selected for participation in the 1978 U.S. Army Materiel Development and Readiness Command Materiel Acquisition and Readiness Executive Development (MARED) Program.

The MARED program was initiated in 1976 as a means of providing career development training opportunities for civilian employes whose records indicate high potential for executive responsibilities.

Selection into the program is based upon a review of GS-13 through GS-15 applicants who are employed in the fields of science or engineering, procurement, quality and reliability assurance, supply management and materiel maintenance management.

All selectees must commit themselves to geographical mobility and five years of additional U.S. Government service.

Qualifications of all applicants are reviewed at the field command level, with additional review by a DARCOM career program panel. A high level MARED Board makes the final determination of selectees. More than 200 applicants were nominated for 1978 consideration.

A 4½-day seminar will be held from 25-29 June at San Antonio, TX, to

provide selectees with individual counseling, an Individual Development Plan (IDP) outlining short and long range training and duty assignments, and to present an overview of DARCOM's present and future management picture.

DARCOM Commander GEN John R. Guthrie will present the keynote address at this year's seminar. Separate addresses will also be presented by LTG Robert J. Baer, DARCOM deputy commander for Materiel Development; LTG Eugene J. D'Ambrosio, DARCOM deputy commander for Materiel Readiness; and MG Robert L. Bergquist, DARCOM deputy commander for Resource Management.

Listed by their activity/agency, the 1978 MARED program selectees and their job titles are: *HQ U.S. Army Materiel Development and Readiness Command.* Philip W. Beaumont, procurement analyst; John J. Boyle, quality assurance specialist; Matthew T. Brussock, supply management specialist; Carter H. Cowan, new equipment training manager; Mark Donovan, procurement analyst; Douglas W. Driskill, logistics management specialist; Kenneth D. Griffiths, procurement analyst; Raymond A. Kelly, procurement analyst; Daniel W. Marks, electronics engineer; William P. Neal, general engineer; John W. Shepard, procurement analyst; Willard F. Stratton, supervisory general engineer; Carroll A. Tillman, operations research analyst.

HQ U.S. Army Armament R&D Command. George M. Curran, contract specialist; Nova J. Hughes, supervisory contract specialist; Richard W. Hutchinson, chemical engineer; Nicholas Montanarelli, physical science administrator; Fritz Oertel Jr., general engineer.

HQ U.S. Army Armament Materiel Readiness Command. Edwin W. Anderson, industrial engineer; Rodney W. Blaske, supervisory inventory management specialist; Elijah Craighead, supervisory general engineer; Eugene W. Eiklor, supervisory contract specialist; Larry A. Guerrero, supervisory operations research analyst; Richard W. Janik, supervisory industrial engineer; John W. Jones, supervisory contract specialist; Frank W. Kern, supervisory equipment specialist; Peter C. Lui, chemical engineer; Kenneth W. Maly, operations research analyst; Jimmy C. Morgan, supervisory industrial engineer; Thomas J. Redling, general engineer; Fred W. Taylor Jr., civilian operations officer; Gary L. Wagler, contract specialist; Walter R. White, supervisory industrial engineer.

HQ U.S. Army Aviation R&D Command. Nathan H. Saunders, operations research analyst; Delmer L. Short, supervisory aerospace engineer; Lawrence C. Taylor, supervisory quality assurance specialist; David J. Weller, mechanical engineer; Wayne A. Wesson, operations research analyst.

HQ U.S. Army Troop Support and Aviation Materiel Readiness Command. William B. Divin, supervisory inventory specialist; Paul L. Hendrickson, supervisory inventory management specialist; Barbara H. Lyles, operations research analyst; Rudolph Scott, supervisory inventory management specialist; Calvert L. Worth, supervisory inventory management specialist.

HQ U.S. Army Communications and Electronics Materiel Readiness Command. Aubrey V. Adkins, electronics engineer; Eugene P. Bennett, supervisory supply management specialist; Richard J. Caccamise, operations research analyst; Kenneth A. East, operations research analyst; Barry Kline, supervisory supply management specialist; Wallace G. Pope', logistics management specialist; Seton M. Reid, operations research analyst; Bertram Skolnick, electronics engineer.

HQ U.S. Army Communications R&D Command. George E. Brown, electronics engineer; Ingrid A. Eldridge, electronics engineer; Maureen E. MacFarland, supervisory program analyst; Barbara L. Valeri, operations research analyst; *HQ U.S. Army Tank-Automotive R&D Command.* Frederick N. Kisbany, supervisory mechanical engineer. *HQ U.S. Army Mobility Equipment R&D Command.* Alayne A. Adams, research chemist; Larry I. Amstutz, physicist; Ib A. Berg, physical scientist; John R. Gonano, physicist; Howard C. Webb Sr., electronics engineer. *HQ U.S. Army Electronics R&D Command.* Richard V. Bertolini, electronics engineer; Frank L. Murphy, supervisory general engineer; James R. Predham, physicist; Louis E. Williamson, physical science administrator.

HQ U.S. Army Missile R&D Command. Richard K. Dudney, electronic engineer; Bobby D. Guenther, research physicist; Anthony W. Horton, mathematician; Vernon A. Kerry, contract specialist; Zane M. Phillips, contract specialist; Victor W. Ruwe, electronics engineer; Tilden S. Tippit, electronics engineer; *HQ U.S. Army Missile Materiel Readiness Command.* Joseph W. Camp Jr., general engineer; Leroy T. Gregg, supervisory equipment specialist; Jacque H. Laney, inventory management specialist; Lara Marcelo, supervisory general engineer; Billie W. Slagle, inventory management specialist.

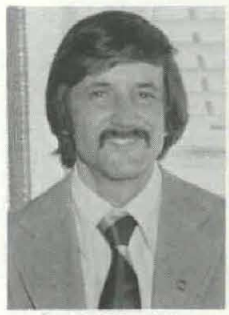
HQ U.S. Army Natick R&D Command. Gregory C. De Santis, supervisory physical science administrator; Miriam H. Thomas, research chemist; Charles R. Williams, physicial science administrator; *HQ U.S. Army Test and Evaluation Command.* Glenwood E. Bradley, supervisory electronics engineer; Mary J. Carroll, physical scientist; Roberto Gonzalez, electronics engineer; Terry W. Horton, mathematician; Curtis F. Jones, physical scientist; Ronald P. Lenert, supervisory mechanical engineer; Roddy C. Metroka, electronics engineer.

U.S. Army Security Assistance Center. Antonio D'Ambroiso, operations research analyst; Daniel J. Kelleher, supply systems analyst; Charles H. Rock, logistics management specialist; *Vint Hill Farms.* Barbara L. Strippich, supervisory contract negotiator.

Corpus Christi Army Depot. John B. Jones, aircraft maintenance manager; William N. Peacock Jr., supply management officer; Jimmy Welch, aircraft maintenance manager; Don Wells, industrial engineer; *Quality Assurance Field Activity, Lexington Blue Grass Army Depot.* Victor K. Evans, quality assurance specialist; *HQ U.S. Army Depot System Command.* Billie G. Murphy, supervisory general engineer; *Project Manager's Office, SMOKE.* Julius B. Miller, general engineer; *Army Logistics Management Center.* Edward T. Lovette, procurement analyst.

Project Manager's Office, Munitions Production Base Modernization and Expansion. Pierre A. Marceau, industrial program specialist; *Communications Systems Agency.* Joseph M. Valasquez, electronics engineer; *Presidio of San Francisco.* Charles E. Slyker, supervisory operations research analyst; *Army Satellite Communications Agency.* Bernard C. Price, general engineer.

3 Ballistic Laboratory Employes Selected as Fellows



Dr. A. Dietrich

Dr. W. Sturek

Donald F. Menne

Three employes of the U.S. Army Armament R&D Command's Ballistic Research Laboratory, Aberdeen (MD) Proving Ground, were named BRL Fellows in recognition of scientific and technical achievements.

Dr. Andrew Dietrich, chief of BRL's Shaped Charge Branch, Warhead Mechanics Division, was cited for research and supervision in the Crossing Velocity Research Program, a high-priority effort to determine flight characteristics and dynamic motion of armored targets on the performance of high explosive and antitank warheads.

Employed at BRL since 1968, Dr. Dietrich was a recipient of a 1977 Army R&D Achievement Award, and won second prize at the 1974 Army Science Conference. His memberships include the American Association for the Advancement of Science, the American Society for Metals and Tau Beta Pi national honorary engineering society.

Dr. Walter Sturek is acting chief of the Air Dynamics Branch, Launch and Flight Division. He has been recognized for his work on the supersonic turbulent boundary layer development in an adverse pressure gradient, and for a technique for computing Magnus effects on artillery shells.

A BRL employe since 1965, Dr. Sturek has presented papers at the past two Army Science Conferences. He is a member of the American Society for Mechanical Engineers and the American Institute for Aeronautics and Astronautics.

Donald F. Menne, assigned to the Ballistic Modeling Division, is responsible for coordinating all BRL efforts in armor and armaments. He is currently organizing a vulnerability methodology team to develop new tools for evaluating the vulnerability of armored combat vehicles and lethality of antiarmor munitions.

Credited for scientific and engineering achievements in the design, development and evaluation of the XM1 Tank System, Menne has also developed a key technology program in support of the Army's Cannon Launched Guided Projectile. He joined BRL in 1951 as an enlisted man in the Army's Scientific and Professional Program.

C&GSC Publishes 1976-77 Master's Abstracts

Brief abstracts of all Master of Military Art and Science Theses and Special Studies submitted by students at the U.S. Army Command and General Staff College during 1976-77 are listed in an annual publication of the U.S. Army C&GSC.

Legislation authorizing award of the Master of Military Art and Science

degree by the Command and General Staff College was enacted by Congress in 1974. This legislation prescribed that the MMAS program require that a thesis be completed by all graduating students, and that the College attain affiliate or member status with the North Central Association of Colleges and Schools.

Full accreditation as a master's degree institution was granted to the College by the North Central Asociation on 31 Mar. 1976, representing signal recognition for the quality of military education in general, and for the C&GSC in particular.

Compiled by Drs. L. L. Sims (MAJ USAR) and MAJ A. D. Officer, Office of the Director, Graduate Programs, the 1976-77 abstract book contains the title, author, descriptive summary, and number of pages of each master's thesis.

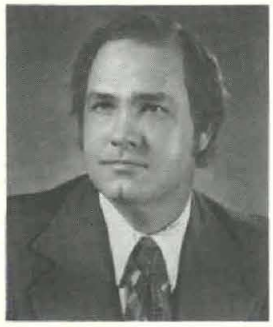
General subject areas include logistics, military unions, R&D, Reserve components, the Soviet Union, leadership, fire support, World War II, communications, artillery, armor, air support and medical.

Copies of theses written after 1975 have been placed on file in the Defense Documentation Center (DDC) and are available for public use. These can be requested by using accession numbers which are included in the latest master's theses index. Address request to: Defense Documentation Center, ATTN: TSR, Cameron Station, Alexandria, VA 22314.

Copies of *all* theses are on file in the Command and General Staff Library and may be obtained through interlibrary loan channels. Borrowing agencies may contact: Interlibrary Loan, USACGSC Library, Bell Hall, Fort Leavenworth, KS 66027.

WES Physicist Chosen for Executive Training

Jerry W. Brown, a research physicist at the U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, was recently selected to receive four months of executive development training in the Department of the Army Office of the Deputy Chief of Staff for Research, Development, and Acquisition.



Jerry W. Brown

Brown will be working with Director for Army Research Dr. Marvin E. Lasser, whose office is responsible for management of Army RDT&E activities and acquisition planning, programing and budgeting.

During his term of training, Brown will be provided an opportunity to observe, first hand, how research requirements evolve. He was chosen for the executive development program from a field of nominees submitted by each of the five Corps of Engineers laboratories.

Graduated from Oklahoma State University with a master's degree in mathematics, he is currently assigned as chief of WES's Explosive Excavation Division. His responsibilities include supervision of studies in military and civil applications of nuclear and chemical explosives.

Awards . . .

K. C. Emerson Receives Secretary of Defense Award

In an impressive ceremony, attended by a large number of high-ranking and distinguished guests, Dr. Kary C. Emerson was presented the Secretary of Defense's Meritorious Civilian Service Award by Under Secretary of the Army Walter B. LaBerge.

Under Secretary of the Army Dr. Walter B. LaBerge awards Secretary of Defense Meritorious Civilian Service Award to Dr. Kary C. Emerson, as wife Rebecca looks on.

This award, one of the highest awards a civilian employe of the Defense establishment may receive, cited Dr. Emerson's meritorious service to the Department of Defense while serving as Deputy for Science and Technology to the Assistant Secretary of the Army (Research, Development, and Acquisition), and for periods when Dr. Emerson served as Acting Assistant Secretary of the Army (Research and Development).

Secretary of Defense Harold Brown's citation specifically noted Dr. Emerson's "singular ability to supervise and conduct thorough and objective analyses, necessary scientific and technical data was provided the Congress to support the President's plan for transportation of obsolete chemical munitions safely to a seaport for ocean dumping."

Dr. Emerson has announced plans for his retirement, and his forth-coming step has already occasioned expressions of regret at his departure. One senior official noted in a letter to Dr. Emerson that "despite the many constraints within which the [Army's] laboratories exist today, we would be in considerably worse shape had it not been for your efforts and direction . . . ."

Upon retirement "KC", as he is popularly known, intends to pursue his entomological research and writings, as well as his more recent avocation of becoming a geneological research expert.

He has been credited to date with discovering and describing in scientific journals, some 300 new species of insects. His scientific books and papers have been published throughout the English speaking countries, Denmark, India, and Thailand.

Standing with Dr. Emerson as he received the medal from Under Secretary LaBerge was his wife, Rebecca, a commissioned officer (O-6) with the Public Health Service, stationed at the Clinical Center, NIH, Bethesda, MD. The Emersons have three sons, MAJ William K. Emerson, 11th Armored Cavalry Regiment, Germany; CPT James B. Emerson, U.S. Army Hospital, Berlin; Robert E. Emerson, a mechanical engineer with Stanford Research Institute.

Among the distinguished list of attendees were Vice Chief of Staff GEN Walter T. Kerwin; GEN Harold K. Johnson (USA, Ret.); LTG Howard H. Cooksey (USA, Ret.); LTG and Mrs. William Gribble (USA, Ret.); LTG Walter Lotz (USA, Ret.); LTG J. W. Morris, Chief of Engineers; LTG John R. McGiffert, Director of the Army Staff; MG Surindar Bhaskar, OTSG; MG Larry H. Williams, OJAG; MG Robert J. Lunn, DARCOM: MG E. N. Peixotto, DCOA, BG George Snead (USA, Ret.); Norman R. Augustine, former Under Secretary of the Army; David C. Hardison, OUSA; Dr. Richard Haley, DARCOM; Norman L. Klein, DARCOM: Jack E. Hobbs, OASA (IL&FM), and a large number of other past and present associates of Dr. Emerson.

Edith L. Birkle Ends 53 Years of Government Service

CERTIFICATE OF APPRECIATION is presented to "Edie" Birkle by Deputy Chief of Staff for R,D&A LTG Donald R. Keith.

Miss "Edie" Birkle, a long-time budget analyst with the Office of the Deputy Chief of Staff for Research, Development and Acquisition, officially retired effective 1 Apr. 1978.

Miss Birkle's service extended across the span of 10 of the 38 men who have been President of the United States, starting with Calvin Coolidge in 1924. At that time she began her government service with a temporary appointment in the Veterans Administration. A year later she transferred to the Army Adjutant General's Office. This was followed by a short period of service with the Department of Commerce.

Her real lifetime career in financial management started in 1926, when she rejoined the Army to serve in the Office of the Army Chief of Finance. In 1953, "Edie" joined the R&D Directorate of the Office of the Assistant

Chief of Staff, G-4 (Logistics), and since that time has been a career budget analyst with the Office of the Chief of Research and Development and the Office of the Deputy Chief of Staff for Research, Development, and Acquisition.

Miss Birkle was the recipient of nine Outstanding Performance Ratings and Sustained Superior Performance Awards between 1966 and 1973. In 1976 she was awarded the Meritorious Civilian Service Medal, the second highest decoration the Army can award a civilian employe.

At a previous party held two years ago in honor of her fiftieth year of service, Miss Birkle was the recipient of several gifts and momentos. (See September/October 1975 *Army R&D Newsmagazine.*) Among the items given her was a personal letter of congratulations signed by President Gerald R. Ford, and a gold diamond-studded pin in recognition of her half century of service.

Miss Birkle's official retirement was celebrated by a luncheon at Cameron Station on 30 Mar. 1978, and the official retirement ceremony the following day in the Office of LTG Donald R. Keith, Deputy Chief of Staff for Research, Development, and Acquisition.

The luncheon was attended by approximately 100 associates and friends, headed by GEN John R. Guthrie, DARCOM commander. The affair was highlighted by recollections of "Edie's" many accomplishments and contributions by Charles R. Woodside, Paul A. Turner, COL Richard L. Nidever, MG Ernest N. Peixotto, and MG Philip R. Feir, the latter also revealing and demonstrating for the first time the recipe for Miss Birkle's famous Pentagon Punch.

Edie plans to continue to reside in the Washington, DC, area and enjoy her hobbies of stamp and coin collecting and bowling.

Dr. Carlson Receives Second Meritorious Award

A second Meritorious Civilian Service Award, the Department of the Army's second highest honor for civilian employes, has been presented to Dr. Richard M. Carlson, director of the U.S. Army Aviation R&D Command's Research and Technology Laboratories, NASA Ames Research Center, Moffett Field, CA.

Dr. Richard M. Carlson

Signed by Secretary of the Army Clifford L. Alexander Jr., the citation noted that Dr. Carlson's contributions to the Army's aviation R&D program and other "high priority" technology programs have resulted in an effective relationship between the Army and the National Aeronautics and Space Administration.

Commander of the Aviation R&D Command MG Story C. Stevens, presented Dr. Carlson's award during AVRADCOM's Commander's Conference at the Hughes Helicopter Plant Activity.

Dr. Carlson has served as director of the Research and Technology Labs (formerly AMRDL) since 1975, and was the 1974 recipient of the American Helicopter Society's Honorary Fellowship Award for contributions to the advancement of rotary wing aeronautics..

He graduated with BS and MS degrees in aeronautical engineering from the University of Washington, and holds a PhD in engineering mechanics from Stanford University, where he has conducted classes in VTOL aerodynamics, aeroelastic problems and configuration design.

A registered mechanical engineer in California, Dr. Carlson was the first foreign member of the Swedish Society of Aeronautics and Astronautics, and is a Fellow of the Royal Aeronautical Society, and an Associate Fellow of the Institute of Aeronautics and Astronautics.

Personnel Actions . . .

36 Colonels Designated for Temporary BG Rank

Appointment of the following 36 colonels to the temporary grade of brigadier general has been approved by President Carter, and announced by the Department of the Army:

John E. Rogers, deputy assistant chief of staff, I Corps (ROK/U.S.) Group; James N. Ellis, executive director, Engineer Staff, Office, Chief of Engineers; William H. Schneider, chief of staff, 25th Infantry Division, Schofield Barracks; Elmer D. Pendleton Jr., commander, 1st Corps Support Command, Fort Bragg; Thurman E. Anderson, chief of staff, 1st Armored Division, U.S. Army Europe; Joseph O. Lax Jr., project manager, Light Antitank Weapon (Viper) and Advanced Heavy Antitank Weapon (AHAMS); Arron L. Lilley Jr., deputy chief of staff for Logistics, First U.S. Army, Fort George G. Meade; Joseph J. Leszczynski, project manager, Training Devices, Training Device Agency; James A. Teal Jr., executive to the Assistant Chief of Staff for Intelligence; and

James R. Henslick, chief of staff, VII Corps, U.S. Army Europe; Charles D. Franklin, chief of staff, 9th Infantry Division and Fort Lewis; Leo A. Brooks, commander, 13th Corps Support Command, Fort Hood; Kenneth A. Jolemore, chief, Supply Policy Division, Office, Army Deputy Chief of Staff for Logistics; John R. Galvin, chief of staff, 3d Infantry Division, U.S. Army Europe; David L. Buckner, deputy assistant commandant, U.S. Army Infantry School, Fort Benning; Hugh S. Robinson, district engineer, Los Angeles Engineer District; Gary S. Hutchinson Jr., deputy community commander, U.S. Army Europe; Carl H. McNair Jr., executive to the Deputy Chief of Staff for Research, Development and Acquisition, DA; and

Eugene S. Korpal, deputy assistant commandant, U.S. Army Field Artillery School, Fort Sill; Richard A. Scholtes, brigade tactical officer and deputy commandant of Cadets, U.S. Military Academy; H. Norman Schwarzkopf, commander, 1st Brigade, 9th Infantry Divison, Fort Lewis; Robert C. Forman, assistant chief of staff, G-3, VII Corps, U.S. Army Europe; John P. Prillaman, profesor of Military Science, Virginia Military Institute; John A. Hemphill, chief of staff, 7th Infantry Divison, Fort Ord; Vincent M. Russo, commander, 4th Transportation Brigade, U.S. Army Europe; Robert C. Hawlk, director, Plans, Doctrine, and Systems, HQ U.S. Army Materiel Development and Readiness Command; Leroy N. Suddath Jr., chief of staff, U.S. Army Training Center and Fort Dix; and

Lawrence F. Skibbie, deputy commander for Ammunition Readiness, U.S. Army Armament Materiel Readiness Command; Edward L. Trobaugh, executive assistant to the Commander in Chief, Pacific; Dale A. Vesser, fellow, Center for International Affairs, Harvard University; Frank H. Baker, deputy commander, 5th Signal Command, U.S. Army Europe; Andrew P. Chambers, commander, Division Support Command, 9th Infantry Division, Fort Lewis; Benjamin F. Register, commander, U.S. Army Maintenance Plant, U.S. Army Europe; Paul P. Burns, deputy commander for Automation, U.S. Army Finance and Accounting Center; Dallas C. Brown Jr., commander, U.S. Army Field Station, U.S. Army Intelligence and Security Command; and Robert M. Joyce, U.S. Army Military Personnel Center, and adjutant general U.S. Army Europe.

8 Personnel Slated for DARCOM PM Assignments

Selection of eight military personnel for future assignments as project managers was announced recently by the U.S. Army Materiel Development and Readiness Command.

COL Jay W. Pershing, currently director of Weapon Systems Management at DARCOM's Troop Support and Aviation Materiel Readiness Command, St. Louis, MO, will assume new duties in December as project manager for the Army Container Oriented Distribution System.

Commissioned in the Army Transportation Corps in 1954, COL Pershing holds a bachelor's degree in animal husbandry from Purdue University, and a master's in business administration and transportation/traffic management from Michigan State University.

COL James L. Tow has been chosen as project manager for the CH-47 Modernization Program, U.S. Army Aviation R&D Command, St. Louis, MO. He has served since 1975 as project manager for the 2.75-inch Rocket System, Army Missile R&D Command, Redstone Arsenal, AL.

A graduate of the U.S. Military Academy, COL Tow has bachelor's and master's degrees in aeronautical engineering from Georgia Technological Institute, and has completed course requirements at the Army Command and General Staff College and the Army War College.

COL Joseph D. Bennett, deputy division engineer, U.S. Army Engineer Division, Middle East, has been picked to become project manager for the Family of Military Engineer Construction Equipment; and Universal Engineer Tractor, U.S. Army Mobility Equipment R&D Command, Fort Belvoir, VA.

He earned a bachelor's degree in building construction from the University of Florida, a master's degree in industrial engineering from Arizona State University, and is a graduate of the Army Command and General Staff College, and Army Engineer Officer Courses.

COL Neil S. Williamson, director/commander, Fire Control and Small Caliber Weapon Systems Laboratory, U.S. Army Armament R&D Command, Dover, NJ, has been named as future project manager of the TOW/Dragon Guided Missile System, U.S. Army Missile Materiel Readiness Command, Redstone, AL.

COL Williamson's academic credentials include a BS degree from the U.S. Military Academy, and an MS degree in mechanical engineering from the University of Michigan. He has also completed the Army Command and General Staff College, the Industrial College of the Armed

Forces, and the Defense Systems Management School.

COL Paul C. Bayruns, will become the new project manager for the M-60 Tank, following completion of the Industrial College of the Armed Forces. He graduated from the University of Kentucky with a BS degree in electrical engineering, and from the Air Force Institute of Technology with an MS degree in logistics management.

COL William P. Farmer, director of Personnel, Training, and Force Development, U.S. Army Armament R&D Command, has been selected for future assignment as PM for Nuclear Munitions. A 1956 graduate of the U.S. Military Academy, he holds an MSME from Mississippi State University, and has completed the Naval War College.

Also selected for project management assignments, are COL Monte J. Hatchett, who will become PM for Kuwait/Jordan Missile Systems, and LTC (P) Alan B. Salisbury, future PM for the Single Channel Ground and Airborne Radio Subsystem (biographical data was unavailable).

Doyle Picked as Armor Center/Fort Knox DC

BG David K. Doyle, assistant commandant, U.S. Army Armor School, Fort Knox, KY, since 1977, has been assigned additional responsibilities as deputy commander, U.S. Army Armor Center and Fort Knox.

BG David K. Doyle

BG Doyle served during 1975-76 as deputy to the Director of the Army Staff (Staff Action Control), Office of the Army Chief of Staff), and commanded the 3d Armored Cavalry Regiment, Fort Bliss, TX, from 1973-75.

Listed among his earlier tours of duty are chief, Staff Management Division, Office, Army Chief of Staff; assistant secretary of the General Staff, Office of the Army Chief of Staff; and senior adviser, Dong Da National Training Center Adviser Detachment, MACV.

BG Doyle has a BS degree in military science from the University of Maryland, an MS degree in international relations from George Washington University, an MMAS in military science from Command and General Staff College, and completed the Armor School and National War College.

His military honors include the Silver Star with two Oak Leaf Clusters (OLC), Legion of Merit with two OLC, Bronze Star Medal with "V" device and three OLC, Meritorious Service Medal with OLC, Air Medals, Army Commendation Medal with OLC, and the Purple Heart.

Brown Chosen as Training Study Director

BG Frederick J. Brown III, former deputy commander, U.S. Army Armor Center and Fort Knox, KY, has assumed new duties as director, U.S. Army Training Study, Fort Knox.

BG Frederick J. Brown III

Graduated from the U.S. Military Academy, BG Brown holds an MA degree in international relations from the University of Geneva, Switzerland, and a PhD in political science from the Graduate Institute of International Studies, Geneva, Switzerland. He has completed the Army Armor School, Armed Forces Staff College, and National War College.

During 1976-77 BG Brown was chief, Readiness Group, U.S. Army Readiness Region VI, Fort Knox, following tours as commander, 1st Brigade, 2d Armored Division, Fort Hood, TX; commander, HQ Command, Fort Campbell, KY; executive officer, G-1 and installation director for Personnel, 101st Airborne Division, and executive officer, 1st Brigade.

Other key assignments have included military assistant to the Vice Chief of Staff, Office of the Army Chief of Staff, Washington, DC; military assistant to the Deputy Assistant to the President for National Security Affairs, Office of the President, Washington, DC; and operations officer, Office, Coordinator of the Army Studies, Office, Army Assistant Vice Chief of Staff.

BG Brown wears the Silver Star, Legion of Merit, Distinguished Flying Cross, Bronze Star Medal with five Oak Leaf Clusters (OLC), Meritorious Service Medal with two OLC, Air Medals, Joint Service Commendation Medal, and the Army Commendation Medal with two OLC.

O'Donohue Selected as Iranian Aircraft PM

COL John D. O'Donohue is the new Department of the Army Project Manager of the Iranian Aircraft Program, U.S. Army Troop Support and Aviation Materiel Readiness Command, St. Louis, MO, following service as commander of U.S. Army Depot Activities, England.

COL John D. O'Donohue

Commissioned in 1952, following graduation from Infantry Officers' Candidate School, COL O'Donohue has bachelor's and master's degrees in business administration, and has completed the Command and General Staff College and the Industrial College of the Armed Forces.

Included among his earlier career assignments are commander, 45th Support Group, 25th Infantry Division; commander of "Operation New Life" (a Vietnamese refugee camp in Guam); Office of the Deputy Chief of Staff for Logistics, DA; commander, 765th Aircraft Maintenance and Supply Battalion, Vietnam; and overseas tours in France and Korea.

COL O'Donohue is a Master Army Aviator and a recipient of the Legion of Merit with two Oak Leaf Clusters (OLC), Joint Service Commendation Medal, Army Commendation Medal with two OLC and the Air medal with six OLC.

Lockerd Named DARCOM SE&T Associate Director

John A. Lockerd, former technical director, Combat and Combat Support Systems Directorate, Fort Leavenworth, KS, assumed new duties in May as associate director for the Systems Evaluation and Testing Office, HQ U.S. Army Materiel Development and Readiness Command.

Graduated with a master's degree in business administration from Texas Christian University in 1960, Lockerd also holds a BS degree from Texas Tech College and has completed the resident course at the U.S. Army War College.

During 1968-72, he served as scientific adviser, U.S. Army Combined Arms Group (now the Combined Army Combat Developments Activity), Fort Leavenworth, following earlier assignments in the Office, Army Comptroller and the Office, Army Chief of Staff.

Additionally, Lockerd served on active Army duty with the Signal Corps, has been employed in private industry as a flight test engineer and a petroleum engineer, and was an operations research analyst with the U.S. Army Training and Doctrine Command.

Personnel Shifts May Impact on CSL's Mission

Three new personnel assignments in the Plans and Programs Office of the U.S. Army Armament R&D Command's Chemical Systems Laboratory, Aberdeen (MD) Proving Ground will reportedly impact on CSL's R&D mission.

William A. Barr, a chemical engineer formerly assigned to CSL's Munitions Division, has assumed new duties as CSL's Technical Industrial Liaison Officer. The TILO concept is geared to strengthening cooperation between the Army and industry, in meeting future Army materiel requirements.

Responsibilities for assuring a more rapid exchange of Army/industry R&D information have been assigned since 1974 to the U.S. Army Materiel Development and Readiness Command.

Barr began his federal career in 1942 with the Chemical Warfare Service's Pittsburgh Army Procurement District. He was awarded an Army Specialized Training Program certificate in 1944, and later worked as a research chemist on the atomic bomb project at Los Alamos, NM.

Graduated with a bachelor's degree in chemistry from Carnegie Mellon University, he is listed in *American Men in Science,* and holds a patent for antistatic agents for aviation jet fuels.

Susan K. Luckan has been appointed as the Chemical Lab's executive secretary of the Technical Cooperation Program. Her duties entail review of R&D documents and reports for use in international R&D programs.

Previously assigned as a chemist in CSL's Physical Protection Division, Mrs. Luckan has also been named dean of Edgewood Institute, the CSL university program which offers undergraduate and graduate science courses.

She holds a 1969 bachelor's degree in chemistry from the College of Notre Dame (Baltimore, MD), has received graduate training in electrochemistry and advanced analytical chemistry, and has authored or coauthored numerous articles related to gas chromatographic techniques.

Davanna E. Rembold, recently selected as an international standardiza-

tion specialist, will coordinate CSL's participation in international research, development and standardization programs for chemical and biological defense materiel.

International programs under her monitorship include the Quadripartite alliance (U.S., United Kingdom, Canada, Australia), NATO, the Mutual Weapons and Defense Development Data Exchange programs, and the Technical Cooperation Program.

Mrs. Rembold began her federal career in 1955 at Edgewood Arsenal. She served initially as a clerk typist and later progressed through the supply field until her appointment as a supply cataloger in Edgewood's Development and Engineering Directorate.

Goodwin Selected as HDL Acting Commander

COL Clifton R. Goodwin

COL Clifton R. Goodwin has been selected as acting commander of the U.S. Army Electronics Research and Development Command's Harry Diamond Laboratories, Adelphi, MD.

Graduated with a BS degree in civil engineering from the University of Maine, COL Goodwin has completed the Command and General Staff College, the Air Defense Electronic Warfare Course, the Combat Surveillance and Electronic Warfare Course, and the National Security Agency's Senior Cryptologic Course.

Included among his earlier assignments are assistant to the deputy chief of staff for R&D, U.S. Army Security Agency; Office, Chief of R&D, Electronic and Space Branch, Department of the Army; Military Assistance Command, Vietnam; and air defense adviser to the South Korean Army.

COL Goodwin is a recipient of the Bronze Star Medal, Meritorious Service Medal, Joint Service Commendation Medal, and the Army Commendation Medal with two Oak Leaf Clusters.

Lindberg Assumes Command of SATCOM Agency

COL Charles F. Lindberg

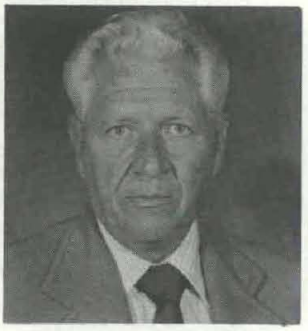
COL Charles F. Lindberg assumed new duties as commander of the U.S. Army Satellite Communications Agency, Fort Monmouth, NJ, and Army project manager for development, acquisition and initial fielding of ground terminals for the Defense Satellite Communications System.

He served formerly as a deputy project manager with the Defense Communications System, U.S. Army Communications Systems Agency. He is a graduate of Washington State University, holds an MS degree from George Washington University, and has completed the Command and General Staff College, Naval War College, and Signal Officer School.

Earlier tours include communications officer with the 2d, 9th, and 25th Infantry Divisions in Korea, Hawaii and Vietnam; and assistant signal officer, 1st Region Army Air Defense Command, Fort Totten, NY.

COL Lindberg is a recipient of the Legion of Merit with two Oak Leaf Clusters, the Bronze Star Medal with OLC, Meritorious Service Medal, Air Medal, and the Army Commendation Medal with OLC.

Kirkland Retires as Chief of OCE R&D Office



Terence G. Kirkland

Recent retirement of Terence G. Kirkland as chief, Research and Development Office, U.S. Army Office of the Chief of Engineers, ended more than 30 years of combined government and industry service in the fields of research and engineering.

Kirkland had assumed responsibilities for the Engineer Corps' five research laboratories last year, following earlier service as technical director, U.S. Army Mobility Equipment R&D Command, Fort Belvoir, VA.

He began his engineering career in 1947 as an Alaska coal mine operator, and was employed from 1948-64 with the Allis-Chalmers Manufacturing Co. He joined the Mobility Equipment R&D Command in 1964 with an assignment in advanced power plant engineering.

Army R&D — 15 Years Ago

The Army R&D Newsmagazine reported on . . .

New Fuel Cell Regarded as Significant Advance

Fuel cell electric power research achieved a major advance as a result of an Army concept when the General Electric Research Laboratory announced that an experimental cell efficiently uses inexpensive fuels.

Based on a theoretical approach suggested by scientists at the U.S. Army R&D Laboratories, Fort Belvoir, VA, originally funded under an Army contract and jointly financed with the Advanced Research Projects Agency since mid-1961, the new cell uses hydrocarbon fuels.

Propane, for example, has achieved efficiency as high as 40 to 50 percent, with further gains anticipated, as compared to about 25 percent efficiency for diesel engines and 12 to 15 percent for the average gasoline engine.

Drs. Thomas Grubb and Leonard W. Niedrach, chemists at the GE Research Laboratory, Schenectady, NY, demonstrated the new cell to representatives of the Department of Defense and the press. It operates at atmospheric pressure and in the moderate temperature of 250-400° F.

While the laboratory cell operates "to a surprisingly degree" on gasoline and diesel oil, its best efficiency to date has been achieved with propane. Hexane and octane also appear to react completely in the cell, forming harmless carbon dioxide and water as byproducts.

Army and other DOD leaders at the demonstration indicated general agreement that the development should result in far-reaching benefits for military ground forces.

DoD Officials Participate in Institute on RA

Key officials from the Department of Defense participated in the Eighth Institute on Research Administration, sponsored by the American University's Center for Technology and Administration in Washington, DC.

Focused on "Operational Problems in Government-Sponsored Research and Development," the Institute was directed by Maurice Apstein, associate technical director of the Harry Diamond Laboratories.

Adam Yarmolinsky, special assistant to the Secretary of Defense, presented the keynote address. A panel discussion on the Bell Report as pertains to improving in-house laboratory capabilities in the Department of Defense was chaired by Willis B. Foster, deputy assistant director (Research), Office of the Secretary of Defense (DDRE).

C. Robert Woodside, assistant for Programs, Office of the Assistant Secretary of the Army (R&D), presented the Army progress report on Bell Report recommendations as effected by provisions of Army Regulation 705–55.

ASAP Reduces Membership, Adds Consultants

Realignment of the Army Scientific Advisory Panel, limiting it to 25 members as compared to 55 or more in recent years, was made public when the ASAP convened 20-21 May at Aberdeen Proving Ground, MD.

Approved by Secretary of Defense Robert S. McNamara, the ASAP reorganization was directed by Secretary of the Army Cyrus R. Vance to make the high-level group of experts "more responsive to the needs of the Army."

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COST PERFORMANCE ANALYSIS CONFERENCE

Commander of the U.S. Army Materiel Development and Readiness Command GEN John R. Guthrie recently presented a keynote address at the Cost Performance Analysis Conference, sponsored by the Defense Systems Management College, and the U.S. Army Management Engineering Training Activity. Hearing his comments on "Cost Performance Analysis" was an audience comprised of acquisition managers and analysts from the Department of Defense, the military services, and industry representatives. The General indicated his desire that his remarks be emphasized.

GEN Guthrie opened his address by stating that the whole area of cost measurement and control—especially cost performance analysis—presents a great challenge. One of the most important and useful approaches to better cost control, he said, has been the application of the DOD Cost/Schedule Control Systems Criteria, which is intended to assure the adequacy of contractor management control systems and the generation of valid data.

He emphasized that analysis of cost and schedule performance data is important because it permits contractors and managers to make better management decisions and exercise more effective cost control.

GEN Guthrie appealed to those persons in the materiel business to design and manufacture capable equipment and get it to the field in the minimum time at an affordable cost. Cooperation between government and industry, he added, has never been more important than today.

He stressed that the Soviets are engaged in a massive, all encompassing force modernization program and are increasing the sophistication and performance of their equipment. We no longer can consider ourselves qualitatively superior in any meaningful sense, he said.

"The nature of the threat demands that we capitalize on our greatest asset, the superiority of our science and technology to modernize in the most practical way. It is here that industry know-how can make its greatest contribution—but only if we keep *costs* under control."

GEN Guthrie then followed with a brief discussion of his earlier experiences with cost analysis. He noted that the great potential for better cost and schedule control is lost if available data is not analyzed and made to produce essential management information needed by project and senior managers. He indicated that this was an area of earlier weakness which he recognized as needing correction.

GEN Guthrie stated that shortly after assuming command of DARCOM his "gut" feeling or perception was that the cost control was being given less emphasis that it had been during his earlier assignment at DARCOM. Since then, he has been trying to place increased emphasis on it at all levels.

Relative to the question of how acquisition costs can be controlled, the General said that some dollars are much easier to control than others. We can predict costs, use firm-fixed price contracts, and have little worry about surprises or cost overruns when purchasing commercial or low technology items, he stated.

However, said the DARCOM commander, when we are pushing the state-of-the-art, or when costs are not predictable, the government assumes part or all of the cost risk, and there is great potential for costs to run out of control.

GEN Guthrie added that we need to know that contractors are controlling costs; and we look to the Cost/Schedule Control Systems Criteria to help us do this. Effective analysis of the Cost Performance Report is also necessary so that our managers can exercise better cost control.

Cost/Schedule Control Systems Criteria and Cost Performance Reports are now being applied to more than 20 of the Army's largest acquisition contracts, including the XM1 Tank, the Advanced Attack Helicopter, the Black Hawk Helicopter, the Patriot Missile System, and the Fighting Vehicle Systems (Infantry Vehicle and Cavalry Vehicle).

Although the benefits of applying the Cost/Schedule Control Systems Criteria may be primarily intangible, said the General, they are no less real. General Guthrie cited several specific instances where tangible benefits have been recognized. In one of these a contractor realized savings of more than $1 million in the first year of an aerospace development contract. Following a planning review by an engineering manager, it was discovered that much of the first-year effort could be deleted.

In another instance, a large missile contractor informed DARCOM that as a result of the planning disciplines associated with the Cost/Schedule Control Systems Criteria, they discovered and cancelled an order for almost $2 million of unneeded heat shield material.

A clear indication of the net benefits of the Cost/Schedule Control Systems Criteria, said the General, is found in the steadily increasing number of contractors who use these cost control system disciplines where there is no stated requirement for it in the contract.

Citing some statistics, GEN Guthrie indicated that over the years more than 100 Army contracts have had Cost/Schedule Control Systems Criteria applied to them.

The Army has accepted 60 management control systems after thorough review, and 43 more applications of the Cost/Schedule Control Systems Criteria on subsequent contracts at facilities with accepted systems. Twenty-nine more are being worked on. U.S. Air Force and Navy implementations are equally impressive.

True cost control, the General emphasized, is achieved through management decisions. The Cost/Schedule Control Systems Criteria and Cost Performance Report are only useful management tools to provide information which may be used either poorly or wisely by managers.

Cost analysis, he said, is an important function at all levels, including the contractor, the project manager, HQ DARCOM, HQ Department of the Army, Office of the Secretary of Defense, and Capitol Hill.

Relative to estimating final costs, the General stressed that early visibility of cost and schedule problems must result in the reassessment of the ultimate contract cost and timely changes to program budgets and fiscal plans.

GEN Guthrie called on his audience to seek and obtain from contractors *only* that amount of information needed. He said that too often we have placed burdensome costly requirements for detailed data which we have neither the ability nor capability to use.

"In years past," stated the General, "it was all too common for project managers to have such large quantities of the most detailed data that it was simply not possible to use it all. Our basic premise now is that when application of the Cost/Schedule Control Systems Criteria gives us assurance the contractor is using a good management control system, the government project manager needs only summarized data."

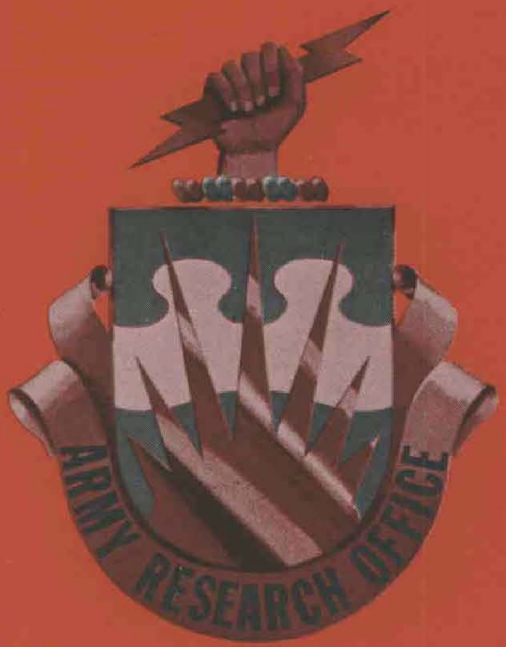
Cost Schedule Control Systems Criteria and summary data from the Cost Performance Report have traditionally been used for major contracts. GEN Guthrie explained that a new tool, the Cost/Schedule Status Report, is now being used to control costs for *non-major contracts.*

However, before a contract requiring the Cost/Schedule Status Report is awarded, it is necessary to understand how the contractor proposes to develop the data for the report, and to negotiate with him if his proposal is deemed inadequate.

DARCOM is now working with other military departments, the Office of the Secretary of Defense, the Defense Contract Administration Service, the Defense Contract Audit Agency, and industry on development of comprehensive Cost Schedule Status Report guidance. The draft is in final coordination.

This document, together with the Cost/Schedule Joint Implementation Guide, said GEN Guthrie, will give our acquisition managers guidance on cost/schedule performance measurement across the entire spectrum of cost reimbursement and cost incentive contracts.

GEN Guthrie concluded his remarks by stressing that cross-fertilization among all those involved in the military departments and industry is most important to the success of cost performance analysis. Said the DARCOM commander: "We need to share our past experiences and extract as much as we can from Lessons Learned .... I intend to assure that our Project Managers and other managers use cost and schedule data fully and effectively."



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