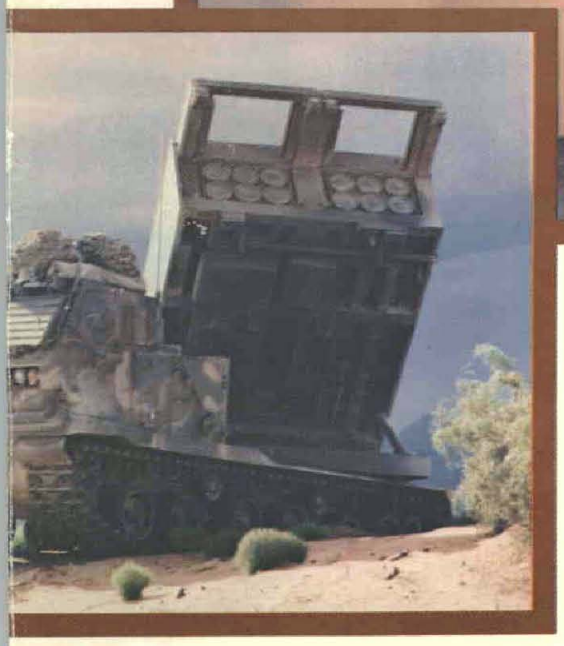
ARMY R,D&A

- RESEARCH
- DEVELOPMENT
- ACQUISITION

JANUARY - FEBRUARY 1984



ARMY MISSILES

Their Development and Acquisition

ARMY R,D&A

Vol. 25 No. 1 JANUARY-FEBRUARY 1984

OFFICIAL MAGAZINE OF THE RDA COMMUNITY, established 1959

ABOUT THE COVER:

This issue of *Army RD&A Magazine* is devoted largely to discussions of past, present and future Army missile and rocket systems. Shown on the front cover is the Multiple Launch Rocket System. The back cover displays (clockwise from the top) PATRIOT, Pershing II and TOW 2. All of these systems are in production. Cover designed by Carolyn J. Zakaski, HQ DARCOM Graphics Branch.

FEATURES

DEPARTMENTS

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

Distribution on an individual basis is restricted to active and reserve officers who hold initial or additional specialties of R&D (51), Nuclear Energy (52), or Procurement (97), or an additional skill identifier of 6T.

CHANGE OF ADDRESS. Individual addresses are provided by Officer Military Personnel Center, Alexandria, VA, and the USARPC, St. Louis, MO. Where active officer addresses are incorrect, individuals should contact their respective officer personnel office to ensure forwarding of correct address. Reservists should contact USARPC, ATTN: AGUZ-OEPMD, St. Louis, MO 63132.

OTHER GOVERNMENT AGENCIES requirements should be submitted directly to U.S. Army Materiel Development and Readiness Command, ATTN: DRCDE-XM, 5001 Eisenhower Ave., Alexandria, VA 22333.

ALL NON-U.S. GOVERNMENT agencies, firms and organizations must obtain publication through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Single copies: domestic—$4.50, foreign—$5.65. Subscription rates (6 issues annually); domestic, APO and FPO address—$13.00, foreign mailing—$16.25.

(USPS-584-330)

Army R,D&A Magazine (ISSN 0162-7082) is an official Army periodical published bimonthly by the Development, Engineering and Acquisition Directorate (DRCDE), HQ U.S. Army Materiel Development and Readiness Command (DARCOM), Alexandria, VA 22333, under sponsorship of the Assistant Secretary of the Army (Research, Development & Acquisition); the Deputy Chief of Staff for Research, Development and Acquisition, Department of the Army; and the Commander, DARCOM.

Second class official mail postage paid by the United States Army at Alexandria, VA. Forward copies per Domestic Mail Manual part 159.225. Use of funds for printing this publication has been approved by the Secretary of the Army on 1 December 1983 in accordance with the provisions of AR 310-1.

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

Picture Credits: Unless otherwise indicated, all photographs are from U.S. Army sources.

Submission of Material: All articles submitted for publication must be channeled through the technical liaison or Public Affairs Officer at installation or command level.

Bylined Articles: Primary responsibility for opinions of bylined authors rests with them; their views do not necessarily reflect official policy or position of Department of the Army.

This issue of the *Army RD&A Magazine* examines the materiel acquisition process of a particular commodity—missiles. Our intention is to provide a look at the acquisition process through a discussion of some of the organizations and individuals that are directly involved in the Army's missile programs.

Featured articles include reports on two missile systems that are nearing the end of the acquisition cycle—the Multiple Launch Rocket System and the TOW 2 missile. These systems illustrate two widely differently approaches to achieving the successful development and fielding of a new system.

An article on missile testing at White Sands Missile Range illustrates one of the many contributions that the test community makes in the acquisition process, while another article describes the process of initiating development of a new system. Finally, because knowing where we came from can provide a peek at where we are going, we have provided a brief history of the Army missile program from the mid-1940's to the present.

The sum of these articles is a snapshot of the acquisition of a single commodity. By using an organizational lens we hope we have presented a picture that can be broadened to include all commodities.

The Editors

Fiber Optic Guided Missile . . .

How Development of a New System Begins

By Dave Harris

There have been a few shining moments worth remembering in the evolution of the way the Army acquires its missile and rocket systems. Consider, for example, a May morning in 1942 when it got its first. Two Army officers went to a firing range at Aberdeen Proving Ground that morning intent on trying out their homemade prototype of an infantry antitank weapon. At that time these officers, MAJ Leslie A. Skinner and CPT Edward G. Uhl, constituted the sole rocket development effort of the entire U.S. Army.

They carried with them a simple steel tube open at both ends, fitted with crude grips, a wooden shoulder rest, trigger and battery powered firing mechanism and nine small rockets. Skinner made the rockets in his home workshop, hand loaded them and mounted inert M-10 grenades on their business ends.

The M-10, which was ordered into mass production in 1941, represented the Army's first application of the lined shaped charge warhead. It was a formidable weapon, capable of punching holes in tank armor that conventional explosives hardly dented. However, the M-10 had one major problem, discovered only after it was coming off the production line by the thousands.

The M-10's heavy recoil made the 3-pound grenade almost impossible to fire from a rifle or machine gun. Since that was the way it was intended to be used in combat, the Army, in May 1942, was the unhappy owner of a rapidly growing pile of lethal but useless munitions.

Frantic efforts to devise some means to shoot the things were getting nowhere. Skinner and Uhl arrived at the range while a multi-starred audience was watching a formal demonstration of the latest experimental M-10 launchers. Unnoticed, they took a position some distance away with their homemade prototype.

When the target tank came their way to make a turn, Uhl shouldered the launcher and Skinner loaded a rocket. Uhl fired and hit the tank. Before the tank could complete its turn, Skinner took the launcher and hit it with another round. They quickly found themselves in the center of the group which had been watching the formal demonstration. Skinner handed the launcher to MG G. M. Barnes of Ground Forces Development and described how it worked. General Barnes took a shot, hit the tank and ordered the Bazooka—as soldiers later called it—into production on the spot.

A few days later the Army contracted with General Electric to make 5,000 Bazookas in 30 days. Six months later American soldiers took them into combat in North Africa.

The Bazooka, the Army's first rocket propelled weapon that worked, became a legend. During the next four decades, the weapons that followed it into service became more complex. So did the process the Army used to acquire them.

Today, well defined acquisition guidelines provide a roadmap for procuring major weapons systems from inception through deployment. However, no two systems follow the same route. The Multiple Launch Rocket System, for example, has just become operational after a highly successful development program that took competitive prototypes from two contractors through a shootoff. TOW 2 has evolved to meet the threat of modern armor by product improvement of a well proven system that has been around for years (see related stories, on page 5).

No one literally hands the Army a weapon any more as Skinner did and and no one orders one into production at first sight.

Someone once defined weapons R&D as a process of finding out a great many things that won't work and a few that will. The same could be said about the weapons acquisition process. And yet the objective is not all that different from what it always has been. What the Army has always wanted is an affordable weapon that works.

Today, that's a thought foremost in the minds of Dr. Paul L. Jacobs and many more people in the Army Missile Laboratory of the U.S. Army Missile Command (MICOM) at Redstone Arsenal, AL, an organization with a mission that traces its roots straight back to Skinner, Uhl and their Bazooka.

Jacobs is a mechanical engineer. His desk and a nearby table in a small office on the third floor of McMorrow Laboratory are cluttered with computer printouts, test schedules, and missile parts. On the wall hangs a photo of his sailboat, spinnaker filled, on a beam reach. It sails on his imagination—the place he has done most of his sailing lately.

Jacobs is now steering the Army missile team's newest start, some-

thing called FOG-M (Fiber Optic Guided Missile). As the Army Missile Laboratory's FOG-M program manager, Jacobs leads a team with players from every laboratory element. Their work is attracting interest, in part because FOG-M combines four of the Army's five new technology thrusts recently defined by the Army Science Board, and in part because it represents MICOM's shot at applying all the new acquisition policy and guidance at the outset of a program, rather than piecemeal to weapons already well along in development or production.

What FOG-M offers the soldier (see weapons concept description and diagram below) in a single package is a real time means to find, hit and kill tanks with top attack while he remains protected in a mobile, automated gunner's station several kilometers and at least one hill away. A few such soldiers and a few such stations well dispersed could mass precision fire anywhere over a broad area.

What eventually becomes of FOG-M depends not so much on the technology in the weapons package, but on how Jacobs and his team put the package together and bring it along. They have been told bluntly to get this one at a reasonable price or forget it.

While weapons developers have been told approximately the same thing for the past 40 years, they tended—in both government and industry—to concentrate on getting something that worked and worrying about the rest afterward. Too often when afterward came along what worked fine on the test range turned out to be something close to impossible to build without enormous difficulty, delay and extra costs.

The road into that minefield is well marked. MICOM, DARCOM, and the Army are not anxious to go that way again. One way to avoid the high cost, high risk trips of the past is to let someone else take the risk and pay the bill.

Dr. William C. McCorkle, director of the Army Missile Laboratory, acknowledges that competition among the giants of the communications industry to perfect fiber optics for commercial application made FOG-M possible. It's a military spinoff of a civilian application. For example, the data link between the missile and the gunner's station is one of the two critical cost drivers of the system. Several years ago when fiber optics began to look promising, the question MICOM wanted answered was could it get the fiber at reasonable cost in continuous lengths that could be packed in a missile and paid out in flight? The answer then was no. Now it's yes. Thank you IT&T and AT&T. When it comes to advancing fiber optic technology, MICOM is riding industry's coat tail and enjoying every minute.

MICOM had to find out for itself if the fiber would break when spooled out from a missile in flight. It got the answer by flying it first in a radio controlled model airplane, later in high speed sled tests and unguided missile flights. Verdict: the stuff works fine in FOG-M, which is not all that fast as missiles go.

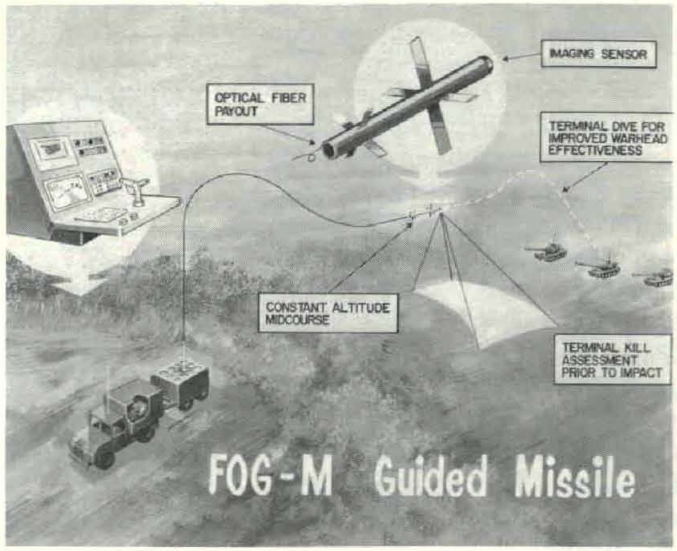
Flying slow is one way to keep the missile seeker simple. That's important because the seeker is the other critical cost driver. Jacobs and his team are ready to accept a slow missile to give the gunner critical seconds to use the missile's eye—the seeker—to find and identify targets that otherwise would zip in and out of view too fast to engage. That way, too, the smart—and costly—elements of the guidance system can be placed in the gunner's station—on the ground—and used repeatedly.

A Glimpse at FOG-M

FOG-M is a promising new U.S. Army Missile Command program to demonstrate that a prototype missile, using a fiber optic link, can attack tanks or other battlefield targets. In flight, the missile contains an imaging seeker—like a low cost TV—that looks for targets and sends pictures back to the operator who looks at a TV receiver. The operator selects a target and simply flies the missile into it.

The fiber optics link, which is paid out like TOW wire, is much better than wire because it has an extremely wide band width, can handle more information, and is more secure because it's essentially invulnerable to countermeasures.

This concept puts the operator's eye in the missile. The operator sees what the missile sees. Using this technique, costly components to transmit and process battlefield information can be kept on the ground, not on the missile. On future sophisticated battlefields, FOG-M will enable gunners to take advantage of cover and fire without being exposed, and locate and destroy targets at longer ranges.



Travelling slower than a speeding bullet means the missile will need relatively large wings to keep it stable. Question: do you use fixed wings that simplify missile design but complicate launching and handling or more complex folding fins that pop out and lock in place after launch? Jacobs and his team opted for the folding wing to gain vertical missile launch and resultant high density packaging of missile rounds. That trade will make it possible to fill up a trailer pulled by a High Mobility Multipurpose Wheeled Vehicle (HMMWV) with a dense pack of FOG-M's.

Additionally, if tradeoffs in design are nothing new, competition in design is. Competition is a word Jacobs uses often. What he means is not competition among contractors, but competition among component and subsystem hardware. Eighteen months into advanced development he and his team have, for example, evaluated three guidance mechanizations; built and tested three actuator designs and four folding wing designs; checked out two launch concepts in flight tests; built and flown both liquid and solid fuel motors; completed detailed design of the launcher; and designed and completely fabricated the gunner's station. Committed to early and frequent testing at the component level, they fold back in what they learn.

The temptation in any development is to stick with something that works. Jacobs and his team aren't just interested in what works. They want to know what it will cost and whether or not it can be built in quantity. This time when the designers smile, the laboratory's producibility engineers better be smiling too. So far they are.

Although not directly tied to FOG-M, one recent study by another element of the laboratory indicates how far McCorkle and his people will go to get an accurate handle on component costs. When they wanted data on a filament wound rocket motor case they made some and kept meticulous records of the cost of materials and labor. Then they went on the street, asked for bids in small and large quantities and bounced what they got back against what they already had. They know where to go to buy motor cases now.

They may not go that far with every component and system cost and producibility study in FOG-M, but if the time comes to lay out an acquisition strategy, Jacobs and his team intend to provide hardware that works and can be built and a solid understanding of what it will cost in production.

So far they've had time to do their homework, largely because normal program pressures are absent. No inflexible Initial Operational Capability date drives FOG-M. There isn't even a formal military requirement for the system yet. This does not mean the laboratory has gone off and done its thing in spendid isolation. There has been early and frequent contact and feedback from the user at every stage. The short-term result has been that Jacobs and his team are working to get prototype hardware to the 9th Infantry Division at Fort Lewis, WA, for evaluation. The long-term desire is that the formal requirement be written by people who clearly understand what the available technology can do for them and what the Army must be willing to pay to get it.

Given their druthers, the MICOM team will come out of the FOG-M effort with a tech data package ready to go to industry.

In the meantime, there's a distinctly tactical look to the hardware taking shape down the hall from Jacob's office. If someone decides they want FOG-M to move faster, the people working on it intend to be ready to go.

What if FOG-M is destined to become just another good idea that never made it all the way? McCorkle has a ready answer for that one. "It will be worth every dollar and every hour we put into the program. What we're doing now, all this up front effort to get the risk out early and answer the cost and producibility questions when we can afford the answers, is the best kind of investment both for the Army and the people involved. And there's another big plus. FOG-M is the first chance many of the people in the laboratory have had in a long time to do real hands on engineering. Some of them are working 60 hours a week and not because they have to. Those guys are having fun."

Count among those having fun, William C. McCorkle and Paul L. Jacobs. One of the four folding wing mechanisms tried for FOG-M came to life on McCorkle's kitchen table. One of many materials considered for the missile's wing was cloth, yes, sail cloth—a thought that came from Jacobs, the weekend sailor.

More than 40 years ago, wanting to be sure his rocket would burn out in the launch tube and not in the gunner's face, Leslie A. Skinner drilled holes every inch along a steel pipe, covered each with tape, fired a rocket through the pipe and started sawing at 54 inches, right next to the first piece of unburned tape. He had fun too.

DAVID G. HARRIS has been public affairs officer at the U.S. Army Missile Command since September 1962. He holds a BA degree from Columbia College and a master's degree in journalism from Columbia University.

The *M*ultiple *L*aunch *R*ocket *S*ystem

&

The *T*ube Launched, *O*ptically Tracked, *W*ire Guided Missile

By Bob Hubbard

The following reports on the Multiple Launch Rocket System and the TOW 2 illustrate two widely different, but successful, approaches to the fielding of new systems.

Multiple Launch Rocket System

When the Army talks about successful missile and rocket programs, one name invariably crops up, at, or near the top—the Multiple Launch Rocket System (MLRS).

Currently being fielded with U.S. troops, MLRS is a free flight artillery rocket giving the soldier the mobility, firepower and punch he never had before.

MLRS features a 12-round launcher mounted on a modification of the Army's new Bradley Fighting Vehicle, capable of 40 mph speed. A crew of three can fire a single round, or ripple all 12 rockets in seconds at targets more than 18 miles away.

In a climate where some defense programs are criticized for soaring costs and plummeting quality, MLRS is praised for meeting costs, schedule and performance goals. What's the reason for MLRS' success?

COL August Cianciolo, former MLRS project manager, who has been named to receive his first star, and Larry Seggel, his civilian deputy, explain: "First, the U.S. Army Missile Command in general, and the MLRS Project Office in particular, did a careful and thorough analysis of the alternative acquisition strategies and established a tailored strategy that put proper emphasis on those aspects of the MLRS that were most important—for example—Design to Unit Production Cost and ammunition cost effectiveness. The objective was to create contractual leverage to obtain the critical development results. Having laid out the acquisition plan in great detail we did a comprehensive and realistic baseline cost estimate that supported the plan. Our plan and the funds were then in lockstep. Therefore, when our budgets were approved, we were fully funded. We never had a budget shortfall in the MLRS program.

"We had competition during the validation phase by two highly competent companies. And when we selected Vought Corp. to be the prime contractor, we awarded a production contract with annual options covering a four-year period which stabilized the program.

"And last but not least, the Army and Vought team is competent, responsive and dedicated. Good players make good managers and good programs."

The Army decided in 1977 how many rockets it wanted to buy and that figure never changed.

"We planned the program, no one dickered with it for four years, and we had total Army support from the user to Department of Army staff. Those are the unique things we hang our hats on," Cianciolo and Seggel said. "And don't forget our dedicated partners in Great Britain, West Germany, France and Italy. They are doing a great job and we believe ours is the most successful multination partnership in the Army."

MLRS is being developed as a standard NATO rocket by the five countries and may be co-produced in both the United States and Europe.

The basic MLRS warhead throws more than 600 grenade-like explosives with each round. It is effective against troops, equipment and materiel. Alternative warheads, the German AT-2 mine layer, and the terminally guided weapon now under development, will give MLRS an antitank capability as well.

Army researchers at Redstone Arsenal weren't re-inventing the wheel in the early 1970's when they began looking closely at free flight rockets. Not since the days of Honest John and Little John in the early 1950's had MICOM focused talent and resources on rockets.

However, Army studies recognized a growing need for a rapid fire, barrage type weapon and MICOM began to apply new technology and know how to make rockets more accurate and affordable. Meanwhile, Vought Corp. had begun tackling the problem, using its own money and resources to develop a system that would overcome the unguided rocket's traditional inaccuracy. It was to be a good marriage.

In March 1976, MICOM awarded contracts to five leading aerospace companies, including Vought and Boeing, for their ideas and best technical approaches for the project then called the General Support Rocket System.

The DOD gave its stamp of approval for the program in early 1977 but directed the Army to accelerate the program and field the system at the earliest possible date. Prior to submitting the plan to DOD, the Army already had reduced the original program from 10 to 7 years. Responding to DOD, the Army further reduced development time to five years.

In September 1977, MICOM awarded competitive contracts to Vought and Boeing to build, test and demonstrate weapon prototypes of their own design.

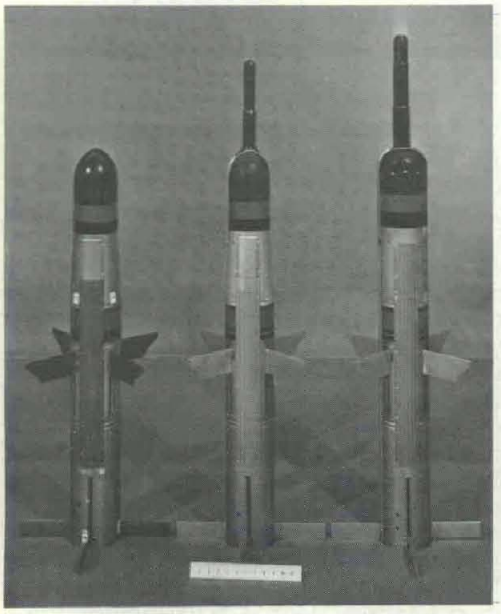
During the 33-month validation period, proposals from both firms were evaluated by an independent committee of approximately 100 members in an intensive 6-month study at Redstone Arsenal, AL. Their work, in turn, was reviewed by senior military and civilian personnel. The Army's selection decision was based on cost and operational effectiveness.

In April 1980, the Army selected Vought as the MLRS prime contractor. A key feature of the contract was the parallel approach of continuing the development, or maturation, of MLRS along with initial low-rate production.

The maturation phase ended with a full-scale production decision in March 1983.

In September 1983, MICOM awarded a 5-year contract with options to Vought that not only completes the Army's MLRS production requirements but is projected to save the taxpayers several million dollars over the life of the contract. The firm fixed price 5-year contract is worth $1.2 billion and is the largest single MICOM contract ever awarded.

Tube launched
Optically tracked
Wire guided missile



Evolution of the TOW missile is pictured here, beginning with the basic model (left), the improved TOW (center), and the TOW 2.

In the early 1960's, the U.S. Army Missile Command (MICOM) began development of a tank killer that could hurl a 40-pound missile two miles, hit with bullseye accuracy, and destroy what it hit. They called it TOW (*T*ube launched, *O*ptically tracked, *W*ire guided).

About that same time, the Army wanted to improve firepower and battlefield mobility and decided to adapt missiles and rockets to helicopters. Since MICOM was to play a major role in arming helicopters, it was only natural that TOW be a candidate for the antitank role. What followed after that, as they say, is history.

TOW was deployed in 1970, and two years later, earned a niche in Army missile history when it went to Vietnam aboard two UB-IB helicopters. Later, ground versions became the first Army-developed guided missiles to be fired in combat by U.S. soldiers.

Today, TOW is deployed with 40 countries around the world and is the free world's antitank weapon. What's more, MICOM is conducting two major improvements to upgrade and keep TOW abreast of the enemy armor threat for years to come.

"We're modernizing TOW and improving lethality to meet armor threats into the 90s and beyond," said COL Byron Powers, TOW project manager, and his civilian deputy, George Williams.

The first phase of the upgrading program, called Improved TOW, is intended for more immediate armor threats and features an improved 5-inch diameter warhead similar to basic TOW but will penetrate heavier armor. Improved TOW missiles have already been deployed with U.S. soldiers stationed in Europe.

"The new warhead is compatible and can be retrofitted to existing missiles, thereby protecting the Army's investment in fielded missiles and launchers," Powers said. "That's important that we minimize the impact on fielded equipment and the supply system."

The second phase, called TOW 2, will counter even more sophisticated armor with its 6-inch warhead, new flight motor and improved guidance system for dirty battlefields. TOW 2 has been fielded. TOW 2 modifications can be retrofitted into earlier versions but will require more sophisticated procedures.

Both versions of the upgraded TOW missile have an extensible probe to enhance penetration. Once the TOW 2 modifications are retrofitted into earlier launchers, either of the three TOW missiles may be fired from that launcher.

TOW is a classic example of MICOM's plan to meet new threats, where possible, by inserting new technology to improve existing, well established weapons. That way the Army saves money by using the same support equipment, trained soldiers, and logistics network without going through the development pains, longer time, and spiraling costs of introducing new systems.

MICOM was able to improve TOW because technology was available in the areas of motors, warheads, and thermal imaging.

Senior Army officials became concerned in 1978 that increasing armor threats and improvements against battlefield dirt, smoke, fog and bad weather, demanded a new heavy antitank system, or major improvements to TOW.

Thanks to the new technology that was available, and TOW's proven success record, the Army decided it would be more cost effective to update and upgrade TOW than to develop a new weapon system.

So Improved TOW and TOW 2 were born, and the fixes to cope with growing threats were begun by MICOM and Hughes Aircraft, TOW prime contractor.

Prior to 1978, only one change of literally dozens suggested, had been approved since basic TOW was deployed in 1970 and that was to extend the range from 3,000 to 3,750 meters. This was in 1976. This was done to increase the survivability of the Cobra helicopter, Powers said, so MICOM added 750 meters of wire to TOW for just a few dollars a missile. "We simply don't make changes, or improve a system, do anything unless in response to a new or updated threat," Powers said.

Before awarding TOW 2 production contracts, MICOM told contractors to demonstrate, in performance tests, that the hardware to be delivered met government specifications and requirements. Those tests were staged in addition to "fly before buy" tests in which TOW missiles are pulled at random off the production line and tested to show they work before the Army buys that production lot.

MICOM and Hughes each have validating computer simulations with hardware in the loop to insure that hardware performs properly. Meanwhile, MICOM has broken out for competition just about every major piece of TOW hardware and today the TOW Project Office manages more than 70 active contracts. Major ones are with Hughes for missiles and system integration, and to adapt TOW 2 to the Bradley Fighting Vehicle; with Texas Instruments for the launch equipment and modification kits; and with Emerson Electric for the optical sensor.

MICOM also is forming a Should Cost team to look at the possibility of a multi-year procurement of TOW 2 missiles.

BOB R. HUBBARD is chief of News and Media Relations in the Public Affairs Office at the U.S. Army Missile Command. A former newspaper reporter, he holds a BA degree from Athens College.

Missiles From A to Z . . .

The Role of White Sands Missile Range in Fielding Missile Systems

By Jim Eckles

Testing a missile system at White Sands Missile Range, NM, involves much more than firing the missile at some sort of target. As the range's welcome brochure states, the extensive laboratories and scientific personnel "shake, rattle and roll the product, roast it, freeze it, subject it to radiation, dip it in salt water and roll it in the mud. We test its paint, bend its frame and find out what effect its propulsion material has on flora and fauna."

White Sands is a unique combination of geography, laboratories, weather, personnel and support activities which make it almost ideal for modern testing. The 2-million acre U.S. Army Test and Evaluation Command range is located in southern New Mexico between Las Cruces and Alamogordo. Much of the terrain is flat while mountain ranges surround the complex providing excellent observation and communication points. Visibility is usually excellent 300 days every year and temperatures are moderate with low humidity.

Established on 9 July 1945 as America's first missile test facility, the range (initially called White Sands Proving Ground) has seen the first atomic bomb explosion, German V–2 rocket launches, CPT Kittinger's 20 mile free fall from a balloon and the landing of the space shuttle Columbia in 1982. In 38 years, White Sands has become the most highly instrumented test range in the free world. It has developed off range launch complexes in Utah and Idaho which allow flight corridors of over 800 miles for certain tests. Most of all, the range has assembled a team of military, DOD civilian, and contractor personnel which possesses most of the skills to meet all user requirements.

When a user comes to White Sands, be it the U.S. Army, another DOD or government agency or a foreign government, a sponsor is assigned to the project. The sponsor is intimately familiar with the range, its capabilities and its operating procedures. He or she coordinates user requirements with the various range organizations and will represent the user in scheduling meetings and planning sessions. For Army programs, the sponsor is also the manager of government test phases.

Before a user brings his system to White Sands, range scientists and engineers are often called in by the project office to assist in the early phases of missile development. The missile range's personnel have a great deal of experience working with Army, Navy, Air Force and foreign missile systems. That experience is valuable for insuring old mistakes are not repeated in new systems. Engineers also work with the user in identifying areas where tests will be necessary to judge the performance of the system and insure it meets specifications.

In the planning stages it sometimes becomes apparent the range may have to make special provisions to support a user. To support long-range test flights it has been necessary to establish launch complexes near Mountain Home, ID, and Green River, UT, and develop instrumentation which could be taken there. These developments not only make it possible to support current systems but they also become range assets available for other projects and range users.

The types and numbers of tests available to range users are almost limitless. Test programs are individually designed to meet all the user's requirements. It is estimated that 90 percent of all the earth's existing environments can be simulated at White Sands test facilities.

The Climatics Laboratory has a number of fixed and portable chambers for duplicating any weather condition. They can simulate most existing temperature extremes (from minus 60 degrees F. to plus 160 degrees F.), including freezing rain, humidity, salt fog, and solar radiation. The desert Southwest is noted for its spring duststorms, but for scientific purposes the laboratory can create its own artificial ones. High altitude conditions can also be duplicated in special vacuum chambers.

Portable equipment is available to provide climatic conditioning to missiles on launchers and other equipment in the field. For instance, Copperhead projectiles can easily be frozen and conditioned to 20 below zero for 12 hours and then fired in a test to determine the effects of low temperatures on the rounds. It is not unusual to see laboratory personnel wearing heavy parkas and gloves in the middle of summer as they work with very cold or hot equipment.

Another aspect of environmental testing is the evaluation of biodeterioration of missiles and associated equipment. The range has a well equipped Microbiology Lab to perform standard fungus tests. WSMR also has the country's largest test chamber for simulating tropical environments. Testing at this facility, for example, has demonstrated that electronic circuit boards left untreated can be made useless in just a few days. Fungus can live off nutrients found in the board coating or mounting material itself, and it eventually bridges the wiring and causes short circuits. Scientists also have found that some fungus can live and multiply in water found in fuel tanks. The resulting growths can clog fuel filters and stop an engine cold.

Dynamic testing is available and can take the form of some 20 different shock and vibration trials. Items as large as dual-wheel vans and as small as electronic components can be subjected to the jolts and bounces encountered in the real world. Days of road testing, for instance, can be simulated in just a few hours saving money and valuable resources. An entire missile can be subjected to the same vibrations it might encounter in flight and then taken apart and examined for damage.

To test the blast, radiation and thermal effects of a nuclear explosion on equipment the range has a variety of resources. By using one of the world's largest furnaces, the thermal effects of a nuclear weapon can be simulated by focusing the sun's rays onto a 4-inch diameter circle to generate up to 5,000 degrees F. In the nuclear effects facility radiation chamber, a fast burst reactor is used to simulate nuclear weapon radiation in a safe testing environment.

To study the blast effects of large-scale explosions, the range supports Defense Nuclear Agency testing on White Sands. In late 1983, the agency conducted a test using 600 tons of ammonium nitrate fuel oil suspended more than 100 feet above the ground to simulate a one kiloton nuclear burst. Various structures, shelters, military systems and equipment were exposed to the blast and thermal phenomena which could be expected from a nuclear weapon.

The range also has Chemical and Metallurgical Labs. Experts test metal components for corrosion, propellants for proper composition, and the atmosphere itself for contamination. Using ultrasonic and X-ray equipment, technicians can check the structural integrity of materials before and after testing without damaging the material.

After rigorous laboratory testing the typical missile system moves to the field. For some systems, this means putting all the components together to see if it works as an integrated system for the first time. Others go through more component and subsystem testing.

An air defense system like PATRIOT or Roland might be taken to the field to just test its radar and tracking systems. To accomplish this, high performance aircraft from Holloman and Kirtland Air Force Bases are often called in to fly different approaches and maneuvers to assure realistic tests against the system.

Simulations are frequently used in test and evaluation to provide low cost expansion of test results. Two classes of simulations are employed. First, mathematical representations or models of a missile system are programmed for computer execution. Missile system simulations can be used to extend knowledge of the weapon system by varying parameters such as velocity, range or maneuver level.

The second class of simulation, frequently called a driver, represents the target or threat. Again, variations in parameters, such as number of targets in a raid, countermeasures employed, weather conditions, or target performance, can be used in conjunction with the system model to expand knowledge of performance against complex threat scenarios.

The field test can be further expanded to include a full battlefield scenario. This scenario can run through a complete system set up and preparation for fire and end just before the fire button is pushed or it can continue to the point of actually firing and completing engagement of a target.

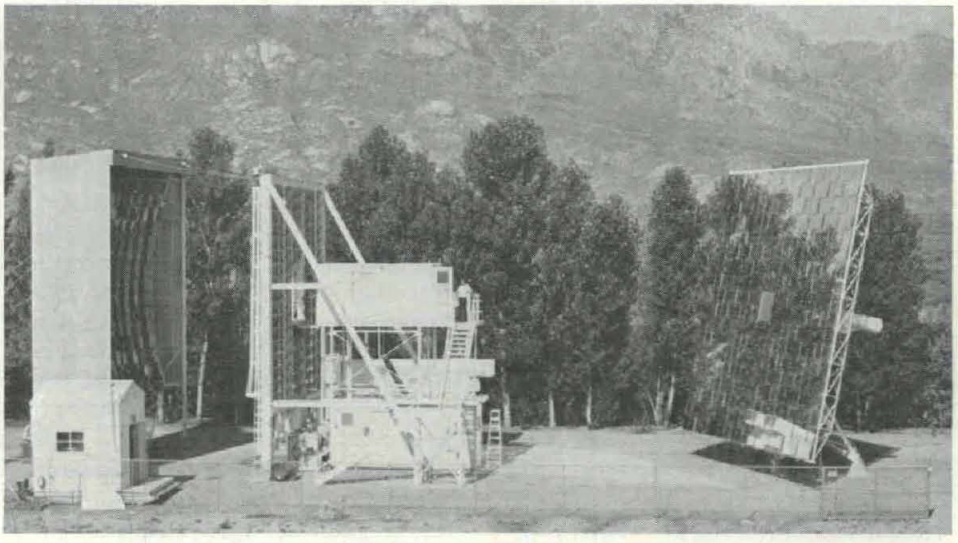
When the time arrives to actually fire a missile against a target, numerous range resources are activated. A missile launch can involve hundreds of personnel—everyone from the MP manning a highway roadblock to the range controller who coordinates and controls all activities during the test.

White Sands can provide a variety of ground and aerial targets. Stationary and remotely piloted M47 tanks and plywood simulations are available as ground targets. The computer operated Drone Formation Control System can automatically control up to 10 moving tanks on a special course in one of the range's target areas. If necessary, range operations can manually control the tanks from the Range Control Center.

For aerial targets, the range has a variety of aircraft ranging from the small QH-50, a subscaled helicopter, to the PQM-102, a full size, obsolete F-102 fighter aircraft. Like the tank targets, the drone aircraft are remotely controlled by the Drone Formation System. This system is sophisticated enough to fly several drones in close formation and has routinely been used to automatically land a full sized drone on a runway at White Sands. Again, like the tank drones, operators can take manual control of the aircraft at any time and fly them by remote control.

Remotely controlled aerial targets capable of representing threat level per-

The Distant Object Attitude Measurement System is a twin-barreled tracking telescope used to obtain attitude, event and miss-distance data on missile tests. The system consists of two 24-inch aperture telescopes of 100- and 200-inch focal lengths and high speed 70 mm cameras.



The White Sands solar furnace is one of the largest in the world. It is capable of generating temperatures up to 5,000 degrees F. on a four-inch spot. The furnace is used to simulate the extreme heat of a nuclear explosion.

formance are expensive, whether full sized or subscale. Aircraft or aerial targets can be configured to tow inexpensive target representations. Subscaled and towed targets are typically small and are equipped with augmentation devices such as reflectors or transmitters, which generate signal levels representative of real targets.

Except in warhead tests, most aerial drones are not actually shot down. They are too expensive to regularly blow up. Instead, they are loaded with instrumentation which is used to collect data on the missile as it flies by. To save the drone, the missile is programmed to miss the target by a certain distance. Basically, it is shooting for a spot in the sky relative to the drone.

Data taken from the drone and other instrumentation are used to calculate if the missile hit the required spot. Once the mission is complete small drones are gently let back to earth by parachute and the full sized aircraft are remotely flown to an airfield for a landing.

Miss distance calculations are also derived from the other instrumentation used on range to record missile tests. Missile flights vary in length from a few seconds to several minutes and are some of the best documented events in the world today. During the flight, data on trajectory, attitude, events, miss distance and internal performance are collected and recorded for later analysis. No single instrument or family of instruments can accurately record all the required data so a combination of optical, radar and telemetry systems is used.

Optical instruments include fixed and ballistic cameras, cinetheodolites and telescopes. The Distant Object Attitude Measurement System is a newer system which improves the range's capability to provide attitude, event and miss-distance data.

Film from optical instruments is developed on range and then examined. By looking at vital sequences of film from a telescope, data analysts can often detect reasons for failures. For instance, if a fin fell off the missile it might cause a flight anomaly. Loosing the fin might not be detectable from any other source but it is there recorded on the film along with the exact time the event occurred.

Film from cinetheodolites is read by experts on special machines where the visual information is changed to numerical data which can be manipulated by high speed computers. Using the information from just a few cinetheodolites, data analysts can derive azimuth and elevation angles, pitch, yaw, spin, miss distance, velocity, acceleration, and the exact position of the missile or target at any given time during the test flight. Range officials feel optical data are some of the most accurate information available for evaluating missile performance.

Radar data come basically from the FPS–16 and MPS–36 radars and the special Miss-Distance Indicator Radar system. Most of the radar data goes to the Range Control Center where it is processed by a real-time computer system. This computer takes the data and within a fraction of a second displays flight information for range controllers and users. Digital displays of missile performance such as speed, altitude and azimuth angle are just a few possible readouts.

The computer also drives plotted displays which visually show the position of the missile over a map of the missile range and its movement. For safety, the computer continually makes impact predictions for the missile during its flight. Missile flight safety personnel watch this indicator as well as other incoming data during a test to insure the missile and target do not stray off the range. Position data derived from radar information can also be sent back to the field to assist in acquisition of the missile by other instrumentation.

Data generated in the missile itself can be transmitted or telemetered to ground receivers and recorded during the flight. Information can include almost anything but is limited to the space available in the missile for measuring equipment. Typical data collected are skin temperature, internal pressures, propulsion levels, power supply levels, and fin inclinations.

Some ground equipment, such as the Angle Measurement Equipment and the Electronic Sky Screen Equipment, track a missile's flight by following signals telemetered from the missile.

After the completion of a test, users can get "quick-look data" and "validated data." The quick-look data are the raw data transmitted to the Range Control Center. This information is in a variety of forms and is available almost immediately or within hours of the test. It can give users a feel for how their test went but lacks evaluation of precision.

Validated data are almost always supplied to the user in the form of a final data report. Data supplied in this form have been reduced, evaluated and presented in a format specified by the user.

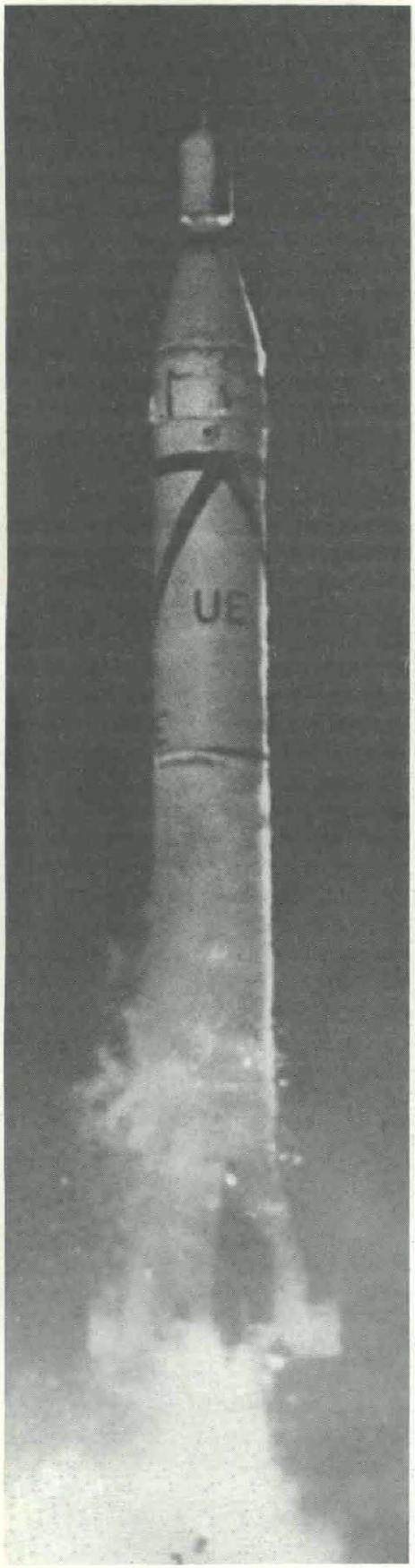
Finally, the range has recovery teams which go into the field and retrieve the missiles and targets after testing. In many cases, missiles will undergo post mortem examination especially if the test had any failures. Like a human autopsy, experts looking at missile debris can often find the causes of failures.

Even after a missile goes into production it may return to White Sands for repeated testing. Initially, first items off the production line can be tested to verify adequacy and quality of systems when produced in quantity. Later, production lots are tested to assure continuing quality.

Pershing Ia missiles are still fired at White Sands even though they have been fielded since the 1960's. These follow-on programs not only provide the opportunity to test for quality assurance but also for product improvements and, as in the Pershing program, provide excellent training opportunities for the ultimate user—the soldier in the field.

In summary, White Sands Missile Range, is almost unique for its capabilities and also for its work with missile systems from their cradles to the grave. Very few organizations play a more important role in the development and continued testing of this Nation's defensive missile system.

JIM ECKLES is a public affairs specialist in the White Sands Missile Range Public Affairs Office. He is a graduate of the University of Nebraska with a degree in psychology and English and the University of Washington with a master's in English. He entered government service in 1975 as a DARCOM intern.



On January 31, 1958 at about 2248 hours EST, the Army Ballistic Missile Agency launched the free world's first earth satellite, the EXPLORER I, from Cape Canaveral, FL.

A Brief History of the

By Mary T. Cagle

Responsibility for the U.S. Army's rocket and guided missile program rests with the U.S. Army Missile Command (MICOM), commanded by MG Jerry Max Bunyard. The youngest and southernmost of DARCOM's major subordinate commands, MICOM is located on a sprawling 38,000-acre tract at Redstone Arsenal, AL, in the north central part of the state near the city of Huntsville.

MICOM's 8,200 civilian employees and 640 soldiers exercise integrated systems acquisition and commodity management of missile and rocket systems and other assigned materiel, including research, development, procurement, logistical support, and security assistance service; basic and applied research and engineering and advanced development in related technologies; production and dissemination of scientific and technical intelligence on assigned foreign missile and space materiel and activities; and provide support service to a number of tenant activities, including the Marshall Space Flight Center.

Redstone Arsenal was activated in October 1941 as an Army Ordnance ammunition loading plant adjacent to the Chemical Corps' Huntsville Arsenal. During World War II, these arsenals complemented each other in producing millions of rounds of conventional chemical ammunition. After the war, both installations were placed in standby status and later became available for other purposes.

Although American scientists were actually the first to outline basic principles of jet-propelled guided missiles, the Germans developed the first long-range, surface-to-surface missile and used it with devastating effect against the Americans and their allies during World War II. By the time the German V–1 and V–2 missiles appeared in 1944, America had already recognized the great potential of these weapons and had made a good start in the research effort.

Proposals to develop a V–1 type of missile had been advanced as early as 1941, but it was not until the German V–1 attacks on England that the War Department officially initiated the development project. Known as the JB–2, or Loon, this 450-mph pulse jet was very similar to the German V–1. Large-scale production was well underway when V-E day led to the cancellation of most of the procurement order. The available JB–2's, together with captured V–2 missiles, were used by the three Services for experimental work and for training.

Meanwhile, the Army Ordnance Department began a long-range R&D program in the field of guided missiles. The Ballistic Research Laboratory at Aberdeen Proving Ground, MD, and the Guggenheim Aeronautical Laboratory of the California Institute of Technology (GALCIT) conducted preliminary feasibility studies of surface-to-surface guided missiles.

Impressed with the favorable results of these studies, the Ordnance Department requested California Institute of Technology to undertake an R&D program on long-range rocket-propelled guided missiles. This request led to the ORDCIT project, the first of its kind in the United States and the oldest of the Army's missile projects.

In June 1944, the Office, Chief of Ordnance awarded GALCIT a $3.3 million contract for general research leading to the development of long-range guided missiles. Later that year, the GALCIT activity was reorganized and designated as the Jet Propulsion Laboratory (JPL) of California Institute of Technology.

By December 1944, experimental work at the JPL had confirmed the feasibility of jet-propelled missiles, and the Ordnance Department established two more R&D programs: the Hermes surface-to-surface missile project at the General Electric Co., and the Nike anti-aircraft guided missile project at the Bell Telephone Laboratories of the Western Electric Co.

In 1945, the JPL research facilities, which had been expanded and largely financed under wartime defense contracts with the GALCIT research group, were acquired by the Army Corps of Engineers and became a Government-owned activity operated by California Institute of Technology.

The ORDCIT project, in effect, supported all other guided missile contracts for specific missiles. It embraced fundamental R&D and testing of solid and liquid propulsion systems, guidance and control techniques, guided missile research test vehicles, and other related subjects. Objectives were to increase progressively the size complexity of the various missiles, beginning with the experimental Private series and continuing through the Corporal and Sergeant guided missiles.

In 1946, the Ordnance Department

U.S. Army Missile Program

established the Ordnance R&D Division Suboffice (Rocket) at Fort Bliss, TX, to provide working facilities for the team of 130 German rocket scientists, who had been brought to the United States in "Operation Paperclip" following Germany's surrender in 1945. These German scientists rendered valuable service in indexing and translating captured documents, identifying rocket materiel, and assisting with the assembly and firing of captured V–2 missiles at White Sands.

The German scientists also worked on the Hermes II project, the object of which was to develop a ramjet missile as a research test vehicle. Ordnance personnel and General Electric Co. employees who worked directly with these men learned the extent of the German missile technology and applied it to hasten American missile developments, thereby saving many years and dollars in the establishment and development of the United States' guided missile program.

During the 1944–48 period, numerous research test vehicles were developed under the ORDCIT project and flight tested at the White Sands Proving Ground (now White Sands Missile Range). Among these were the A4 (V–2) missile; the Private "A" and "F"; the WAC (without altitude control) Corporal; the Bumper (a modified V–2 and WAC Corporal)—the free world's first two-stage liquid-fueled rocket; the Corporal "E" which was later developed and produced under a crash program for tactical use; and various designs of the Hermes surface-to-surface missile, the C1 model of which was later developed into the tactical Redstone ballistic missile.

By 1949, the Army rocket and guided missile programs had progressed to the point where it was necessary to decentralize management and operational activities of these programs from the Pentagon and other agencies to an appropriate field establishment. The Redstone Arsenal-Huntsville Arsenal complex was selected as the most suitable site for the rocket and guided missile mission.

On 1 June 1949, the Department of the Army returned Redstone Arsenal to active status for rocket R&D. In April 1950, the Chemical Corps relinquished jurisdiction over the Huntsville Arsenal to the Ordnance Corps, and the installation was consolidated with Redstone Arsenal for use as an Ordnance Guided Missile Center.

The Ordnance R&D Division Suboffice (Rocket) was then transferred from Fort Bliss, TX, to Redstone Arsenal, expanding the arsenal's mission to include both rockets and guided missiles.

In the ensuing 33 years, Redstone Arsenal and its successors, the U.S. Army Ordnance Missile Command and U.S. Army Missile Command, together with the Army Ballistic Missile Agency, developed, procured, and fielded numerous major weapon systems for Army combat elements and laid the foundation for the U.S. space program.

The Army Ballistic Missile Agency, commanded by MG John B. Medaris, operated as a separate activity at Redstone Arsenal from 1 February 1956 until 31 March 1958, when it became an integral part of the newly established Army Ordnance Missile Command.

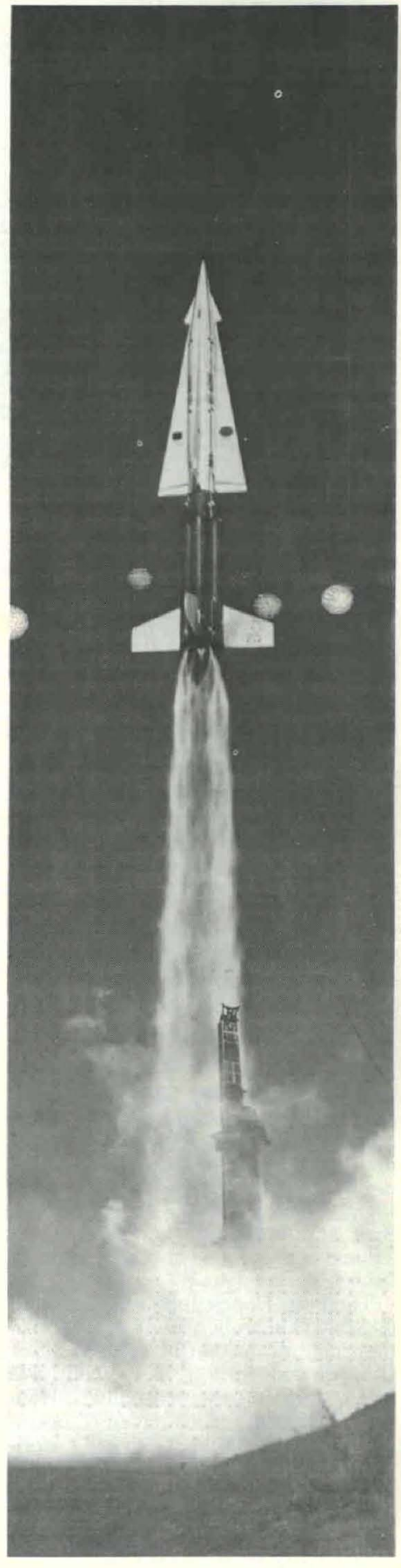
With the team of German scientists, technicians, and specialized facilities formerly assigned to the Redstone Arsenal Guided Missile Development Division, the Ballistic Missile Agency finished development of the Redstone ballistic missile system which was begun at Redstone Arsenal in September 1950; developed and perfected the 1500-mile Jupiter Intermediate Range Ballistic Missile (IRBM); and, combining the two vehicles in the form of the Jupiter C, placed the first United States satellite in orbit on 31 January 1958. It also began development of the Pershing missile system which later supplanted the Redstone.

The space missions, facilities, and equipment assigned to the Missile Command were officially transferred to NASA's Marshall Space Flight Center at Redstone Arsenal in March 1960 with the mass transfer of some 4,000 personnel taking place on 1 July 1960.

The Army delivered the tactical Jupiter IRBM to the U.S. Air Force for overseas deployment in 1958. The tactical Redstone ballistic missile system, with a range of 50 to 175 nautical miles and known as the Army's "Old Reliable," also reached the field in 1958. With deployment of the 400-mile Pershing I missile system in 1964, the Army gradually phased out the Redstone and declared it obsolete in June 1964.

The improved Pershing Ia missile system began replacing the Pershing I in September 1969 and remains in the active Army inventory. The Pershing II was deployed in December 1983.

Beginning in the early 1950's and con-



The Nike Hercules in flight, February 1961.

The Shillelagh after firing from a Sheridan, October 1966.

tinuing into the 1970's, three generations of shorter-range (75 nautical miles) artillery missiles were developed and deployed: the Corporal, Sergeant, and Lance. The Corporal missile system, embryo of the Army missile program, evolved from the Corporal "E" research vehicle developed under the ORDCIT project. Three Corporal battalions were activated in March 1952—the first ballistic missile units to be formed in the United States—and the first Corporal battalion was deployed to Europe in February 1955.

The second-generation Sergeant missile system replaced the Corporal in 1962–63, and the third-generation Lance missile system began replacing the Sergeant in mid-1973. The last Sergeant battalion left the field in May 1977. Currently under development is the Joint Tactical Missile System (formerly the Corps Support Weapon System) as a successor to the Lance.

Other artillery weapon systems developed and fielded were the 30-kilometer Lacrosse guided missile, which remained in the Army inventory from mid-1959 until early 1964, and a family of free-flight rockets consisting of the 762mm Basic and Improved Honest John, the 318mm Little John, and the Multiple Launch Rocket System.

The Basic Honest John system, issued to Army field artillery units in 1954, had the single distinction of being the first U.S. tactical nuclear weapon. It was replaced in 1961 by the Improved Honest John system, which remained operational until mid-1982. Designed for primary use in airborne assault operations, the helicopter-transportable Little John rocket system complemented the heavier, self-propelled Honest John systems.

The Little John reached the field in November 1961 and remained in the Army inventory until August 1969. The Multiple Launch Rocket System, mounted on a tracked, self-propelled launcher-loader derived from the chassis of the new M2 infantry fighting vehicle, was initially deployed in 1983.

Development of antitank/assault weapons began in 1953 with the illfated DART project, which was terminated in September 1958. The Department of Defense then authorized offshore procurement of the French ENTAC and SS–11 wire-guided missile systems to meet interim requirements until suitable antitank weapons could be developed.

By the mid-1970's, a family of advanced antitank weapons capable of coping with the enemy threat had been developed and fielded. The TOW (Tube-launched, Optically-tracked, Wire-guided) heavy antitank weapon became operational in September 1970, initially replacing the 106mm recoilless rifle and French ENTAC system, and later the helicopter adaptation of the French SS–11 system.

Other members of the new generation of weapons were the M72 Light Antitank Weapon (LAW), which began replacing the Bazooka and antitank rifle grenade in 1963; the Shillelagh combat vehicle armament system, which reached the field in 1967; and the Dragon medium antitank weapon, which began replacing the 90mm recoilless rifle in 1975.

The Improved TOW system was deployed in 1981, and the TOW 2, featuring a full-caliber warhead with probe, is currently in production. Under development as an ultimate replacement for the M65 TOW/Cobra subsystem is the Hellfire missile, the primary antiarmor weapon on the AH–64 Apache advanced attack helicopter.

The Viper was developed as a replacement for the improved M72A3 LAW, but production was halted in March of 1983. The Army subsequently announced that the AT–4, a system developed by FFV of Sweden, was the best in a competitive test and evaluation of lightweight antiarmor weapons, including the Viper and the M72A3 LAW.

Development of antiaircraft guided missiles commenced early in 1945 as part of the ORDCIT project. The first to become operational was the high-altitude Nike Ajax system, which began replacing conventional antiaircraft artillery in 1954. Its successor, the second-generation Nike Hercules system, reached the field in June 1958 and remained in the active Army inventory for 25 years. The PATRIOT (Phased Array Tracking to Intercept of Target) tactical air defense system will replace the Nike Hercules in the high-altitude role and also has a medium- and low-altitude capability.

The Basic Hawk low-to-medium altitude air defense system, deployed in August 1960, was succeeded by the Improved Hawk beginning in October 1972. The manportable Redeye air defense system reached the field in 1967, followed by the improved Stinger manportable system in 1981.

The Chaparral short-range forward area air defense system has been operational since November 1969 and is expected to remain in service into the 1990's, and the mobile U.S. Roland forward area air defense system, which was to have replaced the Chaparral, is scheduled for deployment with the Rapid Deployment Force.

Today, the U.S. Army Missile Command is engaged in the modernization of key operational weapons, development of new systems to meet projected enemy threats, and logistical support of 10 major weapon systems—Pershing Ia, Lance, TOW, Dragon, Shillelagh, Hawk, Redeye, Stinger, Chaparral, and the Multiple Launch Rocket System. Soon to join the family of operational weapons are the U.S. Roland, the Pershing II, the PATRIOT, and the Hellfire/Apache subsystem.

MARY T. CAGLE is chief historian at the U.S. Army Missile Command. Her services at the installation span more than 39 years. She is a member of the Society for History in the Federal Government and the Huntsville-Madison County Historical Society.

"What Do WSSMs Do?"

By COL William V. Murry

What Do Simple Folk Do?

King Arthur, *Camelot*
Scene 2, Act 2

Weapon System Staff Managers (WSSMs) are not "simple folk," but in the hierarchy of protocol they occupy the same position that tradesmen did in the society of Camelot. Thus, the Lords of the Realm of Materiel Acquisition—the program managers, project managers, commanders, deputies, and secretaries—may often ponder the title question.

In 1976, manning at HQ U.S. Army Materiel Development and Readiness Command (DARCOM) was drastically reduced. The intent was to decentralize operations to the major subordinate commands and to make the headquarters the corporate offices for the Army's materiel acquisition effort.

System program offices, in the then Development and Engineering Directorate, were reduced to a personnel structure consisting of a user function (e.g., Field Artillery) team chief, a military R&D coordinator, a GS–15 engineer and a GS–14 engineer. This small contingent was barely able to track the many Army acquisition programs and to respond to command group concerns. They were constantly overloaded in a purely reactive mode of operation.

Lack of unifying headquarters guidance and system focus were recognized and the commander formed a special study effort to find a way to realign the HQ DARCOM assets to provide better systems acquisition management.

The result of the special study, in October 1981, was to realign systems development and systems procurement directorates parallel to the Office of the Deputy Chief of Staff for Research, Development and Acquisition (ODCSRDA) from "whence cometh" our money, and to apply matrix management concepts. This latter move was made to minimize additional manpower requirements and reorganization turbulence. Matrix management spawned the staff manager concept as reported in the November-December 1981 issue of *Army Research, Development and Acquisition Magazine.*

The WSSM as a Mini-PM

Initially termed Weapon System Manager, the new job title was quickly changed to Weapon System Staff Manager. This change was made to avoid any signal that the headquarters was taking system management responsibility or authority from the field or the PM. It also emphasized that the WSSM's responsibility and authority were structured to provide "staff management," not system management.

Staff managers are in effect mini-PMs. The product of their effort is staff management of the assigned weapon system. They preside over a HQ DARCOM matrix organization, the Weapon System Management Team (WSMaT), with the authority of their director.

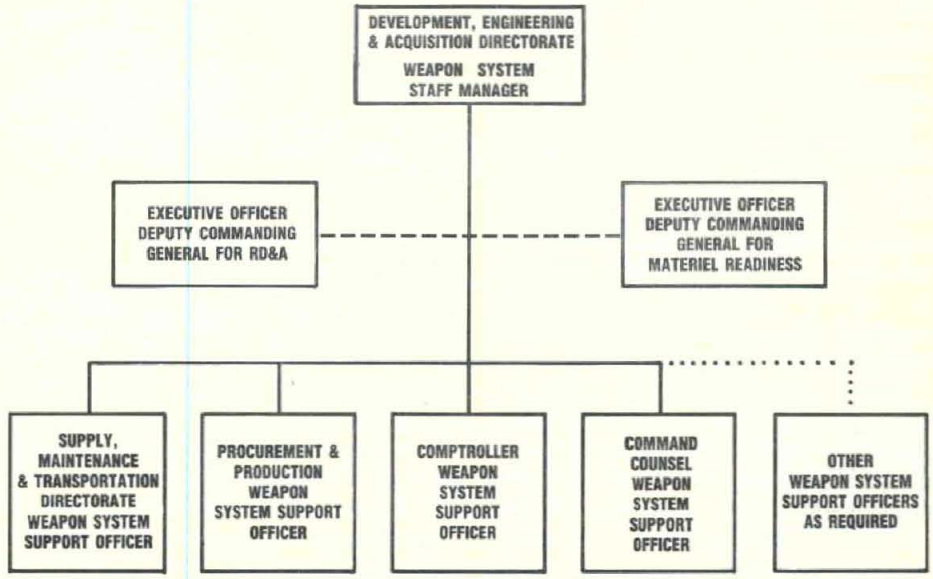
The WSMaT was originally conceived as a fixed matrix organization staffed by Weapon System Support Officers (WSSOs) from the functional directorates in the headquarters. In reality, the management team is a flexible, task-organized team that the WSSM pulls together to address the task at hand.

For programs in Demonstration and Validation or full-scale development phases, the staff manager is from the Development, Engineering and Acquisition (DEA) Directorate.

Key support officers on the management team are provided by the Supply, Maintenance and Transportation Directorate and the Procurement and Production Directorate. Often the support officers from the Readiness Directorate, Office of the Comptroller, Office of the Command Counsel, and the Modernization Management and ILS Policy and Data Management Divisions will play key roles.

No functional directorate is immune from being called on to provide a support officer (see diagram). Other divisions in the DEA Directorate might provide an officer and two or more of these officers might be provided from some directorates. The executive officers to the deputy commander often play a key role in the management team as consultants to the WSSM.

The Weapon System Management Team is the WSSM's staff. It provides the added manpower and expertise that make the headquarters a pro-active element in the system



Typical Weapon System Management Team for a weapon system in full scale engineering development.

Key MAM Functions

- Mission Area Analysis
- Requirements Documentation
- Doctrine Development
- Concept Formulation
- Training Requirements Identification
- Cost and Operational Effectiveness Analysis
- Research
- Development
- Manned/System Integration
- Integrated Logistics Support
- Systems Engineering
- Configuration Management
- Testing
- Evaluation
- Procurement
- Production
- Quality Assurance
- Distribution
- Financial Management
- Personnel Management
- Data Management
- Security Assistance

acquisition process. The WSSM is both the focal point in the headquarters and the focusing element that converges the functional expertise represented in the management team. The WSSM's role as a staff manager, not a system manager, cannot be overstated.

The WSSM as an Alter-Ego

The WSSM provides the HQ DARCOM interface with the subordinate command and the PM for the assigned system. WSSMs represent the deputy commander and the appropriations directors. At the same time, the staff manager represents the Project Management Office and the major subordinate command (with regard to the assigned system) at all elements of HQ DARCOM.

The Weapon System Staff Manager is thus an alter-ego of the headquarters Command Group to the field and an alter-ego of the PM to the headquarters. That this is a tightrope act is an understatement because it demands competence, resourcefulness and sagacity of the highest order.

When representing the Project Management Office to the headquarters, the WSSM serves the needs of the PM and the system project without becoming a servant of the PM, Project Management Office and the subordinate command. To become enslaved to the field would destroy the WSSM's utility to the headquarters—the reason for the job position.

When representing the headquarters to the field, the staff manager serves the needs of the Command Group and the Army materiel acquisition process without becoming a bureaucratic tyrant. To become only a pedantic mouth-piece for HQ DARCOM would destroy the vital two-way communications link required to be responsive to the needs of system acquisition. The Weapon System Staff Manager wears two hats but cannot be two-faced.

The WSSM as a Font of Knowledge

WSSMs are materiel acquisition management (MAM) specialists in the fullest sense. Their "field of play" includes all the key acquisition management functions (see accompanying list).

To properly and completely represent the headquarters and to ensure staff management of system acquisition, the WSSM must have a working knowledge in the area of each of the key MAM functions. The WSSM relies on the Weapon System Support Officers or their management team for the detailed execution expertise, but the WSSM's knowledge in the area of each function must be sufficient to support resourceful resolution of issues.

The WSSM maintains a detailed, comprehensive and up-to-minute knowledge of the status of his assigned program with respect to all key materiel acquisition management functions. This is the most time consuming task for the WSSM, but it is also the most important and most rewarding.

Second only to money, knowledge is the most critical source of influence and impact on system acquisition. The breadth and quality of that knowledge determines the effectiveness of the Weapon System Staff Manager. Each time a crisis issue arises the WSSM asks, "What should I have known and what could I have done to avoid this?"

Acquiring and maintaining the system knowledge essential to performing the WSSM's duties taxes the WSSM's talents, psyche, and time. There is no prescribed formula for success. Doing the job well depends on the system manager's ability to mix with the key players involved in the program, particularly the PM.

If the personalities of the WSSM and the PM "click," information flow and the staff management process is enhanced. When this synergism is lacking, responsiveness and efficiency in providing program needs are lost. Making the PM-WSSM relationship harmonious should be the objective of both. However, in reality the burden is on the staff manager.

The WSSM and the DASC (and the FISO)

Before the realignment at DARCOM that created the Weapon System Staff Manager, the ODCSRDA Department of the Army System Coordinator (DASC) was the solitary kingpin linking the PM and subordinate command to the Army Staff. Many DASCs had become adept at either bypassing the "bureaucrats" at DARCOM or manipulating the DARCOM action officer into impotence. Now, the WSSM and the system coordinator work together as a team. They stand back-to-back.

The DASC looks up the pipe to the Army Staff, OSD and Congress to get the resources and approvals for program execution, and passes these to the WSSM. The staff manager looks down the pipe to the DARCOM staff, the major subordinate command and the PM to ensure that program management gets the Army and the taxpayer "mostest" of the "bestest" for the dollar spent.

The WSSM has a similar relationship with the ODCSOPS Force Integration Staff Officer (FISO). The FISO works the generation and approval of requirements between the TRADOC surrogate user and the Army Staff. The staff manager works to ensure that the DARCOM developer meets the user needs. However, the WSSM is also expected to challenge the user requirements with the Force Integration Staff Officer and TRADOC in the interest of producibility, supportability and cost effectiveness.

The WSSM also works with the integration staff officer to ensure requirements are specified as battlefield performance and supportability parameters and that the user does not try to "design engineer" the system.

The system coordinator orientation should be on resources, and the FISO's on priorities and requirements, while the staff manager concentrates on the business management of program execution. Like the PM-WSSM relationship, the effectiveness of the DASC-FISO-WSSM team as the Washington staff management element depends on a mix of personalities.

What Makes a WSSM?

In the DEA Directorate, most WSSMs are GS–14 or GS–15 engineers but some of the military R&D coordinators also serve as staff managers. Most of the WSSM positions are classified as mechanical engineers (GS–830), a few are general engineers (GS–801), and a few are from other specific engineering series, e.g., aeronautical (GS–861) or electrical (GS–850/855). Regardless of the classification, staff management of a system in development requires the Weapon System Staff Manager to be proficient in multiple engineering disciplines.

Engineering is only the entrée to the DEA WSSM job. It requires an understanding of the technical issues that drive development and procurement. However, as noted earlier, the WSSM is an acquisition management specialist who must know acquisition policy, contracting, finance, testing, quality assurance, production, provisioning, supply and maintenance as thoroughly as engineering.

A system begins the acquisition process under the DEA director and the staff management of a DEA Directorate WSSM. Sometime later in the system's life cycle, generally after all development, including the preplanned product improvements (P^3I) and the initial procurement are completed, the system staff management responsibility is transferred to the Supply, Maintenance and Transportation (SMT) Directorate. The effort of staff management at this time centers on the logistics functions shown in the accompanying list. Consequently, most of the SMT staff managers are supply management representatives (GS–2003), maintenance management specialist (GS–301) and procurement specialists (GS–345).

In the near future, many of the SMT Weapon System Staff Manager positions may be reclassified as logistics management specialists (GS–346). SMT WSSM positions are graded as GS–11, GS–12 and GS–13. Some, who also have team and branch supervisory responsibility, are GS–14 and GS–15. Logistics is the entrée to the SMT Weapon System Staff Manager's job.

Although the SMT staff manager's responsibilities and expertise revolve around the various aspects of logistics, the staff manager must be cognizant of the newly transferred system's history, especially in the engineering and funding arena. The SMT staff managers, like their DEA Directorate predecessors, must be a font of knowledge for their systems.

In spite of job series classification and grading, successful performance as a staff manager demands ingenuity and human relations factors that cannot be specified in a position description. Identification of these qualities in job applicants is difficult.

What Do WSSMs Do?

The simple answer to the above question leaves a mundane picture. A Weapon System Staff Manager sits at a desk talking on the phone to collect data and assimilate knowledge, writing information papers to keep the Command Group informed, and writing messages and decision papers to implement headquarters staff management decisions. WSSMs run around HQ DARCOM and the Pentagon coordinating matters and papers on the assigned program.

The WSSM travels to contractor plants, major subordinate commands, laboratories and test sites to gain first-hand knowledge and to participate in the materiel acquisition management process. The WSSM also attends seminars, conferences and courses at the Defense Systems Management College, the Army Logistics Management Center and the Army Management Engineering Training Agency to hone skills in acquisition management.

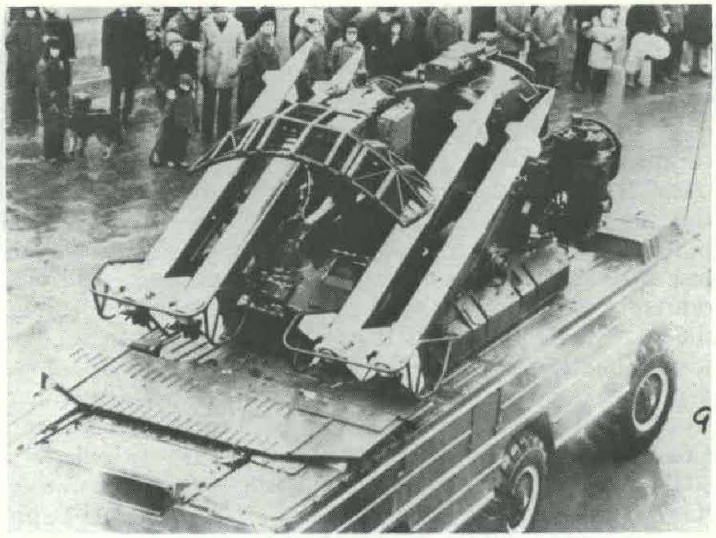
When the simple description of what a Weapon System Staff Manager does is placed against the background of what the WSSM concept is all about, the picture is far more complex and interesting. The picture of WSSMs in action is particularly interesting. This is because they can, and usually do, impact on the success of a program.

Staff managers can justifiably take pride in the part they play in helping the PM and DARCOM make that program a successful materiel acquisition effort. Instead of likening the Weapon System Staff Manager to the tradesmen of Camelot, it might be more appropriate to draw a comparison to Merlin—advisor to the king and performer of magic, Yea verily, the WSSM is a wizard.

COL WILLIAM V. MURRY was chief of the Missiles and Air Defense Systems Division in the Research, Development and Engineering Directorate, HQ DARCOM, during the implementation of the WSSM concept. He is now the Dean of Administration and Support at the Defense Systems Management College. COL Murry holds a BS from the U.S. Military Academy, and an MS and a PhD in chemistry from Rensselaer Polytechnic Institute. He has served about nine years in materiel acquisition management positions and is an Army War College graduate.

Soviet

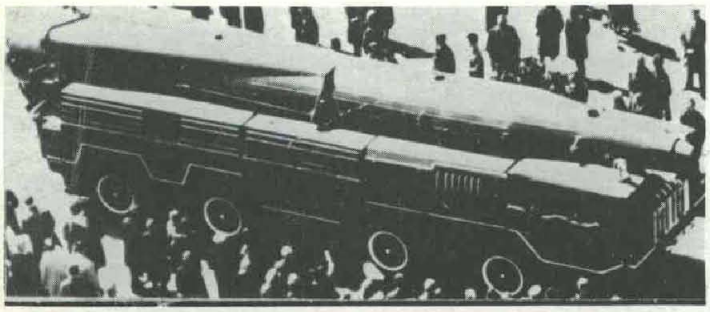
Pictured are the best available u tactical missiles, submitted by th Agency. A short description iden each photograph.



SA-8. The SA-8 air defense unit is fully autonomous, performs all acquisition, tracking and guidance functions on one amphibious vehicle. The missiles have an effective range of up to 15 km.

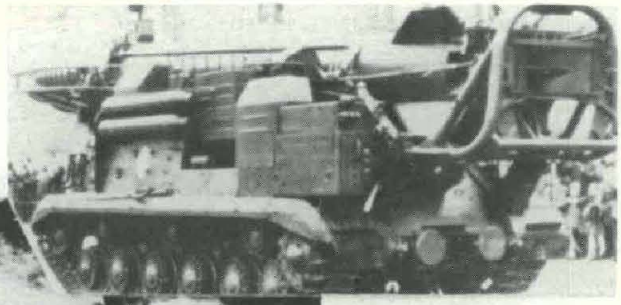
SA-6. The SA-6 GAINFUL missiles have a minimum range of approximately 4 km, a maximum range of about 30 km, and are used for low altitude air defense.

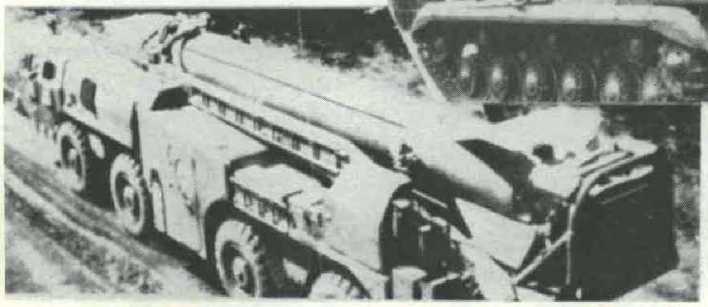
FROG-7. (above) An unguide with a range of about 60-70 k



SS-22. Replacing/augmenting the SS-12 (same vehicle) with similar range but greater accuracy.

SCUD. (right and below) Produced in two models—SCUD-A and SCUD-B. SCUD-B has both a tracked and wheeled version.



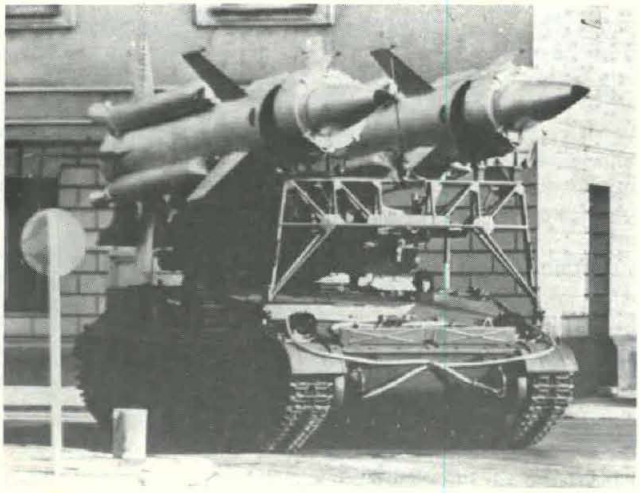


The SS-23 (not shown), with improved range and accuracy, is replacing the SCUDs.

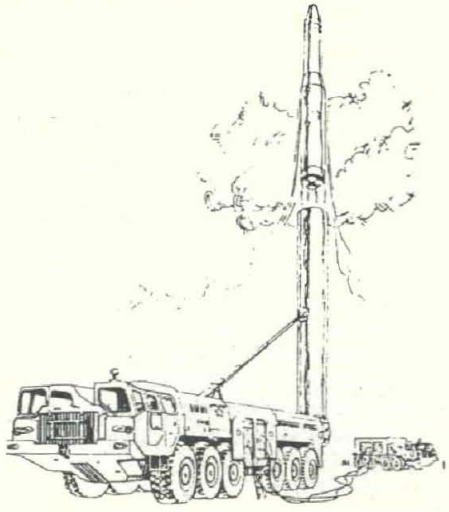
Missiles

nclassified photographs of Soviet
e U.S. Army Missile Intelligence
tifying each missile accompanies

SA-13. The SA-13 system, a replacement for the SA-9, has a range-only radar and can intercept targets at ranges up to 4 km and will be employed against close air support aircraft.



SA-4. The SA-4 is an Army-and-front-level medium to high altitude tactical surface-to-air missile system with a maximum operational range of 80+ km.



SS-20. Artist's concept of a mobile launched intermediate range ballistic missile, carried on a tracked vehicle. Two versions are known: a MIRV version, and a long range version. SS-20 was initially deployed in 1978.

d tactical missile
m.

SS-21. (right) Transporter-erector-launcher, replaces the FROG-7 with better range and accuracy.

SA-7. (left) The SA-7 is a man-portable, infrared-homing, shoulder-fired surface-to-air missile with a range of approximately 5-6 km.

The SA-9 is a short-range system with four infrared homing missiles mounted on a launch rack atop a modified BRDM-2 amphibious vehicle. SA-9 is used in conjunction with the ZSU-23-4 and has a range of 4-6 km.

The Role of ODCSRDA's Missiles and Air Defense Division

What role does the Army Staff play in the acquisition of weapon systems? Although space limitations in this issue of *Army RD&A Magazine* preclude a discussion of the entire role of the Army Staff, it is possible to describe one of these roles—that performed by the Missiles and Air Defense Division within the Office of the Deputy Chief of Staff for Research, Development and Acquisition. The following article is a brief but concise summary of this role and one of the key individuals involved in it—the Department of the Army System Coordinator (DASC).

At the outset, it should be stated that the Missiles and Air Defense Division is the "hub" relative to the passing of information on every missile and air defense system within the Army. Responsibility for accurate, up-to-date status reporting on all aspects of system development, testing, production, and fielding rests with this division.

Comprised of a chief, 15 DASCs, 3 budget analysts, and administrative support personnel, the Missiles and Air Defense Division is currently responsible for 53 R&D projects and 20 procurement efforts. Their FY 1984 R&D budget is approximately $480 million and their procurement budget is about $3.5 billion.

The division channels DA Program Guidance to subordinate program managers and addresses RD&A issues within the Army Staff. In addition, the division monitors development of missile systems through its system coordinators. These DASCs interact with all related DA Staff members and represent HQ DA at all subordinate command levels.

Functions of the DASC

The primary function of the DASC is to actively participate in the development of all Planning, Programming, Budgeting, and Execution System (PPBES) documentation for the system. This documentation includes:

- Program Decision Increment Package preparation
- Program Objective Memorandum (POM) justification
- Modernization Resource Information System/Army Modernization Information Memorandum review
- Budget submission
- The Program Budget Decision (PBD) process
- System Acquisition Reviews (if appropriate)

Secondly, the DASC prepares Congressional statements, testimony, and information papers, and meets with Congressmen and their staffers as required. In addition, he must prepare for and participate in all program reviews, monitor test programs, and participate in the fielding of his system.

Not only is the system coordinator responsible for being a short notice, reliable information source, he must ensure that presentations are unbiased and that he is an honest broker. A DA System Coordinator establishes his reputation based on his credibility.

All forms of communication, both formal and informal, are used by the DASC to relay information not only up and down the Army chain of command, but also to the Office of the Secretary of Defense (OSD), Office of Management and Budget (OMB), and the Congress.

The DASC must be an expert communicator and briefer. Every type of audio visual tool is available and is used at one time or another by system coordinators. The job entails management and marketeering. Information has to be tailored to meet each and every requirement. Formats are numerous and, as a result, "cut and paste" is a rule rather than the exception.

Formal documentation requirements are structured around the planning programming and budgeting process which includes annual (POM, and budget) as well as milestone driven requirements (ASARC/DSARC). The content of these formal documents is specified by regulation. Their staffing and coordination follows well established guidelines, and their ultimate purpose is generally well known.

Less formal methods of transmitting information include information papers, briefings, film clips, phone conversations, and impromptu meetings. It is not unusual for a DASC to be given one to two hours notice to go to the Congress or OSD to defend his program.

Although prescribed channels do exist for OSD, the Congress, and the press to obtain information, they are often times circumvented for the sake of expediency. The DASC must be prepared for this, respond to the situation, and then let his chain of command know what happened.

Involvement With the User and Developer Communities

Each ODCSRDA representative may informally coordinate directly with subordinate agencies throughout the developer and user communities. For example, it is common for the DASC to direcly deal with a project management office (PMO) or TRADOC systems management office (TSMO). These informal coordination activities provide the flexibility necessary to develop timely draft staff actions in response to development issues originating at the Congress, OSD, other Services or Army agencies. However, to ensure consistent and appropriate exchange or validation of information in the formal sense, the DASC coordinates with his counterpart weapon system staff manager (WSSM) at DARCOM and relies upon the Force Integration Staff Officer (FISO) to coordinate with TRADOC.

A word about the FISO. He is the DASC's counterpart in ODCSOPS and, as such, is the action officer on the Army Staff which he deals with most. The DASC and the FISO operate in close partnership, keeping each other informed and supporting each other's actions.

Other ODCSRDA representatives, such as the Program Analysts, coordinate directly with counterparts at HQ DARCOM. This formal coordination structure provides reasonable assurance that appropriate HQDA and subordinate activities are provided an opportunity to comment on Army development actions.

Other Services and Allied Nations

In the area of international weapon systems acquisition, most contacts with other nations are conducted through OSD. In the area of foreign military sales cases the Defense Security Assistance Agency (DSAA) is the primary OSD organization involved in policy level decisions regarding acquisition of U.S. systems.

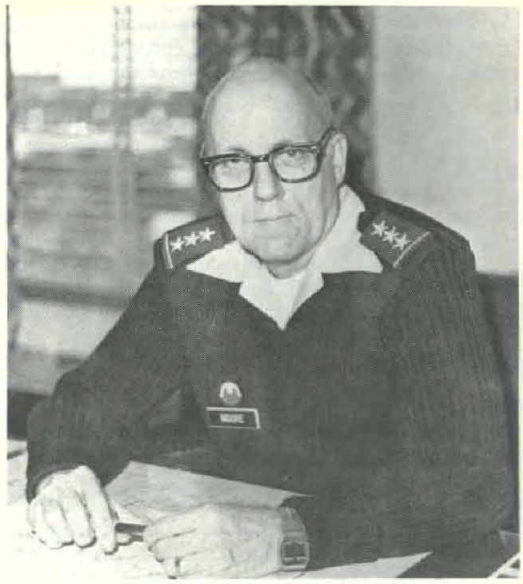
However, in recent years most foreign allies, especially NATO Nations and Japan, require their foreign military sales expenditures in the U.S. to be offset by U.S. expenditures (government or industry) in their respective countries. This offset requirement is making it much more difficult to establish large international weapon systems programs.

As a result of these offset requirements, a DASC must interface with many different elements of the OSD Staff to coordinate all the weapon programs under consideration by a particular foreign customer. In some cases where co-production or licensed production is concerned, there can be large amounts of interaction between the U.S. Army program and international programs.

(Continued on page 21)

Interview With

LTG Robert L. Moore



DARCOM Deputy Commanding General for Research, Development and Acquisition

Q. Prior to your present assignment you served as commander of the U.S. Army Missile Command and prior to that tour you were DARCOM chief of staff. What comments or suggestions relative to improving the RD&A process might you offer since you have been involved in management of the process from a number of vantage points?

A. I have three suggestions. First, and most important is to start off with a good acquisition strategy. This not only includes how to buy the system but its definition from the TRADOC requirements point of view, and a plan for how to test it. Defining the risk areas is just as necessary as defining the strategy.

The second is that DARCOM and TRADOC must work with the project manager and the TRADOC System Manager (TSM) to freeze the requirements and the design process in order to develop the weapon system in some meaningful timeframe. Some people would call that stability, and that's what we need.

My third point relates directly to stability. The TSM and the project manager should initiate a mind set in the Army that says "Our job is to fight unnecessary changes in weapons systems." We define the requirement and we define the strategy to bring on a system to meet that requirement. We, therefore, ought to fight for the funds to pursue the program and fight against tinkering with the requirement after we have started to develop the weapons system. If we did that, I think we could shorten the acquisition process, and provide stability for ourselves and the contractors. Finally, we need the Army collectively to sign up for what is really required and have cohesion in pursuing the system to fruition. Overall, we'd have a better program. We'd all sign up for what we want from the beginning. We'd have cohesion of purpose throughout the Army.

Q. Some people contend that the Army's acquisition process has grown unnecessarily burdensome due to increasing Congressional involvement in the process. What is your opinion?

A. I don't know how to stop that. That's their prerogative. I think the process has grown increasingly burdensome due to everybody's involvement at every level. It's not just Congress, it's DOD, DA, DARCOM, TRADOC, and field commanders, who are now asserting their rights. The PMs and TSMs are also having an impact during the design and requirements process. Everyone is contributing some input, and that is healthy if it's controlled. I think one way to exercise control is to have some unity of purpose and cohesion in the process as I described earlier. We've got to do a better job of showing Congress that we've decided on what we need and are going to develop and procure the system in a reasonable time and within cost. Congress has their requirement to provide those dollars and we have our requirement to protect and spend them properly.

Q. During a speech late last year you indicated that one of the important aspects of the Army's force modernization effort is the need for improved cost discipline and quality control. Can you cite some specific actions that DARCOM has taken to insure that this need is being addressed?

A. Yes, we started out at Atlanta IX. Atlanta is the series of Army/industry conferences to talk about how we can improve the way we do business. I think better cost control results when there is a better understanding between industry and the Army on what our needs are and how to go about meeting those needs. We should be up front with the contractor and he should be up front with us. I say that in the literal sense of "good business."

Adversarial relationships must go. We've got to have a better relationship from the outset. In doing that, DARCOM discussed with industry the evolution of cost estimates from a parametric analysis all the way through defining the cost to a Should Cost effort. This would bring together experts in the comptroller area, the procurement area, the producibility area, and industrial engineers to look at the production base itself. They could see what standards and utilization factors were important and they could have better cost estimates from the outset. If we can have better cost estimates and more realistic negotiating positions, I think we can better control costs.

Secondly, we decided at Atlanta IX that we would use all available data to watch over industry's shoulder in order to insure that the production line was staying within the cost constraints provided by the contract. I put it very simply, sometimes, when I say a project manager ought to contract for his program and then manage the contract execution. If he does that, he'll manage his program.

We must be more concerned about the cost of the programs and the execution of those programs and less about the budgetary constraints. We must also stop trading off things in the process, like spare parts, or producibility engineering or production tooling. Anything we trade off up front we have to put back in later and the later we put it in, the more expensive it is.

We have to look for balanced programs, and I think we've done that. It should be emphasized that the initial operational capability is a milestone and not a magic date. Work toward the milestone and not toward a magic date.

Finally, we must get tough about producibility and quality. We in the Army and the contractor must understand that quality must be achieved and cannot be traded for cost or schedule. In fact, good quality should help reduce cost and improve our chances of making schedule. We must reduce scrap and rework. We must do it right the first time. We're getting there.

Q. You recently stated in a letter to General Keith that a PM must live within funds allocated in the POM and seek risk money through cost reductions, value engineering and other initiatives. Is that statement meant to discour-

age the use of TRACE funding (or other techniques for creating management reserve) or just to encourage innovative approaches to finding more money over and above the management reserve?

A. It's more the latter than the former. The project manager should have already estimated the cost of risk in the initial program formulation, regardless of whether you call it TRACE or put it into the program elements themselves where the risk occurs. I don't think it matters. What does matter is that he must add in some excess funds as part of his risk factor.

The biggest cost increase factor we have had in the past is inflation, and if the PM had looked for ways to offset inflation by cost reduction through value engineering, in partnership with his contractor, then we would have had less cost growth and maybe we would have started living within our funds. Normally speaking, the Army doesn't have a pot of reserve money, so every time a project manager asks for funds for his program, those funds have to come from other programs. Now what's that going to cost? It's going to increase instability, it's going to decrease flexibility and it's going to cause cost growth not only in his own program but in everybody else's program that's affected by the tradeoffs we have to make. Of course, this is assuming you don't kill programs to pay the extra bill.

It's very difficult to get a program killed because each one has its own guardian angel. I think we should kill some programs. I think our platter is probably too full and we ought to look at it and see what we want to do about it. What we don't want is for the PM to trade-off ILS, producibility, production engineering or training funds to pay for engineering errors or poor quality.

Q. **The U.S. industrial base is often criticized for not being capable of achieving all that the Army requires. What do you believe needs to be done to improve this situation?**

"It should be emphasized that the initial operational capability is a milestone and not a magic date."

A. I think we and industry must understand that we have contracted for a product of a stated quality and quantity and they have the responsibility to deliver the system meeting contract specifications. We must make them deliver it and stop waiving quality standards. We must stick to the standards we requested when we paid for the initial production contract. We must get back to the basics—back to the American work ethic and better quality. Quality has got to be our number one product. If it is, then cost control will be much easier. I'm talking quality in everything we do; excellence and professionalism both on the part of the Army and the contractor, as well as DCAS and all others who help us.

Q. **How would you assess the technical talent bank both here at HQ DARCOM and in the field?**

A. I think there's a great deal of excellent talent both here and in the field. What we must learn to do better is to assimilate that talent so that we understand the roles of those around us. We all understand our own individual roles quite well. However, we must understand the role of others and how we can effectively influence or impact the process itself. A PM who lives for his project alone may be a great project manager, but he may be one who operates at the expense of the Army's overall needs.

What we've got to understand is how we each fit into the total system so the sum of the parts will be greater than the whole. We must also use matrix management better and use other's resources which are available to us rather than try to gather all the resources under our own name.

We really have one heck of a talent bank. We have industrialists in the depot system, physicists, engineers, and scientists galore in the laboratory system, and producibility engineers involved at all levels. Additionally, we have good cost accounting and cost estimating people in the comptrollers' shops and good pricing talent in our procurement shops.

Another plus is our good procurement sense in our procurement shops and our ability to specify in great detail the technical requirements of a weapons system. If we did our job as a team rather than in our individual organizational functional roles and we understood each other's interplay in that team process, I think we would have a tremendous increase in our effectiveness. I'd like to see that happen.

Q. **What is your assessment of two recent Army innovations—the High Technology Test Bed and the National Training Center?**

A. I think both of these are the greatest innovations produced by the Army in a long time. I have been to the National Training Center. It provides a good base for obtaining instant feedback on individual marksmanship, exposure and leadership capabilities. It provides a realistic tactical environment and makes it possible to fight a battalion size unit involving friendly and enemy forces. The training center features a total battlefield where nobody gets hurt. It is a good learning and feedback process. In my opinion, no system is worth its salt without a good method of obtaining feedback. I have never seen a better training device in my life than the National Training Center.

The 9th Division's High Technology Test Bed, now called the U.S. Army Development Employment Agency, is an excellent way to take conceptual technology and give it to a soldier in a division environment for testing and get early feedback on the feasibility of a system. In my view, it is a good idea to take some developmental concepts and put them in the field with the troops very early in the process in order to see if the concept is worth pursuing and if the soldier is satisfied with its design. After all, the soldier is the true customer.

Q. **The philosophical approach to the High Technology Test Bed appears to be the avoidance or streamlining of the conventional acquisition process. Is it working and does it portend major changes in the acquisition process?**

A. It's working to a degree, but I don't know if it portends major changes to the process. I'm not so sure we didn't force it into a different process. I think the thrust of the High Technology Test Bed was to try to shorten the process. I don't know whether it will achieve that or not. What it will achieve, if nothing else, is to get a soldier-machine interface early so we can tell what the problems with that interface might be, both in the organizational and operational concept and the hardware. I discussed that earlier.

I'm hopeful it will also shorten the process by showing us that we can write meaningful requirements documents without making them unreasonably long and come up with the developer's concept of how to execute that requirements document without taking seven months to do so.

I also hope that the test bed approach will provide a way to do our weapons concept validation in a division environment so that we can judge quickly whether we need to go to advanced development or engineering development and whether we have established the concept properly. This should save us time in the process. However, I'm not sure we can reduce the bureaucracy in that process. We still need to look at that.

Q. **During recent years you have devoted a large portion of your time to some of the more controversial of the "high visibility" systems such as Pershing II. Are there any lessons learned or special problems associated with these systems that you would like to discuss?**

A. I would like to put some myths to bed. Concurrency isn't bad, in fact on expensive systems it is cost effective if done well. Some people are worried about insufficient testing. I'm worried about a different aspect of testing. It seems that we can no longer tolerate failure in engineering development testing. But that's what engineering development testing is all

about! We should understand that in engineering development we're going to shoot to fail. We're going to try to find the problems and cure those problems and we're going to mature that system as we bring it through the process.

If we've done our job correctly, we will not only have engineered a weapon system itself, we will have also engineered the new aspects of the production process and the production tooling. Therefore, by the time testing has ended, the tested systems (R&D prototypes) will have come off production tooling.

But we must be professional in our approach. If we have difficulties, we must stop and fix the problems. We must "manage out" the issues and keep track of the fixes. We must work more closely as a team with the scientist, engineers, testers, quality folks, laboratory and integrated logistics support people; all involved in bringing a quality, cost effective system to the soldier in the shortest possible time.

Q. **What advice do you have for present and future PMs relative to successful management of acquisition programs?**

A. Know your job—know it in detail. Know your contract—know it in detail. Be the master of your world. Control your environment even though you don't control all elements of your environment. Be in charge and take charge.

Understand for whom you are working. There are three populations: The American public, for whom you are building national defense; the Congress, who represents that public and is critical when we don't do our job correctly; and more importantly, the American soldier who's out there to defend his country and needs the right weapons systems to do it. Our job is to get them to the soldier at the least possible cost, with the best possible performance envelope, and with the greatest possible quality. Be all you can be.

Our partner in this effort is industry. Industry must be a partner and they must understand that they also serve the rest of the public. If they don't do their job well, we absorb their criticism as well as ours. If we don't do our job well, they will also receive criticism and the whole system will become tarnished. If we want to retain American public and Congressional support, and I think we can, we'll have to continue to learn how to do our job better. We must do a better job of controlling quality and providing effective and efficient systems at lesser cost. That's a big challenge.

The world of a PM is not a positive world. Most of the things he deals with are problems or mistakes, so it's a negative world. Don't think of it that way. Think of it as a challenge. If a PM can't do that, then he is not of the mind set to be a very effective and efficient PM. PMs will face challenges, a lot of criticism, and a lot of negatives. They have to turn those around to positives. If they can't do that they should not be project managers.

Q. **What are you going to do to strengthen project management?**

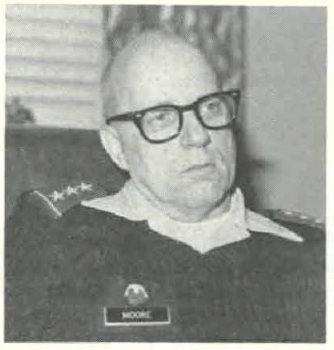
A. It is a great challenge today to have the job of a project manager. We're in the middle of the greatest modernization since World War II. We are fielding new systems daily, and have highly spirited, highly motivated troops who understand high technology. They have lived with it. If there's any problem in the Army today, it is that we older guys haven't been around the new technology enough and we don't understand it.

We've got to have the right kind of people to bring on those weapon systems; people who aren't afraid of pressure, who can manage major technical challenges, and are not afraid of facing criticism and change, for change is inevitable.

We need to ensure that the PM is considered a commander. That he is heard and that he has a line of communication all the way to the top that he can exercise when needed. We hope to provide these things.

The PM needs as much high level support as he can get to deal with all those negatives I referred to earlier. To that end I have moved the Project Management Office here at HQ DARCOM under my direct control so that I can be more closely involved in the project management system.

Today we have the best Army I've seen during my 30 years of service and I hope we can motivate and challenge more and more people to join the Materiel Acquisition Management Program and become project managers and assist us in getting the most modern systems to the troops in the shortest possible time. I challenge everyone to seek out these types of people and encourage them to join and be project managers. It's an interesting and awesome job.



"We're in the middle of the greatest modernization since World War II."

ODCSRDA's Missiles and Air Defense Division . . .

(continued from page 18)

The DASC is required to meet with representatives from the allied nations to discuss many details associated with program development, scheduling, costing, fielding, and logistics. Usually after a foreign country has made the decision to acquire a U.S. weapon system, their military staff will designate the equivalent staff member who will function as a "DASC" for the foreign military customer. A direct interface between the DASC and the foreign counterpart will then occur on a fairly regular basis.

Army Long Range RDA Plan

Another area of missile development in which the division plays a part is in its contribution to the Army Long Range RDA Plan. The plan begins with input from the DASCs which is then consolidated into an overall plan for the Army missile and air defense systems by the division chief.

The Long Range RDA Plan covers the full spectrum of RDA activities and is a reflection of the input and cooperation of the entire Army RD&A community. The plan also presents R&D initiatives in support of concept requirements as stated in AirLand Battle 2000.

In FY 1982, the plan was used for the first time as the basis for a detailed review of the entire RDA program by the senior Army leadership to validate existing priorities and to provide to the Army Staff for the development of the FY 1985–89 POM.

The plan has a 20-year threat horizon, portrays programs over a 15-year period, displays RDTE initiatives that support procurements in the next century, and is fully compatible with the budget. Finally, the plan reflects a by-year Army prioritization, is the start point for RDA program building, and is the predominant Army instrument to stabilize the materiel acquisition process.

In summary, to coordinate the events in the life cycle of a system, the Missiles and Air Defense Division must gather information, analyze the facts and insure that the facts are provided to the right people at the right time to cause the right decisions to be made.

The preceding article was authored by personnel in DCSRDA's Missiles and Air Defense Division.

PM Conferees Cite Importance of 'Basics'

Major issues related to successful management of key Army weapon systems were addressed during general and special session discussions at the 13th Annual Army Project Managers' Conference, 2–4 November, in Gettysburg, PA.

The meeting, which was sponsored by HQ U.S. Army Materiel Development and Readiness Command, attracted more than 150 attendees, including the Army's PMs, representatives from the Department of the Army, laboratory directors, and personnel from major subordinate commands and support activities. A "back to basics" theme underscored the tone of the conference, which featured a format geared to maximum audience participation.

DARCOM Commander GEN Donald R. Keith began the meeting with a 2-hour "debriefing" on the 1983 Army Commanders' Conference. His intent was to provide the PMs with a flavoring of some of the thoughts of the Army Chief of Staff and others who spoke at the conference. The conference, he said, was open, informative, and highly productive.

Keith cautioned the PMs to keep in mind that "bad news" does not get better with age. Said he: "If you need assistance ask for it." Keith also emphasized that a better job must be done to insure that program offices and functional staffs have a good working relationship.

Army Vice Chief of Staff

Army Vice Chief of Staff GEN Maxwell R. Thurman followed GEN Keith with an overview of a number of high priority issues. One of his strongest points was the need to put more stress on light forces equipment. Backed by impressive statistics, the Vice Chief of Staff expressed a very positive perspective relative to the high caliber of individual now entering the Army. He credited the RD&A community with making a major contribution to the Army's successful recruiting effort because today's recruits are largely being attracted to our high technology.

Thurman called on the PMs to assist in putting the Light Infantry Division together and to provide help regarding equipment needs. Among the major points expressed by the Vice Chief of Staff were: the need for smaller and lighter equipment; better written contracts; the need to establish better requirements; the need to field good equipment that works and the need for better operational security. He concluded by praising the achievements of the PMs and stating that the troops in the field are depending on them for good equipment.

Assistant Secretary of the Army (RD&A) Dr. Jay R. Sculley presents the Award for Project Management to COL Donald J. Callahan, PM for the Multi-Service Communications Systems Program.

Development and Readiness Issues

A "Huntley-Brinkley" type format was used as the vehicle to present a back to basics discussion of development and readiness issues by LTG Donald M. Babers, DARCOM deputy commander for Materiel Readiness, and LTG Robert L. Moore, DARCOM deputy commander for Research, Development and Acquisition.

General Babers noted at the outset that DARCOM, the Defense Logistics Agency and the General Services Administration have put the Army in the best position it has ever been in with regard to stocks. He added however, that more attention must be paid to logistics R&D.

Babers' other key points were: consider non-developmental items; if you think a system shouldn't proceed to Initial Operational Capability then say it shouldn't; make use of your WSSMs; be more involved in the repair parts process; and be well acquainted with your contract.

LTG Moore emphasized that everybody must be responsible for successful fielding of equipment, not just the PM. The logisticians and the labs, for example, must get involved in the RD&A process early. He added that a good starting point for a successful system must be a good acquisition strategy.

Moore enunciated several things expected of the PMs. These included: be an excellent manager and expediter; utilize resources wisely; insure that quality, supportability and all the other "ilities" are addressed in the contract; be willing to accept decisions you may not agree with; exercise control of all aspects of your system; and make the contractor deliver what the contract calls for.

Under Secretary of the Army James R. Ambrose, the

speaker for the formal dinner at the end of the first day, was very candid in expressing his viewpoints regarding management of programs. He explained that requirements are sometimes too severe and this can lead to failures. He appealed to the PMs to be more diligent in reading specifications and to do a better job of assessing the ramifications of the specifications. He added that the first units of a system cannot always be expected to meet reliability projections.

Ambrose stressed that there are two assumptions which he believes are unrealistic and too costly to follow. They are:

- All equipment must work under all conditions and in all environments.
- All of the Army must be equipped with the same items.

Additionally, the Under Secretary said that the training of Army contract personnel should be upgraded and that more emphasis should be placed on support equipment. There is an imbalance in the purchase of primary weapons and the purchase of support equipment, he noted.

Other opening day speakers: *Seymour Lorber,* DARCOM director of Product Assurance and Test, spoke on some of the root causes of poor quality and the responsibilities of the PM and the contractor relative to quality. (A comprehensive article on quality is scheduled for publication in the *Army RD&A Magazine* in the near future).

COL Ronald P. Cundick, chief, Contract Law Division, Office of the Judge Advocate, discussed some of the Army's tax liabilities which amount to more than $1 billion annually as the result of indirect state and Federal taxes. He offered some alternative approaches which he felt might lessen the Army's tax burden. He noted that his office has Army-wide responsibility for all tax matters and should be called upon to assist PMs and their contractors in analyzing questionable tax statutes.

> *"the training of Army contract personnel should be upgraded and more emphasis should be placed on support equipment."*
>
> **James R. Ambrose**
> **Under Secretary of the Army**

COL Robert M. Nutt, chief, Labor and Civilian Personnel Law Office, Office of the Judge Advocate General, gave an overview of the mission of his office and services it can provide as the interface between DA and the Department of Labor. One of their major responsibilities is to guide management in the event that a strike, slowdown or work interruption occurs which affects any major Army program.

BG Donald R. Infante, PATRIOT PM, related his experiences with the Test Analysis and Fix procedure, commonly termed TAAF, as applied to the PATRIOT missile. Some of the benefits of TAAF include the potential of reducing hardware problems, and the capability of providing a good projection of MTBF to be expected of an item when it is fielded.

Army PM Award

One of the conference highlights was Assistant Secretary of the Army (RDA) Dr. Jay R. Sculley's presentation, as luncheon speaker, of the Secretary of the Army Award for Project Management to COL Donald J. Callahan, PM for Multi-Service Communications Systems. His award certificate reads: *COL Donald J. Callahan is cited for outstanding performance as Project Manager of the Multi-Service Communications Systems Program during the critical period July 1982 through June 1983. Through his initiative, technical competence, excellent judgement and astute managerial ability, COL Callahan managed and coordinated the activities of a complex multi-level program interfacing the joint tactical (TRI-TAC) communications systems, the family of mobile subscriber equipment and the family of digital group multiplexer equipment. His direct leadership and strict fiscal policies have resulted in significant cost savings while producing and fielding state-of-the-art systems on or before schedule. COL Callahan's performance reflects great credit upon himself, the Multi-Service Communications Systems Program, and the U.S. Army.*

Dr. Sculley provided brief remarks relative to the need for paying greater attention to improved productivity and quality. He emphasized the importance of incorporating the quality ethic throughout the entire RD&A process.

MG David W. Stallings, DARCOM director of Procurement and Production, opened the second day of the conference with a spirited discussion of spare parts. He related that the Congress considers this a very high priority issue. He then discussed some of the actions which have been taken to improve the Army's spare parts posture. Some of his key points were the need to buy spares in more economic quantities; increase competition; and the need to do a better job of determining fair and reasonable prices. He concluded by stating that industry is a co-equal with the Army in improving the spares program.

Light Infantry Division

The Light Infantry Division concept, a topic of increasing importance at all levels of the Army, was the subject of a presentation by *COL Richard A. Burke, Jr.,* director of Force Design, U.S. Army Combined Arms Combat Developments Activity.

Supported by an extensive array of graphic materials, COL Burke gave an overview of the proposed makeup of a 10,000-man force which would be capable of fighting in a low to high intensity conflict. Specific missions the Light Infantry Division is being designed for include the capability of fighting against light enemy forces in all types of terrain and fighting against heavy enemy forces in close terrain. COL Burke discussed the light division in terms of its organization, personnel, and required equipment (a report on the Light Infantry Division is pro-

> *"industry is a co-equal with the Army in improving the spares program."*
>
> **MG David W. Stallings**
> **Director, Procurement & Production**
> **HQ, DARCOM**

grammed for publication in a future issue of *Army RD&A Magazine*).

DARCOM Deputy Director for Development, Engineering and Acquisition *Darold L. Griffin* followed COL Burke with a discussion of some actions that DARCOM is taking to support the light division concept. He discussed about 60 pieces of equipment which have been identified for the division, based on the assumption that $1 billion was available to procure the equipment.

Griffin also noted that DARCOM has established a task force to work on the light division project. The PMs, he said, are expected to take the lead for systems they are responsible for and the major subordinate commands are expected to take the lead for systems which are non-project managed. He added that the Army labs will be responsible for technology development.

MG Louis Wagner, Director of Force Development, Office of the Deputy Chief of Staff for Operations and Plans, also provided a brief update on what the Department of the Army is doing relative to the light division. He noted that approval for the new division must still be obtained from the Secretary of Defense and the Congress.

Luncheon Speaker

Luncheon speaker LTG George Sammet Jr. (U.S. Army Ret.), gave a multiple topic presentation which evoked vigorous audience response. He discussed industry's views on the spare parts issue, engineering changes, and findings of the Atlanta IX Conference Cost Control Panel. With regard to spares, Sammet appealed to the Army to buy them in larger quantities, to combine requirements for one or two years, and to do more concurrent buying of spares in the basic contract.

In discussing engineering changes, Sammet noted that there will always be changes but they should not be allowed to get out of hand. He also clarified some of the differences between design engineers and production engineers and stressed that production engineers must get involved in the acquisition process early.

Major findings of the Atlanta Cost Control Panel, cited by Sammet, were:

- Cost growth is largely caused by unrealistic initial budgets established in a highly competitive environment.
- The full-scale engineering phase needs to be redefined to include production on hard tooling.
- Contractors must be motivated to reduce costs along with the government.

Other speakers on the second day of the conference included:

MG Henry H. Harper, commander, U.S. Army Depot Systems Command, reviewed some of the actions taken by DESCOM during the past year to assist the PMs. One of these was establishment of a Force Modernization Office at each of the Army's depots. Harper also discussed the total system fielding approach and his command's data base on the PMs programs.

Assistant Surgeon General for R&D *MG Garrison Rapmund* spoke on the need for the PMs to pay closer attention to potential health hazards in development of their systems. Specific hazards his office is concerned about are noise and blast, shock and vibration, humidity, heat, cold and altitude, toxic gases, and radiation. He directed attention to Army Regulation 40–10 which he termed very important.

> *"there will always be changes but they should not be allowed to get out of hand . . . production engineers must get involved in the acquisition process early."*
>
> **LTG George Sammet, Jr.**
> **(U.S. Army Ret.)**

Conference Conclusions

Reports from some of the special working groups closed the second day of the conference. Some of the conclusions of these groups were:

- More general guidance is needed from the Secretary of Defense regarding spare parts policies.
- Establish a spares clause in contracts that can be used in basic ordering agreements.
- More emphasis must be placed on quantity spares purchases to reduce repetitive buys.
- More information is needed on the Light Infantry Division's maintenance and messing procedures.
- There is a need for a better definition of where the light division will be deployed.

The concluding conference session (restricted attendance) was devoted to executive discussions by high-level HQ DARCOM personnel, commanders from major subordinate commands, PMs, and PM designees.

Correction

In the November-December 1983 issue of the *Army RD&A Magazine* the names of two individuals listed on pages 22 and 23 (Key DA Staff & HQ DARCOM Materiel RDA Personnel) were misspelled. Our apologies to MAJ Vincent R. Jozwiak and COL A. D. Rodgers, III.

DARCOM's Key Role in Target Signatures Programs and Requirements Planning

By William N. Hulsey III

"The battlefield of the future. We should expect the battlefield of the 21st Century to be dense with sophisticated combat systems featuring ranges, lethality, and employment capabilities which surpass anything known in contemporary warfare. The airspace over the battlefield will be saturated with aerial and space surveillance, reconnaissance, and target acquisition systems" (AirLand Battle 2000).

The preceding projection places an unprecedented burden on developers of tomorrow's military systems and equipment. Within the Army this burden is borne by the U.S. Army Materiel Development and Readiness Command (DARCOM), which must not only develop these systems but also maximize use of its scientific and technical resources in the process.

In order to perform this mission, it is critical that close coordination between the DARCOM RDA laboratory scientists and engineers and foreign scientific and technical intelligence (S&TI) analysts be maintained, because it is through a coordinated effort that the detailed needs of RDA laboratories can be best satisfied by the intelligence community.

One of the key interfaces between these proponents of the Army's technical community is in the measurement and analysis of target signature data. These data are used by advanced sensors and seekers to identify, classify, and target aircraft, ground vehicles and land facilities. To develop stronger linkages between these specialists and eliminate duplication of effort or other potential waste of critical resources in the development of these data, the DARCOM Signatures Planning Effort was initiated during the summer of 1982. Major thrusts of this program are to:

- Document the baseline situation in target signatures technical capabilities, existing data, and ongoing/projected programs within DARCOM across the entire electromagnetic, seismic, acoustic, and magnetic spectra.
- Identify, aggregate, and prioritize requirements for foreign and U.S. target signature technical information.

These objectives are being met, and will lay the foundation for meaningful technical dialogue promoting relevant scientific and engineering developments in both the target signature producer and end-user communities.

Because of the pervasiveness of resources and requirements of the target signatures community, this effort has required and received significant support from DARCOM RDA laboratories, foreign S&TI production activities, and HQ DARCOM.

The Office of the Army Assistant Chief of Staff for Intelligence, the Defense Intelligence Agency, and the Army Training and Doctrine Command have also provided guidance throughout each program stage.

Responsibility for the Signatures Planning Effort is assigned to the Army Foreign Science and Technology Center (FSTC) and is led by Mr. Donald B. Dinger, FSTC deputy director. FSTC was selected for this task because it regularly deals with all the above commands.

Program efforts began by canvassing the DARCOM technical community for raw data or inputs on target signature related resources and requirements. This involved a technical survey of all RDA laboratories and S&TI commands within DARCOM.

Results of the survey were initially used for analysis and synthesis by DARCOM scientists, engineers, intelligence analysts, and foreign intelligence officers. These personnel were organized into four technically oriented working groups associated with specific regions of the electromagnetic, seismic, acoustic, and magnetic spectra.

Working group one dealt with the ultraviolet, visual, near infrared, and laser reflectivity (near infrared) spectral regions. The second working group concentrated on infrared, and laser reflectivity (far infrared). Working group three specialized in radar cross section, and millimeter wave topics. Working group four emphasized acoustic, seismic, magnetic, and electrostatic regions.

The objective of these working groups was to convert the information from the survey response forms into succinct technical descriptions of DARCOM target signatures resources and requirements.

When the technical descriptions were completed, formal documentation of foreign target signature S&TI requirements was necessary.

It was decided to not only make maximum use of the DARCOM specialists who perform this documentation (the DARCOM foreign intelligence officers), but to also use those specialists already having a strong appreciation for the important technical details relevant to target signatures. To make certain this would happen, foreign intelligence officers were assigned to participate in the four technically-oriented working groups. These same intelligence officers would then be organized into a single working group to develop the required documents. This design proved successful in coordinating the efforts of all DARCOM laboratories. Results of these combined efforts, which were released during the second quarter of FY84, are the following information tools:

- *Compendium of DARCOM Target Signature Resources.* This publication, in two volumes, describes established capabilities, existing data, and ongoing/projected programs in explicit technical detail. Descriptions include points of contact, spectral regions of interest, specific targets and target types, and many target signature parametric properties.
- *Foreign Intelligence Production Requirements for Target Signatures.* These are the official documents initiated by the weapon system development community and result in a Defense Intelligence Agency approved production schedule. FSTC and other members of the national intelligence community use this schedule to carry out intelligence production. The Signatures Planning Effort has developed draft production requirements, each covering a separate spectral region and as many as 14 general target categories (e.g. field artillery equipment).

These draft requirements are more technically complete than any prior existing target signature-related production requirements and promise to be valuable in improving the statements of intelligence collection requirements and other documents for directing intelligence activities, as well as strengthening the ties between the designer/developer and intelligence producer communities.

- *Requirements for U.S. Target Signature Technical Data.* This aggregate list of technical requirements will be useful to the RDA laboratory and foreign S&TI communities. Like the requirements for foreign signature intelligence, this listing represents the combined needs of the DARCOM target signature community.

This complete set of technical requirements will allow many target signature field tests and data collection efforts to be more efficiently directed, often satisfying more than just one program's or laboratory's needs. It also will include points of contact, spectral regions of interest, specific targets and many needed signature parametric properties.

- *DARCOM Target Signatures Resources and Requirements Data Base.* Currently in the final phases of development, this is an automated data file which contains detailed information to aid developers in meeting current needs and to guide them in stating future requirements. It contains all of the technical details described above, and will be disseminated to the DARCOM major subordinate commands on magnetic tapes.

Since its inception, the DARCOM Signatures Planning Effort has proven valuable in bringing the signature community closer together to solve pressing technical problems. This demonstrates the merit of the program's concept and the validity of its approach in developing necessary managerial and technical planning aids. More importantly, the real benefits from this work will be seen in the future as these documents and the data base serve the designers/developers of the advanced sensors, seekers, and munitions for the battlefield of tomorrow.

WILLIAM N. HULSEY III is a physical scientist with the U.S. Army Foreign Science and Technology Center and the program action officer for the DARCOM Signatures Planning Effort. He has a BS degree in mathematics from Southwestern College (Memphis), an MA degree (pending) in economics from the University of Virginia, and has served as an officer in the Navy nuclear submarine force. He is currently pursuing a Juris Doctorate degree at the Catholic University of America.

Army Approves The Materiel Acquisition Management Program

By LTC John G. Miscik

The Department of Army has approved the new Materiel Acquisition Management (MAM) program for commissioned officers. Although DARCOM has been assigned the responsibilities as proponent, MAM is an Army program to benefit all organizations and officers performing acquisition functions.

The need for a MAM program is apparent when considering the following facts: MAM is highly complex, starting with combat development through research, science and engineering, to procurement and production of systems or equipment; a significant portion of the Army budget is for materiel acquisition; in comparison to the overall commissioned officers in the Army, only a small portion work in the acquisition field. The bottom line is that approximately 6 percent of the officer corps manages 37 percent of the budget involving 100 percent of the high, technologically complex acquisition business.

MAM is a multi-disciplined field requiring managerial expertise across a broad range of functions. Today's technology, system complexity and rising production costs, make it vital that the Army develop successful managers throughout the entire acquisition arena.

Positions requiring officers with MAM skills are predominantly found in DOD, DA, TRADOC and DARCOM. These organizations play a vital role in the acquisition process. Currently, slightly over 2,000 positions have been identified for the MAM program.

MAM is designed to provide officers with defense materiel acquisition management skills. This is achieved through intensive training and broad based assignments. Objectives are in Figure 1.

The program combines the functions and specialties involved in materiel acquisition into one program for the first time in the history of the Army. Thus, the Army can develop and assign the right officers, with the right abilities, to the right jobs in materiel acquisition.

MAM is a dual tracking program under the Officer Personnel Management System. Program members are expected to maintain qualifications in both of their specialties.

The program is divided into three phases: the user/support development phase, the MAM development phase, and the certified manager phase. Each phase provides an important foundation for the next phase. As officers progress through the phases they gain the knowledge and skills to be proficient materiel acquisition managers.

The user/support development phase, which begins when an officer enters active duty, lasts about six years. During this phase, branch specialization and company grade professional development occurs. Also, officers develop an important user/support base of knowledge and experience. Acquisition personnel exist to satisfy a user's need. It is upon the user/support base of experience that we develop the MAM skills for subsequent user/support systems acquisition. This phase precedes the development of MAM skills but is very important.

The MAM development phase begins when an officer enters the program at approximately the 6th year of active commissioned service and lasts for approximately 10 years. This phase includes required training and assignments in MAM positions for captains and majors.

The certified manager phase starts at approximately the 16th year of active commissioned service and lasts throughout the remainder of an officer's career. Specifically, it begins when program officers are certified as materiel acquisition managers. During this phase officers receive varied, high level, responsible manager assignments requiring their MAM skills. Continued refinement of MAM managerial skills occurs throughout this phase.

Entry into MAM is accomplished by a board selection process. Officers must apply for the program by submitting a letter of application, through their immediate supervisor for indorsement, to their appropriate assignment branch at MILPERCEN. Applications should include any training, experience or other pertinent information.

All applicants who meet the selection criteria (see Figure 2) will be considered for the program. Selection is based on specialty and grade requirements. Not all those who apply will be accepted. Once selected, officers will be awarded the Additional Skill Identifier (ASI) 6T. The 6T code has up to now been used for the Project Manager Development program which the MAM program is replacing. MAM officers and duty positions will also be coded with ASI 6T.

There are two types of specialties involved in MAM: Acquisition Specialties and Hardware/Alignment Specialties. Acquisition Specialties (see Figure 3) consist of functions that are closely aligned with the acquisition functions required in an acquisition position.

Hardware/Alignment Specialties provide the commodity, hardware or product focus for the acquisition functions. As an example, in a position coded 51A12, the SC 51 indicates the acquisition requirement, (RD&A) and the SC 12 indicates the hardware area (armor systems). Both types of specialties are required to accurately identify the requirements in acquisition positions.

Accurate identification of position requirements is essential to build the proper inventory of MAM officers to meet the requirements.

The MAM concept is depicted in Figure 4. Active duty officers, upon completion of 5½ years of active commissioned service, who desire to become materiel acquisition managers may apply for the program. They must hold at least one of the acquisition specialties.

Officers, who hold any non-acquisition specialty during the user/support development phase may also apply for the program after having an acquisition specialty designated as their additional specialty. Applicants who meet the selection criteria and are selected for the program by the MAM selection board will normally enter the program at approximately the sixth year of active commissioned service in the grade of captain. They will be awarded the 6T skill identifier and enter into the MAM development phase.

MAM OBJECTIVES

- TO ENSURE THAT OFFICERS PERFORMING MATERIEL ACQUISITION MANAGEMENT FUNCTIONS OBTAIN SPECIALIZED AND INTENSIVE TRAINING, EDUCATION AND DEVELOPMENTAL ASSIGNMENTS
- TO PRODUCE MATERIEL ACQUISITION MANAGERS WITH A BROAD PERSPECTIVE ACROSS THE ENTIRE FIELD OF MATERIEL ACQUISITION MANAGEMENT
- TO MAXIMIZE SUCCESSFUL MATERIEL ACQUISITION MANAGEMENT THROUGH CONTROLLED ASSIGNMENTS OF PROPERLY TRAINED, DEVELOPED AND CERTIFIED MAM OFFICERS
- TO ENSURE THAT MAM OFFICERS HAVE OPPORTUNITIES FOR ADVANCEMENT AND CAREER SATISFACTION

Figure 1

MAM SELECTION CRITERIA

- BE IN A BRANCH MANAGED BY OPMS
- COMPLETED OBC & OAC
- BE IN THE GRADE OF CAPTAIN OR HIGHER
- COMPLETED AT LEAST 5½ YRS OF AFCS
- EXPRESS A DESIRE TO PARTICIPATE IN THE PROGRAM
- HAVE DEMONSTRATED COMPANY GRADE PROFICIENCY AND POTENTIAL FOR FIELD GRADE DUTY
- HOLD A MAM RELATED BACCALAUREATE OR HIGHER DEGREE
- HAVE DEMONSTRATED A HIGH LEVEL OF POTENTIAL FOR DEVELOPMENT AS A MAM OFFICER
- HAVE AT LEAST 6 YRS OF SERVICE REMAINING
- HOLD AN ACQUISITION SPECIALTY REQUIRING MAM OFFICERS

Figure 2

ACQUISITION SPECIALTIES

27 COMMUNICATIONS-ELECTRONICS ENGINEERING
45 COMPTROLLER
49 OPERATIONS RESEARCH/SYSTEMS ANALYSIS
51 RESEARCH, DEVELOPMENT AND ACQUISITION
52 NUCLEAR WEAPONS
53 AUTOMATED DATA SYSTEMS MANAGEMENT
71 AVIATION LOGISTICS
72 COMMUNICATIONS-ELECTRONICS MATERIEL
73 MISSILE MATERIEL MANAGEMENT
74 CHEMICAL
75 MUNITIONS MATERIEL MANAGEMENT
91 MAINTENANCE MANAGEMENT
92 MATERIEL/SERVICES MANAGEMENT
97 PROCUREMENT AND PRODUCTION

Figure 3

When appropriate, MILPERCEN will assign the selectees to their first MAM assignment with TDY enroute to the MAM course at Fort Lee, VA. This assignment is normally followed by a return to each officer's branch or initial specialty for further user/support development. At about the mid-point of their service as a major, program officers will receive their second MAM assignment with TDY enroute to the Program Management Course at Fort Belvoir, VA. The goal is to have received two MAM assignments by approximately the 15th year of active commissioned service.

Upon selection to lieutenant colonel, a very critical point is reached. All program officers will be evaluated by a central selection board for certification as materiel acquisition managers and retention in the program. Those who meet the certification criteria (see Figure 5) and are certified by the board will be assigned to lieutenant colonel and above MAM positions. They will receive an Army certificate attesting to their achievement of becoming materiel acquisition managers.

Only certified managers will be assigned to lieutenant colonel and above MAM (6T) positions. Officers who do not meet certification will have the 6T code removed from their records and will be withdrawn from the program. These officers will still receive assignments in their specialties but not to MAM (6T) positions. All acquisition specialties have both 6T and non-6T positions.

MAM CONCEPT

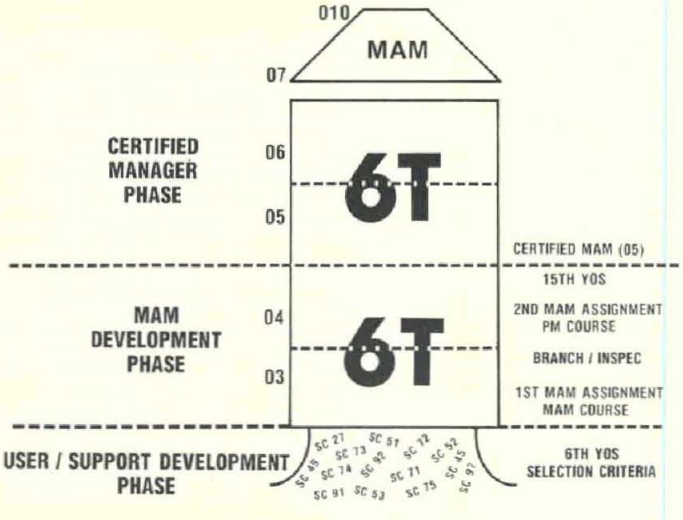


Figure 4

Required education for MAM officers consists of the 9 week MAM Course (entry level) at the Army Logistics Management Center at Fort Lee, and the 20 week Program Management Course at the Defense Systems Management College at Fort Belvoir.

MAM officers selected for a senior service college will normally be programed to attend the Industrial College of the Armed Forces, although some MAM officers can expect to attend other senior service colleges. Graduate civilian schooling is also available for officers to obtain a master's degree in MAM or a related discipline. Related disciplines include management, business, engineering and hard sciences.

Obviously, it will take time to develop materiel acquisition managers from new captains in the program. In the meantime, there will be a shortage of majors and lieutenant colonels. To fill this shortage, majors and lieutenant colonels who have had some related training or experience will need to be selected into MAM.

A transition phase providing for a slight relaxation of criteria will be in effect to facilitate building the inventory assets needed. Those officers that were a part of the PM development program will be screened and if they meet the criteria will be automatically transitioned into MAM. Other officers, majors and above, must apply and if they meet the transition criteria will be selected into the program. Their training and development needs will be assessed and intensive management will be provided to ensure the most reasonable "get up to speed" training and experience provided. The transition phase should not last for more than 3 years.

MAM CERTIFICATION CRITERIA

- **MILITARY SCHOOLING — OBC/OAC/MEL 4 (CGSC)**
- **CIVILIAN SCHOOLING — BACCALAUREATE OR HIGHER IN MAM RELATED DISCIPLINE**
- **MAM SCHOOLING — MAM (ALMC) AND PMC (DSMC)**
- **TWO MAM ASSIGNMENTS**
- **HAVE DEMONSTRATED POTENTIAL TO SUCCESSFULLY SERVE AT THE 05 LEVEL IN MAM**
- **QUALIFIED IN BOTH SPECIALTIES①**
- **SELECTED FOR PROMOTION TO LTC**

①PROGRAM DOES PERMIT SOME OFFICERS TO SINGLE TRACK

Figure 5

MILPERCEN has developed and HQDA has approved a personnel management plan to manage MAM personnel. As a part of the plan, the MAM controller/career manager will function as the focal point for MAM assignments. *(A detailed article on how MILPERCEN will manage program officers will appear in a future issue of this magazine.)*

Details of the program will be included in the next update to Chapter 101, DA PAM 600–3 due out in 2d quarter of FY 1984. It will be a comprehensive chapter and all officers should read it—particularly MAM officers.

MAM is a complete, comprehensive, competitive and challenging program. It is also exciting with its own checks, balances and rewards whereby successful officers can reach the highest levels of the Army.

LTC JOHN G. MISCIK is assigned as the materiel acquisition management project officer in the Directorate for Personnel, Training and Force Development, HQ, DARCOM. He is a graduate of the Command and General Staff College, the Armed Forces Staff College and received his MA degree from the University of Nebraska.

AR 70–1 Revision Includes Major Policy Changes

Army Regulation (AR) 70–1 (Systems Acquisition Policy and Procedures), the capstone Army research, development and acquisition regulation, has been completely revised by a joint HQDA-DARCOM work group. The revision was completed in July 1983 and the regulation is now at The Adjutant General's Office with publication scheduled for 15 February 1984.

Sweeping changes in materiel acquisition policy, promulgated by DOD Directive 5000.1 (Major Systems Acquisition) and DOD Instruction 5000.2 (Major System Acquisition Procedures), triggered revision of all materiel acquisition regulations.

Additionally, the Army Staff drastically condensed AR 1000–1 (Basic Policies for Systems Acquisition), leaving a void in Army guidance for implementing the new Office, Secretary of Defense (OSD) and Army policies. The new AR 70–1 has filled the void, giving materiel developers comprehensive Army policy and procedures for carrying out basic materiel acquisition life cycle activities.

The most important feature of the new AR 70–1 is increased emphasis on planning at the front end of the acquisition process. This is accomplished primarily through the new requirement for a formal Acquisition Strategy prepared during the Concept Exploration Phase and approved at Milestone I. The front end Concept Exploration Phase is initiated with TRADOC's approval of an Operational and Organizational Plan (or Justification for Major System New Start for programs breaching OSD's dollar threshold). During this phase, the user (usually TRADOC) defines and refines the materiel requirement, and the materiel developer prepares the Acquisition Strategy to respond to the user's maturing requirements.

The Acquisition Strategy is the project manager's or materiel developer's master "road map" or blueprint to satisfy the requirement established by the user community. There are four categories of decision reviews. The lowest level is the In-Process Review (IPR), conducted and approved at DARCOM. The next level is the HQDA IPR, conducted at DARCOM but approved at HQDA staff by the DCSRDA. The third level is the Designated Acquisition Programs. These are reviewed by the Army System Acquisition Review Council (ASARC), chaired by the Army Vice Chief of Staff.

Approval authority is retained by the Army Acquisition Executive, the Assistant Secretary of the Army (RD&A). The final category is the DOD Major System. These are reviewed by the Defense System Acquisition Review Council and approved by the Secretary of Defense. The Acquisition Strategy is prepared, reviewed, and approved for all four categories of programs.

Acquisition Strategy covers all important aspects of the acquisition process. AR 70–1 defines the following 13 elements which must be addressed as a minimum: Program Structure, Contracting Strategy, Tailoring the Acquisition Process, Supportability, Manufacturing and Production, Test and Evaluation, Cost Growth and Drivers, Technical Risks, Safety and Health, Soldier-Machine Interface, RSI, Survivability and Endurance, and Short-Term Issues.

Other elements can be added as warranted by the peculiarities of each system. Once approved by the Milestone I decision review, the Acquisition Strategy serves as the stable baseline for the remainder of a program and cannot be changed without approval of the original approving authority.

To emphasize the importance of front end planning, all programs will have a Milestone I, where the Acquisition Strategy is presented, defended, and approved. The course followed after this depends on the program's Acquisition Strategy. The new AR 70–1 encourages flexibility, innovation and tailoring. For example, whole phases and milestones may be skipped if such a program is presented and justified in the Acquisition Strategy, and approved by the Milestone review process which includes input from representatives from all the functional areas.

The Acquisition Strategy is one of the three new standard Milestone program review documents which AR 70–1 requires to be submitted to the Milestone review by the PM. All programs, regardless of their level of review, will use the same general formats. The other two documents are the System Concept Paper (SCP), submitted at Milestone I, and the Decision Coordinating Paper (DCP), submitted at Milestones II and III. These documents contain summaries of the Acquisition Strategy, functional plans, and cost, schedule and performance thresholds. On an exception basis, the Milestone decision authority may request additional data for Milestones II and III in the form of the Integrated Program Summary.

Other major changes promulgated by AR 70–1 pertain to Non-development Item (NDI) Policy, and the Operational and Organizational Plan.

NDI Policy is one form of an Acquisition Strategy. This revision of AR 70–1 is the first official detailed explanation of Army NDI Policy in a formal Army regulation. If early investigations during the Concept Exploration Phase indicate existing sources (commercial, other Services, etc.) can satisfy the requirement, the central effort during Concept Exploration Phase is the Market Survey. The Market Survey allows the materiel developer to search all existing sources including commercial firms, other Services or other nation's armed forces, to determine if there is equipment in existence that will satisfy the requirement.

The Market Survey may identify suitable off-the-shelf equipment, available equipment needing modification, or find that a new development is needed to satisfy the requirement. Results of the Market Survey feed the Acquisition Strategy and the remaining program is structured accordingly. Although one of the major advantages of the NDI Acquisition Strategy is savings in acquisition time, this is not to be done at the expense of logistic planning. NDIs are not exempt from being fully integrated into the standard Army logistic system, and each NDI Acquisition Strategy must address the logistic transition from off-the-shelf to in-the-field.

The Operational and Organizational Plan, as mentioned earlier, assumes a new role. The initial plan serves as a requirements document to support the Concept Exploration Phase. After the Concept Exploration Phase, the Operational and Organizational Plan is updated at each Milestone, but is no longer a requirements document.

In addition to AR 70–1, four other major acquisition guidance documents are due for publication in 1984. These are: AR 71–9 (Materiel Objectives and Requirements) which describes the requirements generation process; AR 15–14 (ASARC/DSARC Procedures); AR 71–3 (User Testing); and the DARCOM-TRADOC Pam 70–2 (Materiel Acquisition Handbook).

In summary, revision of AR 70–1 and the other supporting acquisition regulations and handbooks provide a much needed update of acquisition policy. Application of this policy should promote a more disciplined acquisition program.

Additional information on AR 70–1 may be obtained from Jim Sheldon at: HQ U.S. Army Materiel Development and Readiness Command, ATTN: DRCDE-A, 5001 Eisenhower Ave., Alexandria, VA 22333. His AUTOVON phone number is 284-9060 and his commercial number is (202) 274-9060.

The preceding article was authored by Jim Sheldon, an acquisition policy specialist in the Acquisition Assessment and Policy Division, Directorate for Development, Engineering and Acquisition, HQ DARCOM.

Army Field Office Provides Key Air Force Interface

GEN Robert T. Marsh, commander, Air Force Systems Command, James H. Proctor, chief, U.S. Army Field Office, and MAJ John M. Tanzillo, R&D coordinator, U.S. Army Field Office, discuss the Air Force requirements for Air Base Defense.

An important function of effective interservice research and development is maintaining a direct interface between the Army and the Air Force. From 1954, until 1964 this function was performed by liaison officers. However, in 1964, the function was assumed by the U.S. Army Field Office which celebrated its 20th year of service on 1 January 1984.

The U.S. Army Field Office is located at Andrews AFB, MD, near Washington, DC. It is a separate Class II activity reporting directly to the U.S. Army Materiel Development and Readiness Command (DARCOM) with full staff status in the U.S. Air Force Systems Command (AFSC).

This arrangement enables the field office to assist in coordinating management procedures, monitoring joint service programs, and keeping informed of all Air Force Systems Command actions of potential interest to the Army. Additionally, the field office facilitates the exchange of technical information with DARCOM.

Field office areas of concern include space programs, electronic warfare, aeronautics, munitions, lasers, computer systems, training devices, target acquisition, life cycle costing, design-to-cost, reliability and maintainability, testing, contracting, project management, and intelligence.

The Army Field Office may coordinate requirements with any Air Force Systems Command agency involving DARCOM interests, but is often called on by various Army and other service agencies for assistance.

Many actions which the field office becomes aware of do not warrant widespread dissemination of information. In those cases, individual Army agencies are contacted directly for comments. Procedures established to integrate efforts of the Air Force, DARCOM, and other Army agencies have often resulted in joint development and testing projects credited with substantial dollar savings.

The field office also has presented Air Force policies that have been accepted for Army implementation. Similarly, the office has been able to assist Air Force agencies in resolution of problems in areas of Army responsibility.

Conversely, in coordination with Army agencies, the field office has been able to provide management policies or guidance acceptable to the Air Force Systems Command staff. Frequently, these areas of interest require coordination with DARCOM, Forces Command, the Training and Doctrine Command, TRADOC, and the Army staff.

James H. Proctor, a retired Army officer has served as Chief of the Army Field Office since its inception and headed the liaison effort from 1958–64. He also serves as an Army representative on various interservice panels and committees including the Joint Technical Coordinating Group on Aircraft Survivability; Aircrew Station Standardization Panel; and the DOD Human Factors Engineering Technical Advisory Group.

The Technical Digest, published monthly by the field office, is the primary media for dissemination of a summary of selected Air Force R&D activities of interest to the Army. Distributed to all commands and agencies within DARCOM as well as 64 additional activities and other services, the publication prompts requests for more than 300 specific items monthly. Requests are accepted from overseas as well as CONUS-based commands.

Proctor, whose staff consists of R&D Coordinator MAJ John M. Tanzillo and Cristina E. Biesecker, administrative assistant, said the primary mission of the field office is to aid any and all persons in DOD agencies. "If you need USAFO's services, we are involved from A to Z. We welcome your call," said Proctor.

MERADCOM Becomes Belvoir R&D Center

Fort Belvoir's largest organization, the U.S. Army Mobility Equipment R&D Command (MERADCOM), has been renamed the Belvoir Research and Development Center.

The change is the result of the formation of the Army's new Troop Support Command (TROSCOM) in St. Louis, in a realignment of major subordinate commands of the Army's Materiel Development and Readiness Command. No relocation of MERADCOM's 1,200 predominantly civilian personnel is involved.

The Belvoir R&D Center will retain the command mission of developing military equipment in more than 20 different fields of endeavor, ranging from mine detectors and bridges to camouflage systems and water purification equipment. Integration with TROSCOM will streamline the process of getting this equipment fielded and improve the management of center-developed items throughout their life cycle.

During the redesignation ceremony, Belvoir Center Commander COL Theodore Vander Els said the TROSCOM connection would "help us relate better to the Army in the field and, with MG Kenneth E. Lewi as TROSCOM commanding general, grant us a weightier voice in the TRADOC-DARCOM community."

Awards...

Hollis Presents Army Systems Analysis Awards

CPT August C. Manguso, Army Concepts Analysis Agency (CAA), accepts the Systems Analysis Award from Deputy Under Secretary of the Army for Operations Research Walter W. Hollis as David C. Hardison, CAA director, looks on.

Presentation of Army Systems Analysis Awards was made late last year by Deputy Under Secretary of the Army for Operations Research Mr. Walter W. Hollis during the XXII Army Operations Research Symposium at Fort Lee, VA. One award was given to an individual and one was given to a group.

Comprised of an engraved plaque and a citation certificate signed by the Secretary of the Army, the Systems Analysis Award may be given annually to an individual and to a group for technical achievements by Department of the Army civilian or military personnel engaged in operations research/systems analysis activities.

Any DA analyst, technician or group whose contribution was made or culminated during 1 July 1982 through 30 June 1983 and met one of several criteria was eligible for nomination. Twelve individuals and 22 groups were nominated for the award.

CPT August C. Manguso, an operations research analyst in the Data and Intelligence Service Division, U.S. Army Concepts Analysis Agency, was the recipient of the Systems Analysis Award for individual achievement. His citation praised his significant service to the Army's master menu planning process.

Specifically, CPT Manguso was credited with developing the Econometric Model for Optimizing Troop Dining Facility Operations. This study, which was sponsored by the Office of the Deputy Chief of Staff for Logistics (ODCSLOG), was initiated in response to a need for a consistent, analytical approach for evaluating food service resources in planning the Army's master menu.

The former method of developing the master menu was considered a subjective analysis using some manual and some partially automated procedures. There was no assurance that the resulting menu met optimal nutrition requirements, food and labor costs, and overall acceptability.

As the study director and the only full-time member of the study team, CPT Manguso conceived the new analytical methodology in which nutrition, food costs, acceptability and labor costs could all be considered in achieving a new menu which comes as close as possible to satisfying all of these factors.

CPT Manguso was further credited with meeting all requirements of the study, delivering the model (with documentation) to the Army Troop Support Agency, and with assisting Troop Support Agency personnel in placing the model in operation on the available computer system. The econometric model and documentation were designed with flexibility, ease of operation, accuracy and reliability as key factors.

The group award for systems analysis achievements was presented in recognition of a study which was also sponsored by ODCSLOG. Identified as the Unit Productivity-Transportation Study, this effort was conducted by a multi-disciplinary team of five civilians from the Army Materiel Systems Analysis Activity (AMSAA) and the study leader from ODCSLOG.

The objective of the study was to examine a potential increase in the wartime capability of selected Army transportation units in order to offset shortfalls in the number of units required in the force structure. Seven transportation companies were selected for evaluation.

One of the findings of the study was that the density of materials handling equipment assigned to Army terminal units is extremely low when compared to similar civilian operations. The study team also found that the lack of communications equipment has imposed severe constraints on many terminal and truck operations.

Shown are MAJ Edward Quatrevaux, ODCSLOG, displaying the Systems Analysis Award Certificate and David J. Shaffer, AMSAA, holding the award plaque.

The citation presented for the group achievement noted that the Unit Productivity-Transportation Study established a precedent in methodology for evaluation of combat service support units. Additionally, the study recommendations have been validated and have, in some cases, demonstrated increases in productivity up to 236 percent.

Recipients of the group award were AMSSA employees Mr. David J. Shaffer, operations research analyst and the team leader for the AMSSA effort; Mr. Louis F. DeLattre, operations research analyst; Mr. James F. Parman, military and logistics systems analyst; Mr. John P. O'Malley, operations research analyst; Mr. Theodore M. Muehl, operations research analyst; and MAJ Edward Quatrevaux, study leader from the HQ DA ODCSLOG Directorate for Plans and Operations.

BRL Engineer Receives 1983 Kent Award

Alexander S. Elder, an engineer at the Army's Ballistic Research Laboratory (BRL) has received the 1983 Kent Award, an honor recognized at BRL as the highest annual commendation for achievements in scientific and engineering research. The award was established in 1956 and honors BRL's prominent scientific leader, the late Dr. Robert H. Kent.

Elder was cited for his technical contributions and expertise in the fields of in-bore dynamics and sabot design. A veteran Army researcher, with more than 30 years of Federal service, Elder is the analytics team leader in the Mechanics and Structures Branch in BRL's Interior Ballistics Division.

He was awarded a bachelor's degree in mathematics from Harvard University and received a master of education degree from Boston University. In addition, holds an MS degree in mathematics from the University of Delaware.

He worked as a physicist at the Army's Watertown Arsenal Laboratory in New York prior to beginning his assignment at BRL in February 1950.

Elder is a charter member of the BRL Fellows, an honorary scientific group, a member of Pi Mu Epsilon, a mathematics honor society, and is listed in the *American Men of Science, Who's Who in the East,* and the *Dictionary of International Biography.*

His professional affiliations include the Society for Industrial and Applied Mathematics, the Mathematical Association of America, the Society of Rheology, the American Society of Mechanical Engineers, the New York Academy of Science, the American Academy of Mechanics, and the International Platform Association.

Career Programs. . .

AMCCOM Establishes Ammunition Career Program

Establishment of an Ammunition Specialist Civilian Career Program at the U.S. Army Defense Ammunition Center and School, Savanna, IL, has been announced by the U.S. Army Armament, Munitions and Chemical Command.

The program includes an intensive 2-year training course that is described as ammunition from A to Z, according to MG James S. Welch, director of Supply, Maintenance and Transportation at the Army Materiel Development and Readiness Command. "The ammunition specialist we are training will be familiar with ammunition from the time it begins manufacture until it is fired by the troops in the field," says MG Welch.

The course includes production, storage, inventory, maintenance, packing, shipping and even disposal of the ammunition. DARCOM Commander GEN Donald R. Keith has been designated as the career program's functional chief with MG Welch as the functional chief's representative. Career program operations and the intensive training provided to interns is accomplished at the ammunition center.

Open to government employees with a background in supply, maintenance, production or transportation in addition to outside candidates, the program, in most cases, offers entry level acceptance at the GS–4 grade. However, there may. be some exceptions based on experience. Generally, candidates must have three years of responsible experience which provides a general knowledge of one or more aspects of a career field.

Previously, an installation handling ammunition would get a supply specialist trained in general supply, but knowing very little about the peculiarities of ammunition. Subsequently, the supply specialist was sent to the ammunition center to learn about ammunition. The new career program will include recruitment, training, and then placement of those completing the program into jobs within the DOD ammunition community.

The ammunition specialist intern training is a comprehensive program and deals with ammunition ranging from a .22 caliber bullet all the way up to a Pershing II nuclear weapon.

The program starts with 58 weeks of classroom training at the ammunition center, followed by 44 weeks of on-the-job training at selected ammunition installations and command headquarters having ammunition missions.

The Army discovered an increasing need for the ammo specialist during the last decade as a significant loss of expertise occurred in the field due to attrition. In addition, a study showed that the aging workforce received infrequent training and that little conformity existed in their duties.

The need for ammo specialists is expected to grow from a need of 400 to about 1,500 during the next 20 years as the needs of the Navy, Air Force, and Marine Corps are identified and satisfied. For more information on the new career program, contract the nearest Army Civilian Personnel Office.

Personnel. . .

Black Becomes DARCOM RDA Assistant Deputy

Robert O. Black

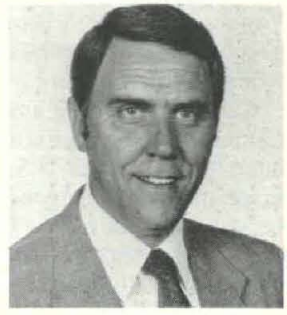
Robert O. Black, who has served since 1981 as associate director for Systems, U.S. Army Missile Laboratory, U.S. Army Missile Command, Redstone Arsenal, AL, is the new U.S. Army Materiel Development and Readiness Command principal assistant deputy for Research, Development and Acquisition, following the retirement of John D. Blanchard.

Black, whose special expertise includes laboratory/project interface, missile testing technology, test programs development, reliability growth, and product assurance, was director of Test and Evaluation at the U.S. Army Missile Laboratory from 1974 to 1981. In 1971 he took over as director of U.S. Army Missile Command quality reliability and maintainability programs, following his organization of the Directorate for Product Assurance.

He holds a BS degree in industrial engineering from the University of Oklahoma, an MS degree in industrial engineering from the University of Alabama, and an MS degree in management from the Massachusetts Institute of Technology.

Additionally, Black is a member of the Association of the U.S. Army and he is a recipient of a Department of the Army Exceptional Civilian Service Award, two Meritorious Civilian Service Awards, and was a 1968 nominee for the Arthur S. Fleming Award.

Boge Takes Over as ETL Technical Director



Walter E. Boge

Walter E. Boge has been named technical director of the U.S. Army Engineer Topographic Laboratories (ETL), Fort Belvoir, VA. As technical director, he is the deputy for technical affairs to ETL's Commander and Director COL Edward K. Wintz.

Since joining ETL as a general engineer in 1960, Boge has held a series of increasingly responsible positions, most recently as director of ETL's Geographic Sciences Laboratory. His technical experience includes mapping, charting and geodesy, digital image processing and systems engineering.

Boge received a bachelor's degree in civil engineering from City College of New York and a master's degree in civil engineering from Purdue University, Lafayette, IN.

Boge holds the Talbert Abrams Award from the American Society of Photogrammetry and the ETL Commander's Leadership Award. He is a member of Chi Epsilon Civil Engineering Honor Society, Phi Kappa Psi Graduate School Honor Society and the American Society of Photogrammetry.

Saunders Succeeds Hayes as Natick Commander

COL D. L. Saunders

COL David L. Saunders has succeeded COL(P) James S. Hayes as commander of the U.S. Army Natick Research and Development Center, Natick, MA.

COL Saunders had been serving as chief, Troop Support Division, Office of the Deputy Chief of Staff, Logistics, Department of the Army, Washington, DC, prior to his arrival at Natick.

Saunders entered the Army in May 1959 after receiving a BS degree in textile engineering from North Carolina State University in 1959. He subsequently earned a Master's Degree in textile engineering from Georgia Institute of Technology in 1970. A graduate of the Quartermaster School Basic and Advanced Courses, the U.S. Army Command and General Staff College and the Industrial College of the Armed Forces, COL Saunders completed three assignments in Germany and two tours of duty in Vietnam as well as several command positions within the States.

Among his awards and decorations are the Bronze Star Medal with V device and two Oak Leaf Clusters (OLC), the Meritorious Service Medal with two OLC, the Air Medal, Purple Heart, the Army Commendation Medal with two OLC and the General Staff Identification Badge.

Bulger Commands Army's Belvoir R&D Center

COL D. B. Bulger

COL Dennis B. Bulger has assumed command of the Belvoir Research and Development Center, formerly the U.S. Army Mobility Equipment R&D Command, Fort Belvoir, VA. He succeeds COL Theodore Vander Els, now director of Combat Developments and the Army Engineer School.

COL Bulger became the Center's commander after serving a year with the U.S. Army Inspector General Agency. Immediately prior to that period, he was assigned to the Office of the Army Deputy Chief of Staff for Research, Development and Acquisition.

Since receiving his commission following graduation from Clarkson College in 1962, COL Bulger has had a variety of assignments, including duty with troops, civil works, facility engineering and research and development. His tours have included Hawaii, Vietnam, Panama and Korea, as well as the continental United States.

In addition to a BS degree in engineering, COL Bulger holds an MS in civil engineering from Clarkson and an MBA in procurement and contracting from George Washington University. He is also a graduate of the National War College and a registered professional engineer in New York.

COL Bulger has been awarded the Bronze Star for Valor with oak leaf cluster (OLC), the Meritorious Service Medal with four OLCs, the Army Commendation Medal, the National Defense Service Medal, the Vietnam Service Medal, Republic of Vietnam Campaign Medals, the Parachutists Badge and the Army General Staff Badge.

Roth Commands, Directs Cold Regions Lab

COL Morton F. Roth has assumed new duties as commander and director, U.S. Army Cold Regions Research and Engineering Laboratory (USACRREL), Hanover, NH. This assignment follows a tour as director, Defense Mapping Agency Inter-American Geodetic Survey, in both Panama and Fort Sam Houston, TX.

Graduated from the U.S. Military Academy at West Point in 1957, COL Roth received his master's degree in civil engineering from Ohio State University in 1962. Additionally, he is a graduate of both the Army Command and General Staff College and the Army War College. A registered professional engineer in Ohio, COL Roth is airborne qualified and holds a private pilot's license.

During 1975–78, he served as NATO pipeline engineer, Allied Forces Central Europe, Naples, Italy. He was a battalion commands and installation engineer, Vietnam, in 1971–72, and was the mapping, charting and geodetic officer for the Atlantic Command, Norfolk, VA, from 1968–71.

COL M. F. Roth

COL Roth's awards include the Defense Superior Service Medal, Legion of Merit, Bronze Star Medal (two awards), Meritorious Service Medal, Air Medal, Joint Service Commendation Medal, and Army Commendation Medal.

Top Chosen as WRAIR Director/Commandant

The U.S. Army Medical R&D Command has announced that COL Franklin H. Top Jr., MC, has been selected to succeed BG Philip K. Russell, MC, as director/commandant of Walter Reed Army Institute of Research. BG Russell has assumed command of Fitzsimons Army Medical Center, Aurora, CO.

COL Top has served for the past two years as commander, U.S. Army Medical Research Institute for Chemical Defense (USAMRICD). He received a BS degree (1957) and an MD (1961) from Yale University. Following pediatric intern and residency training at the University of Minnesota Hospital, Dr. Top reported for active duty in 1966.

He served in WRAIR's Division of Communicable Disease and Immunology until 1970, when he reported to WRAIR's SEATO component in Bangkok, Thailand. From 1972 to 1973 he was deputy director of the SEATO component, before returning to the WRAIR as chief, Department of Virus Diseases, Division of Communicable Disease & Immunology.

In 1978 COL Top was professor of Pediatrics, Uniformed Services University of Health Sciences. From 1979 until assuming command of the USAMRICD in 1981, COL Top was deputy director of the WRAIR.

The Secretary of the Army Research and Study Fellowship

In the summer of 1981, Dr. Samuel Colbeck of the U.S. Army Cold Regions Research and Engineering Laboratory packed his bags and headed for the Swiss Federal Snow and Avalanche Institute at Davos, Switzerland, to study the changes in crystaline properties of snow. A year earlier, Dr. Hain Soicher of the U.S. Army Communications R&D Command had boarded a plane with his family and flew to Haifa, Israel, to study the propagation effects of low elevation signals along earth/space paths at the Israel Institute of Technology. Both scientists studied under the auspices of the Secretary of the Army Research and Study Fellowship Program.

First established in 1956, these Fellowships are awarded to encourage the discovery, development and increased use of the best creative talents among our outstanding career civilians. Experience has shown that the greatest contribution to the development and retention of outstanding employees derives from the opportunity to participate in activities which permit creative thinking. These Fellowships provide a significant means for accomplishing this objective. By making available opportunities for research and study in fields vital to Army missions, mutual benefits accrue both to the individual Fellow and to the Army.

The objective of this article is to alert engineers, scientists, and other researchers to the possibilities of The Secretary of the Army Research and Study Fellowship. A Research and Study Fellowship enables the recipient to spend not less than 6 nor more than 12 months in full-time study or research in connection with a specifically approved project. This project is initially proposed by the applicant and may include study in residence at an institution of higher learning of the individual's choice, in this country or abroad, or in some comparable educational or research activity.

While the study project is normally proposed by the individual, this does not preclude an organization or activity initiated study project. These Fellowships, however, are not intended as a substitute for research which should be conducted on a normal on-duty basis and financed through other currently available appropriations.

Prerequisites for requesting nomination to this program are as follows: the nominee should occupy a position at the GS–12 grade level or above; should have at least five years consecutive Federal Government experience; and should have demonstrated outstanding work achievement, progress and accomplishment within DA.

Application for the Secretary of the Army Research and Study Fellowship is completed in accordance with directions provided in AR 690–400, Chapter 410, Subchapter 13. Employee development specialists in the Civilian Personnel Office Training and Development Branch of most organizations provide assistance and counseling in the preparation of the nomination package. Each recipient of a Fellowship will be paid as if in a work status during the 6 to 12 months of the study project, although he or she is relieved of other duties during that time. Travel and up to 55 percent per diem are also among the benefits of this program.

Submission and processing of applications are as follows:

- Fellowship applications and proposed study projects are submitted by employees at any time.
- Evaluation by a panel at activity level.
- Endorsement by activity commander.
- Intermediate reviews at each successive level of command.
- Evaluation of study project by interested staff agency.
- Final review by Executive and Professional Development Committee, composed of top-level officials specifically designated to administer the fellowship program.
- The committee submits its recommendations to the Under Secretary of the Army who makes final decision.

The Army is interested in providing opportunities for professional growth of its talented and gifted researchers. It is up to the researchers to apply their creativity toward making application for this excellent program.

The preceding article was authored by Joel Kuhn, an employee development specialist with the U.S. Army Civilian Personnel Center, Alexandria, VA.

Statement of Ownership, Management, and Circulation (required by 30 USC 3685). The name of the publication is *Army Research, Development & Acquisition,* an official periodical of the Department of the Army, published bimonthly at HQ, U.S. Army Materiel Development and Readiness Command, Alexandria, Virginia. Publisher and editor: LTC David G. Kirkpatrick, DRCDE-XM, Alexandria, Virginia, 22333. Extent and nature of circulation: Figures that follow are average number of copies of each issue for the preceding 12 months for the categories listed. Printed: 28,182. Total paid circulation, sold through the Government Printing Office: 1,530. Free distribution by mail, carrier, or other means: 26,627. Total distribution: 28,157. Copies not distributed in above manner: 25. Actual number of copies of a single issue published nearest to the filing date: 28,262.

I certify that this statement made above by me is correct and complete: LTC David G. Kirkpatrick, Editor, 26 September 1983.

DEPARTMENT OF THE ARMY

Headquarters
U.S. Army Materiel Development & Readiness Command
5001 Eisenhower Avenue
Alexandria, VA 22333

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DoD-314

SECOND CLASS MAIL