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MARCH-APRIL 1980

FASCAM

Family of Scatterable Mines

(see page 6)

R,D&A ARMY

Vol. 21 No. 2 **March-April 1980**

OFFICIAL MAGAZINE OF THE RDA COMMUNITY, established 1959

ABOUT THE COVER:

Front cover shows Family of Scatterable Mines in tests with tank. Back cover gives acronyms and spells out the 7 members of the FASCAM family, designed to deliver mines to the battlefield via artillery tube, rocket launcher, armored vehicles or aircraft.

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 a specialty indicator of R&D (52), Procurement (97), Atomic Energy (51), and Project Management (6-T).

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ALL NON-U.S. GOVERNMENT agencies, firms and organizations must obtain this publication through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Single copies: domestic-$2.00, foreign-$2.50. Subscription rates (6 issues annually); domestic, APO and FPO addresses-$7.50, foreign mailing-$9.40.

Published bimonthly by the Development and Engineering Directorate (DRCDE), HQ U.S. Army Materiel Development and Readiness Command, Alexandria, VA, in coordination with the DARCOM Public Affairs Office, the Office of the Chief of Engineers, the Office of the Surgeon General's Medical R&D Command, and the Office of the Deputy Chief of Staff for Research, Development, and Acquisiton, HQ Department of the Army, to serve all elements of the U.S. Army Research, Development and Acquisition community.

Grateful acknowledgement is made for the valuable assistance of Public Affairs Offices within the Army Materiel Development and Readiness Command, Office of the Surgeon General, Office of the Chief of Engineers, Army Health Services Command, Army Training and Doctrine Command, Army Forces Command, and related activities. Use of funds for printing of this publication has been approved by Department of Army, 23 Feb. 1979, in accordance with 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.

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Atlanta VI: A New Sense of Urgency

The unofficial theme of the recent Atlanta VI conference was unquestionably "There is so little time." And with events in Afghanistan monopolizing the headlines, the meeting of senior Army leaders and corporate executives to discuss mutual problems pertaining to the Army's readiness was permeated with a new sense of urgency.

The seminar was opened by GEN Henry A. Miley (USA, Ret.), president of the American Defense Preparedness Association (ADPA). Atlanta VI, cosponsored by the ADPA and the National Security Industrial Association, was a continuation of a yearly executive level seminar begun in 1974. The seminars have the objective of improving Army industry business relations.

This year's meeting, 13–15 February 1980, saw over 340 attendees, of which industry was represented by six chairmen of the board, 40 presidents or senior operating officials, and 150 vice presidents, and a number of marketing directors and other senior officials. The Army was represented by Dr. Percy Pierre, Assistant Secretary of the Army (RDA), the Chief of Staff GEN Edward C. Meyer, GEN John R. Guthrie, GEN Donn Starry, GEN R. M. Shoemaker, LTG Robert Baer, and a number of the DARCOM commodity commanders.

The theme of Atlanta VI was to discuss three vital and now critically timely issues: upgrading the industrial preparedness base, improving the quality and reliability of modern weapon systems, and finding ways to improve the overall acquisition, procurement and contracting functions.

GEN Miley, in kicking off the proceedings, noted that the Atlanta meetings had begun in 1974, occasioned by the changed environment that included the institution of the DSARC system and the post-Vietnam climate. He remarked that he was pleased to see that the industrial mobilization base problem was to be a topic of discussion, as he saw a similarity of today's conditions with those of 1940.

John D. Blanchard

Mr. John D. Blanchard, assistant deputy for Materiel Development, DARCOM, then took over the podium to set the stage for the program proper. He noted that the 4-star level of attendance at the conference indicated the Army's dedication to its interpretation of the importance of the meeting, and that industry would have the opportunity to hear this level express Army views as well as having the opportunity to exchange views with these senior policy makers.

GEN John R. Guthrie

Blanchard chose to begin by reviewing briefly the topic of "Where Are We Today?" From Field Marshall Erwin Rommel's book,* published by that officer in 1937 and reflecting his "lessons learned" notes copiously handwritten following each of his combat experiences in WWI, Blanchard quoted several passages to suggest the similarity of historical conditions with those that now confront us, and how Rommel saw the cause and solution. In drawing a parallel for the need for industrial preparedness, Blanchard noted that "In a man to man fight, the winner is he who has one more round in his magazine." Another quote cited the capability of a few dedicated squads to bring about essential change. He suggested there were sufficient numbers of dedicated patriots in the audience to make up a few picked squads that could make the country aware of the grave dangers that confront us.

Mr. Blanchard then introduced GEN John R. Guthrie, DARCOM commander.

The DARCOM commander opened by reflecting on previous Atlanta conferences and his feeling for the need to improve the communication process between the Army and industry, particularly for the Army to benefit from "feedback" from industry. The problem was studied by a smaller meeting in May 1979, dubbed "Atlanta on the Anacostia," and the objectives that emerged from that meeting "will be evidenced," the General hoped, "in the balance of these two days."

Guthrie noted that GEN Meyer, Army Chief of Staff, felt the need for total Army involvement in the seminar, for industry to know where the Army is heading. Accordingly, GEN Starry of TRADOC and GEN Shoemaker of FORSCOM, would be active participants.

The DARCOM commander told the group that as he prepared for this seminar, he was struck by a sense of *deja vu*, "that the pattern of world events is repeating itself, that it may be mocking us because we did not earlier heed its warnings." Using news headlines of May 1977, May 1978, and May 1979, Guthrie noted that "we have reaped the whirlwind . . . which was growing during this period of time. . . ."

Using statistics that compared U.S. versus Soviet expenditures,

*_Attacks_. Field Marshall Erwin Rommel. Athena Press, Inc., P.O. Box 776, Vienna, VA 22180. $14.95

and personnel assets, the General struck out by saying that complacency has been an overriding bane. The nation drifted militarily and economically, and the national will and drive slackened. Innovation, as evidenced by new patents, has dropped.

Citing Dr. Ruth Davis, former Deputy Under Secretary of Defense for Research and Advanced Technology, he endorsed her belief that the U.S. was living off the fruits of the R&D of the 1965–70 era. In her words, he said, there was "scientific apathy and technological disarray."

Such an assessment was hardly comforting, said Guthrie, in view of the fact that the U.S. may well be challenged repeatedly, indirectly if not directly, in the next few years. The record of Angola, Ethiopia, South Yemen, Cambodia, and Afghanistan speaks for itself, said the General.

A sense of urgency was required was the point Guthrie thrust onto the audience, citing Lincoln's message of April 1861 to the governor of Pennsylvania "I think the necessity of being ready increases. Look to it!"

Afghanistan, said Guthrie, sums up our past slackness and our current state of sober awareness. Hitting hard at the need to act now, Guthrie stressed that the nation does not have the luxury of time to debate whether or how fast to regird itself. Action is needed now. As one prominent figure recently put it, said Guthrie *"There is so little time."*

While the issue of possible draft registration will be debated by the Congress, Guthrie cautioned that "there is little need to debate what our individual and corporate response ought to be in the materiel arena." It takes industry the longer time to gear up and produce than it does to register people for a draft, and historically the U.S. has since 1812 suffered from a deficiency in getting equipment to complete training and equipment with which to fight.

Citing the vast materiel modernization effort now underway, the General soberly cautioned that these systems now entering the field are technologically old;

GEN Donn Starry

their technology has been surpassed in our labs, and probably in the Soviets'. We ought now, he continued, to be well into the planning and testing stages for the systems designed to give us technological superiority not later than 1990.

To do this will require the closest collaboration between TRADOC, DARCOM, industry, and the using commands. We must convert quickly the leading edge of technology into the systems we need by means of a planned and stabilized program, quantitatively and qualitatively.

Guthrie noted industry's belief that lead times can be substantially reduced by improved administrative relationships. It must be a mutual effort, he stressed.

The condition of the industrial base and the status of industrial defense agreements also were singled out by the DARCOM commander as being of serious concern. There are not, he noted, necessary war reserve stocks to permit slackness. The same worry of 1940 is present today, the lack of machine tools and the long lead time required to get into high gear.

"We have to shake off what seems to me to have been our general posture of the last few years—reacting," said Guthrie. We need to begin now to upgrade the base, to give us the capability to sustain the total Army under any circumstances.

He noted that a senior industry representative had bemoaned to him not long ago the fact that the U.S. has, in the representative's view, no clear national defense industrial policy. A change was needed, the argument continued, a change in attitude in the country to accommodate geopolitical decisions when U.S. industrial preparedness is at stake. It requires a new study, generation of new policy, and intelligent implementation.

The need to start, said Guthrie, is urgent—"there is so little time."

The audience was then given an overview by GEN Donn Starry, TRADOC commander, of how his command derives requirements and also a glimpse into ongoing planning for the Army of the future.

Starry stressed the complexity of the process, the need to constantly be trading off for balance, for reality, for attainability.

Sophistication of equipment, said Starry, is not the answer in itself.

The TRADOC commander told of the TRADOC effort called the Battlefield Development Plan—a way to focus the Army's effort to get from here to there, a road map for the future.

From this plan have come certain obvious shortfalls. There are ongoing supporting studies on Division 86, Light Division 86, Corps 86, etc. All are aimed at providing guidance on "how to get there."

Speaking of the Light Division 86, Starry noted that this force would have to be highly mobile, heavy in firepower, and rapidly deployable. Its equipment might well be items available now or in the next five years.

Command and control, the General said, are under intensive study for new ways to provide them vital services.

All future needs, he continued, are being thought of in terms of redundancy, robustness and resiliency—the need to be able to keep going, keep operating.

The Army's doctrine, said Starry, is being reviewed. The need is now to play for an "integrated battlefield"—combat involving nuclear and other forces as well as conventional weapons. The Army has no choice but to plan this way in light of the things the other fellow is saying.

The Army once led the Free World in this area, but has lost this lead. The nuclear superiority

we once enjoyed, said Starry, is now gone. We now find ourselves in dire need of providing new doctrine for this contingency, and this will require new materiel in areas such as vehicle protection and decontamination means.

Doctrine now says that the U.S. Army must deepen the battlefield. Not only must the forward enemy elements be attacked, but simultaneously his follow-up, and particularly his combat support echelons must be attacked. This brings forward the need for new intelligence systems to provide real time accurate data to kill these elements in the deepened area.

The element of training, said Starry, must play a vital role in future materiel. Complex equipment that the soldier cannot operate or keep operational is to be avoided.

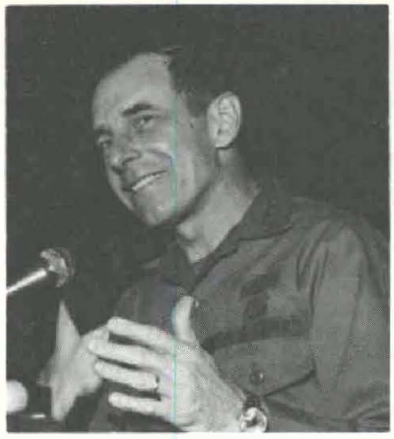
Summing up the Army's needs as he saw it, GEN Starry said that command and control had to be looked at closely; the need to see deep into the battle area would be critical; information engineering is needed to sort out the mass of data for a commander, providing him with critical information only; and the Army has to plan to operate in an integrated battlefield.

Starry closed by stressing that time was short, that technology existed in many of industry's labs, it must be translated into usable systems in the fastest possible time.

As a setting for the panel session to follow, Mr. Robert L. Johnson, former ASA (R&D), and now president, McDonnell Douglas Astronautics, reviewed the findings and recommendations of a mini-executive seminar held in May 1979 at Fort McNair, Washington, DC. Three broad problems, he said, were identified as plaguing the military-industrial cooperation.

These were: (1) getting a program started; (2) developing the hardware once a program was started; and (3) producing the equipment once development was completed.

Under the first of these there was the lack of definition of stated requirements. There was



GEN Edward C. Meyer

confusion over the RSI issue. Further, inadequate front-end funding, especially in the competition phases hinders; excess competition leads to delays and cost; and doctrine has lagged and not guided developments.

Continuing, Johnson said problems in starting a program also were caused by excessive front-end technology, requirements were based on technology capability rather than need, all programs are structured to avoid all the troubles of *all* past programs, affordability has been recognized too late, and finally, competition losers can stall the process.

As for the problems in the development phase, the group had concluded that causes included inadequate front-end funding; inadequate program manager reserves, changing requirements and no forced Army consensus, too many people and organizations providing guidance, micromanagement at top echelons, i.e., Congress, OSD, DA, and DARCOM, striving for too much high performance initially, no plans to evolve a system into higher performance, too many cultists directing the project manager, and badly troubled programs are not stopped.

Turning to the problems of producing systems, Johnson said the findings were that there was too much series testing, there was inadequate concurrency with development, that the user had not shown sufficient intensity and enthusiasm in obtaining a new system, that low production rates slow the IOC date and raise costs, and that late contractor deliveries hurt.

Johnson continued that in the general management area, there was a belief that the Army needed an Army of the Future Plan, that there was a similar lack of a JCS plan for Integrated Armed Forces of the future, that the present acquisition strategy was acceptable but the people in it must be disciplined, the consensus approach was a typical bad committee approach that resulted in anonymity rather than leadership, the DSARC system was out of phase with the budget cycle, and finally, the Army's tour for project managers was too short.

Possible solutions, he continued, included greater reliance on evolutionary product improvement, the prioritization of new starts, start new programs only after establishment of a firm requirement, that over-optimization should be avoided, the competition phases should be tailored and shortened, realistic cost estimates rather than the lowest bid should be followed, both advanced development and full-scale engineering development should be adequately funded, and the military PM should be authorized to run his program.

Johnson was followed by Mr. Gerald J. Tobias, president, Sikorsky Aircraft, who pointed out the total impact on the defense industry—and in particular its suppliers, of inadequate government defense planning.

The boom to bust trends of the past have not encouraged enthusiastic industry participation, particularly at the vendor level. This has had a serious impact on industry's ability today to respond to any increase in production or expansion in mobilization base. Multi-year funding, as well as planning, as the civilian market practices, would improve things, said Tobias.

These presentations were followed by a lively discussion from the floor addressed to a panel composed of Johnson, Tobias, LTG Robert J. Baer, and MG Donald M. Babers.

The luncheon speaker was Chief of Staff GEN Edward C. Meyer. The General began by noting that in 1974, when the

first Atlanta meeting was held, the news of the day contained columns on the reduction of Army strength, the possible reduction of U.S. Army forces in Europe, and the general philosophy that the U.S. Army would not be involved anywhere but in Europe. Indeed, he said, he had been queried at that time to provide an answer to the question as to why the country needed an Army?

The answer evolved, he said, in three parts. There was a need for an Army the day before a war in order to provide deterrence; there was a need on the day of the war in order to fight and win; and on the day after the war the Army was needed in order to provide the ability to negotiate from strength.

In 1974, Meyer continued, the civilian industrial community was faced with the question of the desirability of continuing a close defense relationship in the face of loss of profit margins, constant changes, lack of continuity, etc.

He expressed his concern about the state of the nation's industrial base today. The "Arsenal of Democracy," said Meyer, is not today up to sustaining a long war, and one who plans for a short war is apt to get a short losing war.

The precedent for miscalculation, said the General, has been set, by the Federal Army in 1861, by the Germans in 1914, and even by the U.S. in 1941–42 as it used the ocean barrier to buy time.

Readiness of today's Army, he noted, was vital, but sustaining that Army is equally important. He proposed a vigorous inventory of the nation's production capability. He told the group that in a forthcoming mobilization exercise, industry would be asked to participate to better familiarize all with problems and capabilities. Quoting GEN Omar Bradley, Meyer noted that nations not armies go to war. There was a vital need to preclude surprises, that the base be in the best possible shape when it may be called upon.

While there was some concern over the less than optimal procurement rates of new Army equipment flowing to the field, GEN Meyer noted that there is a very positive side in that it is providing a warm potentially expandable base.

GEN Meyer urged the assembled group of industrialists and military to come up with workable answers to enhancing the mobilization base.

The afternoon session was devoted to a down-to-grips series of three work groups each of which considered a specific topic. One shop considered "Quality/Reliability of Modern Weapon System," and had a panel chaired by Mr. Sidney Stark, vice president, Missile Systems Division, Raytheon Co., with MG Oscar C. Decker, commander, USTARCOM, as cochairman, panel members were: Mr. Seymour Lorber, director, Quality Assurance, DARCOM; MG Albert H. Light, commander, USAARRCOM; BG(P) Albert N. Stubblebine, III, commander, USAERADCOM; Mr. Ralph E. Hawes Jr., vice president/general manager, Pomona Division, General Dynamics Corp.; Mr. A. H. Grava, president, Heavy Vehicle Components Group, Rockwell International; and Mr. Douglas G. Corderman, senior vice president, Emerson Electric Co.

The second workshop considered the problem of "Improving the Acquisition/Procurement/Contracting Function—Trends and Issues." Chairman was Mr. David Westermann, president and chief executive officer, Hazeltine Corp., with MG John K. Stoner Jr., commander, USACERCOM, as cochairman. Panelists were: MG Jere W. Sharp, director, Procurement and Production, DARCOM; Mr. Henry B. Jones, director, Procurement and Production, USATARCOM; Mr. Robert G. Seeds, deputy for Procurement and Production, USAARRCOM; Mr. Barry J. Shillito, vice president, Teledyne Inc.; Mr. Gaynor Lindsey, vice president, Administration, Bell Helicopter, Division of Textron Inc.; and Mr. Joseph F. Caligiuri Sr., vice president, Litton Industries.

The third work group considered "Industrial Preparedness—The Mobilization Base." Mr. John J. Ryan, vice president/general manager, Vought Michigan Plant, was chairman, with LTG Harold F. Hardin Jr., DCG for Materiel Readiness, DARCOM, as cochairman. Panelists were: MG William E. Eicher, commander, USAARRCOM; MG Story C. Stevens, commander, USAAVRADCOM; MG Emmett Paige, commander, USACORADCOM; Mr. Claude H. Molde, vice president, Operations, Honeywell Inc.; Mr. Winston S. Smith, vice president, Singer Corp.; and Mr. John MacCrostie, group vice president, Ordnance Group, FMC Corp.

The morning of the 2d day was devoted to summarizing the findings of the three workshops held the previous afternoon. It began with a panel chaired by Mr. Norman P. Augustine, former Under Secretary of the Army and Assistant Secretary of the Army

(Concluded on page 9)

DARCOM Deputy Commander for Materiel Development LTG Robert J. Baer chats with (l. to r.) Dr. P. W. Lett, director, Defense Engineering Divison, Chrysler; Mr. E. A. Miller, vice president, Engineering, Sanders Asso., Inc.; and Dr. F. P. Adler, vice president, Hughes Aircraft Co.

Improving the M113A1 Armored Personnel Carrier

By Anthony Comito

The M113A1 Armored Personnel Carrier, the Army's most versatile and widely used vehicle, is now an even more valuable asset to the Army, following a major product improvement program. In fact, a recommendation has been submitted to the Department of the Army to type classify the new version - the M113A1E1.

In the latter part of 1979, a Development-In-Process Review culminated a 2-year effort to increase the power of the M113A1 and improve its reliability. Principal parties in this effort are the U.S. Army Tank Automotive R&D Command's Weapon Systems Manager's Office and the M113 Project Manager's Office.

The M113A1E1 is an updated version of the M113A1 which has been in the field since 1964. In late 1976, work was initiated to improve the M113A1 by improving the cooling and suspension systems and the mobility.

The cooling system was changed to increase cooling capacity, allowing the vehicle to operate at higher ambient temperatures. The suspension system was changed to provide smoother cross-country ride performance resulting in an increase in cross-country speed.

These two improvements resulted in redesignation of the vehicle as M113A2, introduced into production in July 1979. Rebuild began in August 1979. Once the suspension was improved, further improvement in cross-country mobility was limited by the available power.

There has been a trend to increase gross vehicle weight in the M113 family of vehicles as in all tracked vehicles. Some members of the M113A1 family of vehicles have a gross vehicle weight as high as 28,400 pounds. This increase in weight has caused concern because of the corresponding decreasing vehicle horsepower-per-ton (HP-ton) ratios. They range from 17.1 for the current M113A1 to a low of 14.8 for the M548. (See accompanying graph.)

Decreasing HP-ton ratios degrade vehicle performance characteristics, mobility, and reliability. Thus, in addition to incorporating the cooling and suspension improvement, the M113A1E1 program was initiated to restore and improve performance while improving reliability.

Major improvements include conversion of the current 6V53 (212 HP) diesel engine to the turbocharged 6V537T (275 HP), and replacement of the TX100-1 transmission, transfer gearcase, steering differential and pivot brakes with the X200-3 Detroit Diesel Allison transmission.

The X200-3 transmission provides: four forward speeds over the present three; hydrostatic steering for smoother turning with less driver effort and less shock loading on the suspension system; and greater power efficiency resulting in more usable sprocket horsepower and fuel savings. Replacement of these major drive line components resulted in an increase in overall drive line RAM-D (Reliability, Availability, Maintainability and Durability).

Together, the new engine and transmission have shown, from test results, to provide better vehicle mobility, increased vehicle range and fuel economy, and decreased support costs.

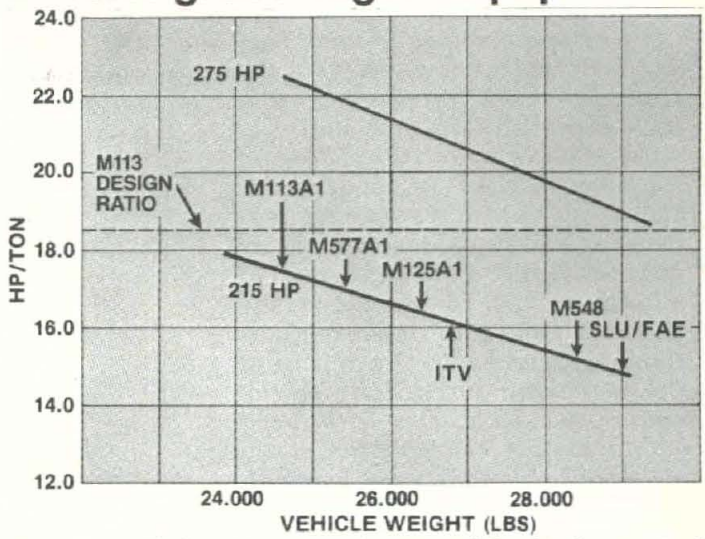
The new engine and transmission have shown, from test results, to provide better mobility, increased range and fuel economy, and decreased support costs.

Vehicle operator controls have also been changed. A steering wheel and brake pedal replace the current steer laterals that perform both the steering and braking functions. These changes minimize driver fatigue and reduce operator training - both verified during operational tests.

Testing was unique in that it consisted of 10 vehicles, five M113A1E1 pilot vehicles and five M113A1 baseline vehicles. Each vehicle completed 6,000 DT II (Development Test) and 1,500 OT II (Operational Test) miles.

DT II tests were conducted by the Test and Evaluation Command at Aberdeen Proving Ground, MD, Yuma Proving Ground, AZ, and the Cold Regions Test Center in Alaska. OT II tests were conducted at Fort Carson, CO, by the Operational Test and Evaluation Agency.

During OT II, and M113A1E1 and M113A1 vehicles were run side by side as much as possible. At the start of OT II tests, external bolt-on fuel cells were added to the M113A1E1 Rise Power Train vehicles for evaluation.



The external fuel cells were approved for type classification at an earlier IPR for the M113A2 and are under consideration by the Army for application in production and depot rebuild. External fuel cells will provide increased stowage and vehicle survivability.

A reliability improvement in MMBF (Mean Miles Between Failure) of 1,894 for the total M113A1E1 vehicle versus 870 for the standard M113A1 was attained during 30,000 miles of DT testing. During an additional 7,000 miles of OT tests, the reliability improvement was 860 MMBF for the M113A1E1 versus 660 for the M113A1. The latter was accomplished without rebuild at 6,000 miles.

During performance tests, a marked improvement for the M113A1E1 over the M113A1 was achieved: acceleration (0-20 mph): 8.1 sec vs 11.7, a 30% improvement; braking from 20 mph: 24 ft vs 33 ft, a 27% improvement; cross-country speed: 21 mph vs 16.3 mph, a 27% improvement; and longitudinal slope speed: for 5 to 60% slope, a 26-43% improvement.

In addition to improved performance characteristics, a significant reduction in fuel consumption was achieved. At 22 mph, the M113A1E1 had a 22% improvement over the M113A1. This was verified by a 20% overall fuel savings in Development and Operational Tests when the vehicles were operated under comparable conditions.

The improved power train in the M113A1E1 enhances operational capability, increases combat effectiveness, conserves energy and should reduce logistic support for the M113 family of vehicles. Increased mobility reduces hit probability, thus increasing survivability in combat.

When this improvement is funded, the M113A1E1 vehicle (prototype designation to be changed to the M113A3) will be a valuable addition to the M113 Family of Vehicles - expected to last well into the year 2000. The M113A3 should provide a suitable complement for both the U.S. Army's new XM1 and XM2 vehicles.

ANTHONY COMITO is weapon system manager for M113 Product Improvement Programs at the U.S. Army Tank Automotive Research and Development Command, Warren, MI. He has 16 years experience within the U.S. tank automotive community on a variety of programs that involve both tactical and combat vehicles.

A Unique New Capability: SCATTERABLE MINES

By Martin B. Chase

An article entitled "Soviet Tactics for Overcoming NATO Anti-Tank Defenses," appearing in a 1979 issue of International Defense Review, *made the following statement:* "NATO's capacity for creating obstacles (using explosives and mines) is now vastly increased. But most dangerous of all, say Soviet tacticians, is the enemy's ability to deliver mines remotely, right into the depths of the attacking forces." *Since the author, Mr. C. N. Donnelly, used only Russian sources, the statement takes on added meaning.*

The United States Army has been pursuing a program termed FASCAM, an acronym for Family of Scatterable Mines, for about a decade. The Army's FASCAM program is managed by the Development Project Office (DPO) for Selected Ammunition, U.S. Army Armament R&D Command (ARRADCOM), Dover, NJ.

FASCAM mines are probably the very mines referred to in the IDR article. And these were the scatterable mines presented at the International Barrier Warfare Symposium this past June in Washington by the ADPA and co-chaired by ADPA and OSD.

Keynote speaker Ambassador Robert W. Komer, then advisor to the Secretary of Defense on NATO affairs, recognized the "revolution in mine warfare" and that "the dynamic delivery of mines on the battlefield via artillery tube, rocket launcher, helicopter or aircraft offers opportunities to lay mines right where we already think the enemy is approaching."

GEN Donn A. Starry, TRADOC commander, recognized the value of scatterable mines in the barrier warfare role as a "relatively cheap combat multiplier that can enhance the effectiveness of other parts of the team . . . tanks, infantry, fighting vehicles and the artillery. Targets are destroyed, delayed, disorganized, or better yet, disrupted."

Some of the other speakers who strongly endorsed the Army's FASCAM program included Dr. Walter B. LaBerge, then Undersecretary of the Army; GEN (USA, Ret.) William E. DePuy; LTG (USA, Ret.) David E. Ott; BG John Woodmansee of HQ TRADOC, and Dr. Joseph Sperrazza, then director of AMSAA.

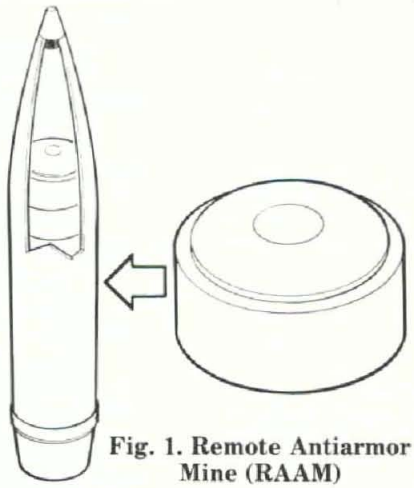


Fig. 1. Remote Antiarmor Mine (RAAM)

Obviously, the Soviets are not alone in their recognition of this new capability to "deliver mines remotely right into the depths of the attacking forces." This new FASCAM, then, has resulted from the addition of sophisticated electronics technology to the proven submunitions capability of the Army's Improved Conventional Munitions program.

Safe and arm sensor and preset self-destruct capabilities, along with countermeasure hardening and anti-disturbance features, have created a family of surface-emplaced mines. These lightweight, compact microelectronic configurations, which can be produced economically on automated equipment, are delivered by a variety of systems including tube artillery, rotary and fixed wing aircraft, ground vehicles and man-portable dispensers.

One member of this family is RAAM, an acronym for Remote Anti-Armor Mine (Fig. 1). RAAM is a magnetically fused antiarmor mine delivered by 155mm projectiles. Nine cylindrical RAAM mines are nested in one projectile. When the projectile is fired, the safe and arming mechanism senses the forces associated with setback and spin and subsequent mine ejection from the projectile. This provides proper mechanical and electrical arming.

The mines are base-ejected from the projectile and fall in predictable patterns as a function of ejection height. Minefield density becomes a function of weapon lay and rounds fired.

After ground impact, the mine is armed, electrically enabled and ready to detonate upon sensing of the proper vehicle signature by the internal magnetometer. Each mine has a built-in, factory-set self-destruct capability which clears the minefield.

The nine mines in the M718 projectile have long self-destruct times, whereas the M741 contains mines that have short self-destruct times. The kill mechanism is a plate or P-charge. Two P-charges are included per mine, making terminal effects insensitive to mine orientation.

This 5-pound mine provides both belly and track kills against known armored targets and it is the basic antiarmor mine utilized in the other delivery systems. Once the mine has been developed and can operate in the violent environment associated with tube artillery setback and angular acceleration, it is easier to design the mine for less violent conditions of ground, air and rocker dispensing.

Another family member is the ADAM, an acronym for Artillery-Delivered Antipersonnel Mine or

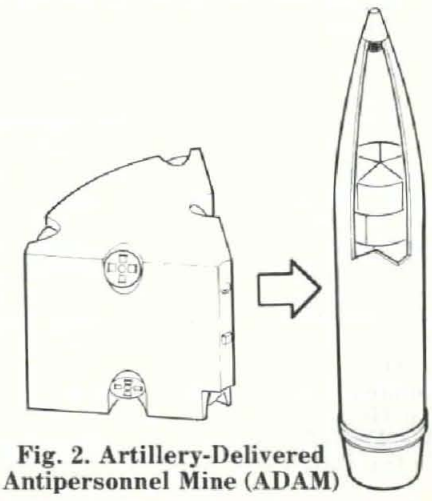


Fig. 2. Artillery-Delivered Antipersonnel Mine (ADAM)

Area Denial Artillery Munition (Fig. 2). It is a trip-line-actuated antipersonnel mine delivered by 155mm howitzer projectiles. Thirty-six wedge-shaped mines are nested in one projectile.

When the projectile is fired, the safing and arming mechanism in each mine senses the forces of setback and spin. Upon mine expulsion from the carrier projectile, the ejection force completes the mine's arming cycle. After coming to rest on the ground, seven trip line sensors are released and the mine is fully armed.

Any small subsequent disturbance of a trip wire such that the mine is moved slightly, or a break of the wire at its weakest point (where it meets the mine body), initiates the detonation train. When this occurs, a liquid propellant surrounding the fragmenting sphere ignites, shattering the plastic wedge body and propelling the sphere upward.

A timing delay in the sphere permits it to reach a predetermined height before it detonates, sending hundreds of lethal fragments out in a spherical pattern at about 3,000 feet per second.

If the mine is not disturbed during its active life, self-destruct occurs. The M692 projectile contains mines with long self-destruct times, whereas the M731 projectile has short-delay mines.

GEMSS, standing for Ground-Emplaced Mine Scattering System, is another system designed to provide rapid emplacement of large prepared minefields in friendly territory (Fig. 3). While minefields of the same size can be emplaced conventionally, GEMSS is preferred because of its faster emplacement rate and lower manpower requirements.

GEMSS' primary use is for minefield emplacement in screening operations prior to attack or behind the FEBA to support predesignated secondary defensive positions. In this situation, lanes must be provided for withdrawing friendly units. The lanes must be clearly marked, requiring a high degree of emplacement control and accuracy. GEMSS can also be used to provide flank protection or to impede the enemy along counter approaches.

Fig. 3. Ground-Emplaced Mine Scattering System (GEMSS) Dispenser

GEMSS mines are deployed by an XM128 mine dispenser mounted on a towed M794 trailer. Minefield density is controlled by launch rate and vehicle speed. The towing vehicle can be an M548 tracked cargo carrier, an M113 series personnel carrier, or heavy-duty truck.

Two types of mines are launched using this system. One is an antiarmor mine that is activated by magnetic influence. The second is an antipersonnel mine activated by trip lines.

The antipersonnel mines can be effectively dispersed with the antitank mines to protect the minefield from clearance by enemy ground support troops. Both types of mines have antidisturbance features and self-destruct times selectable at the instance of mine dispersal.

Another system, the Gator Mine System, is being developed by the Air Force and Navy for interdiction minefields beyond the range of other delivery systems. The GEMSS anti-armor and antipersonnel mines are being adapted for use in the Gator system.

Mine delivery is achieved from any aircraft capable of using free-fall dispensers. The minimum altitude required is 200 feet and delivery speeds may go as high as 700 knots. A single sortie can deliver 600 Gator mines covering a 200-by-300 meter area.

Desired minefield density and length are obtained by varying the number of dispensers dropped, the rate of release of dispensers, and the aircraft release parameters. Delivery flexibility yields a wide range of pattern and density options to meet specific mission requirements.

The antiarmor and antipersonnel mines used in the Gator system are ballistically matched, similar in appearance, and feature a high degree of commonality in their respective subsystems. The main charge and target sensor exhibit the greatest degree of difference. Self-destruct times are set at the dispenser.

Gator mines are designed to be effective for interdiction of second echelon forces in assembly areas and columns. The unique delivery system and functional characteristics contribute substantially to the capability to respond to combat support requirements. The purpose of these minefields is to disrupt and disorganize enemy forces and to deny the use of key areas.

The Modular Pack Mine System (MOPMS), is a man-portable system (Fig. 4) designed for selective protection and smaller area

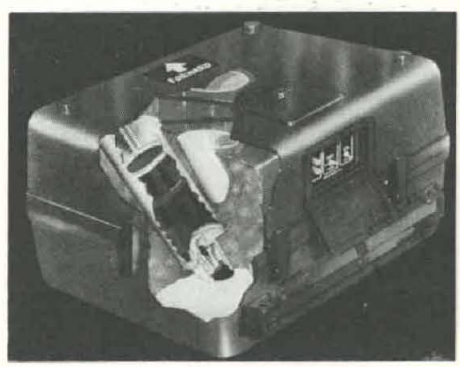


Fig. 4. Modular Pack Mine System (MOPMS)

coverage. The MOPMS modules are transported to the site by truck, and emplaced by two men.

If no contact with enemy forces is made or if there is no need to fire the MOPMS modules, they can be retrieved and re-used. If enemy contact is made, the modules can be fired instantly by a coded remote command to deploy the mines. In a withdrawal, the modules can be activated when the friendly units pass.

Two types of mines can be emplaced using MOPMS. One type is the antiarmor mine, activated by a magnetic influence. The other type is an antipersonnel mine, activated by trip lines, used to protect the antiarmor mines from disturbance by enemy soldiers.

Additionally, there is the M56 mine (Fig. 5), a self-orienting helicopter-delivered blast mine that can be rapidly emplaced with a minimum of time and manpower. Once armed, the M56 will detonate if jarred, tilted or otherwise moved, which prevents the enemy from neutralizing the mine by hand. The M56 uses pressure-time influences to detonate against vehicles.

As with conventional minefields, the M56 minefield is intended to reinforce antiarmor weapon systems. Because of a delivery system that is highly vulnerable to direct enemy fire, the primary use is in friendly areas.

When a threat during a battle becomes apparent, these mines can be used to strengthen specific battle positions in areas out of direct enemy fire as part of an obstacle plan. In a defensive situation, the M56 can blunt enemy penetration or reinforce hasty defensive positions. Offensive uses include obstruction of enemy counterattack routes, flank protection, and enemy containment by blocking escape routes.

M56 mines are delivered from a helicopter carrying two SUU-13 bomblet dispensers. The two dispensers contain 80 canisters, which hold two mines each for a total of 160 mines. Dispensing rate can be controlled by the pilot to determine minefield density and size. A typical minefield made from a single helicopter pass contains 160 mines in a 20 by 300-meter area. Self-destruction is built into each M56 mine.

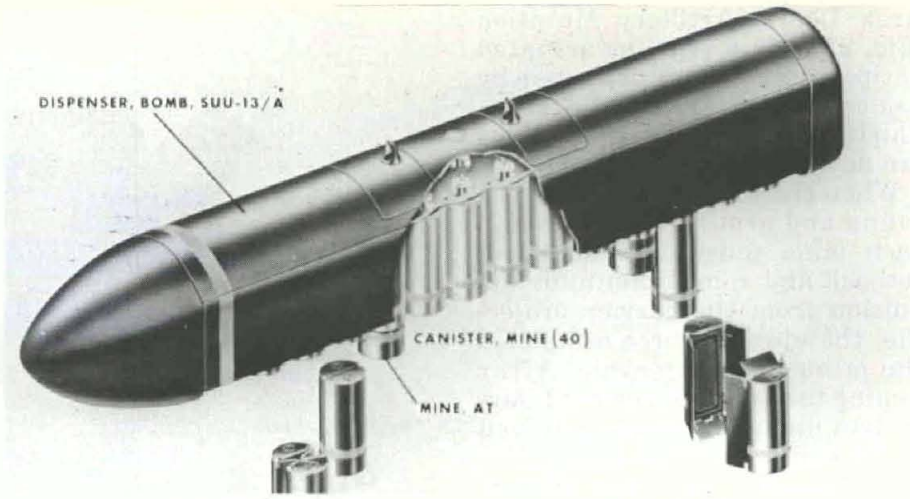


Fig. 5. Mine Dispensing Subsystem, Aircraft: M56

One of the great attractions of all of these mines is their commonality. The electronic portions of these mines can be assembled on identical production equipment with only minor changes for the type of mine being considered. Automatic insertion machines provide rapid assembly and greatly reduce the possibility of error. The net benefit is a highly versatile, reliable, low-cost electronic package.

Reliable power sources that demand no maintenance or power consumption during extensive periods of inactive storage opened the door for the development of electronic mines. Today, mines contain ammonia and lithium batteries that remain passive until the mine is delivered, at which point the battery activates to power the electronics.

A good contrast is the conventional flashlight battery, or dry cell, which is active from the time of its manufacture. The passive feature of ammonia and lithium batteries gives them unlimited shelf life and makes them ideal for use in FASCAM mines.

These batteries are also capable of withstanding severe launch environments—fired from artillery, launched from a towed dispenser, or air-dropped from high-performance aircraft or helicopters. Besides being durable, these miniature batteries trim down size and weight of today's mine to give it excellent deployment versatility.

Although the safing and arming (S&A) mechanisms must satisfy differing conditions of deployment depending upon the delivery method, a number of parts have been designed to be common to more than one mine S&A mechanism. For instance, the electroexplosive device is common to all of the FASCAM mines.

MOPMS and Gator S&A mechanisms are identical, and many of their parts are in the GEMSS S&A mechanism. All FASCAM antiarmor mines share a common clearing charge design.

The four FASCAM antipersonnel mines use trip lines to detonate the submunition, and substantial commonality exists within these trip line designs. ADAM mines contain a trip line design that provides extended range in MOPMS, GEMSS, and Gator. The extended range design shares many common parts with the ADAM trip line.

Although each individual mine is designed to be used for a specific tactical situation, the subassemblies for each mine have been designed to incorporate as many common parts and functions as possible. The commonality concept began with RAAM and ADAM programs, and continued to receive priority on GEMSS, Gator and MOPMS.

When individual piece parts can be used in more than one design, the results are savings in production costs and improved quality. Tooling costs are reduced through commonality and can be amortized over longer production

runs. Near-common production lines will produce all of the FASCAM series, maximizing the efficiency of procurement, assembly, and test. The net result is maximum firepower at the lowest possible cost.

The role of the main charge for an antipersonnel mine is the same no matter how the mine is deployed. The main charge of an antiarmor mine also has the same tasks, regardless of the method of deployment. Therefore, each mine type has a common main charge.

The overall status of these elements is as follows: The M56 helicopter-delivered blast mine has been deployed in Europe since 1977. 155mm ADAM and RAAM projectiles are in production, with deployment expected late in 1980. GEMSS is completing its development cycle with standardization expected in March 1980. Gator is behind GEMSS with standardization scheduled for late 1981, MOPMS for mid-1982.

In summary, the accelerated pace of modern warfare limits the time and manpower available for conventional mine placement and clearing. This has created a demand for radical changes to take advantage of the inherent and proven effectiveness of mines.

The Army has responded to this unique challenge by creating FASCAM, a family of antiarmor and antipersonnel scatterable mines, with a variety of emplacement capabilities through artillery, air and special purpose ground and vehicle delivery.

FASCAM can now be used as offensive weapons in addition to their classical defensive role, thus creating a new dimension in ground warfare.

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Atlanta VI: A New Sense of Urgency

(Continued from page 4)

(R&D), and now vice president, Technical Operations, Martin Marietta. Panel members included Messrs. Stark, Westermann, and Ryan, and MGs Eicher, Decker, and Stoner.

Speaking for the workshop or quality and reliability, Stark noted the group agreed that there were some disturbing signs, i.e., lack of pride workmanship, underestimating R&D by contractors, etc. But the government too, has to accept its share of responsibility by requiring greater attention to these standards.

Testing, Stark continued, was a contributor, because it was not realistic or comprehensive enough. The stressed environment was lacking.

The solutions proposed by the workshop included incorporating recognition of these standards early in the game, and providing a better formal feedback mechanism from tests.

As spokesmen for the workshop on acquisition/procurement/contracting function, Westermann said the group believed greater articulation about these problems, at the local level and to Congressmen and their staffs, would assist in the solution. The acquisition process was desirable from a policy point of view, but it was not in tune with the realities of practice. Greater judgment should be permitted, and the system should not try to eliminate every error made in every past program. The process should match the individual case.

Summing up for the workshop on the mobilization base, Ryan noted that the industrial base clearly cannot respond today. He said the group recognized the need to have an inventory base large enough to allow survival until the full capacity was brought on line. U.S. doctrine, he said, has fostered a short war philosophy, but forgot to provide for a longer one.

Following these presentations, there was a healthy exchange of questions and views from the floor and the panel members which were probably equally as beneficial as the presentations.

The final portion saw the Army provide a very high level panel for the purpose of allowing industry to ask questions and get answers from Army policy level officials. Members included: Hon. Percy A. Pierre, Assistant Secretary of the Army (RDA); GEN John R. Guthrie, DARCOM commander; GEN R. M. Shoemaker, FORSCOM commander; and LTG W. R. Richardson, deputy commander of TRADOC.

Again the informal frank exchanges that occurred in this question and answer session, were no doubt of equal value with the prepared portions, enhancing GEN Guthrie's goal of providing a better "feedback" to the Army of industry's views, problems, and suggestions.

In closing out the meeting GEN Guthrie noted that he felt there was a new sense of needed urgency—something not present in the previous sessions he'd attended. There was a new awareness of the critical importance of the vendor, the subcontractor in the materiel process, and the atrophied status of these suppliers ability and willingness to meet an expanding industrial mobilization base.

The Army recognizes, said Guthrie, the problem of capital outlays for plants, tools, and that there has been a lack of a national industrial mobilization policy. He would be supporting efforts to attain such a policy.

TANK CREW Turbulence

By Newell Eaton & Barbara Black

The U.S. Army has long been concerned with getting the maximum capabilities and effectiveness out of its armor weapon systems. Much of the capability of any weapon system is a function of the performance of the crewmen assigned. Some people in the armor community have expressed concern that crew turbulence—the movement of crewmen from crew to crew, and position to position—may have a negative impact on tank system effectiveness. Research conducted during recent years has addressed this notion and attempted to identify the relationship between tank crew turbulence and tank crew performance.

Tank crews contain four crewmen, a tank commander—commonly called a "TC," a gunner, a driver, and a loader. For the tank weapon system to achieve full potential, each must perform effectively in his assigned position.

Each duty position within the tank system requires unique skills and smooth coordination with the other crew members. The TC must identify and range on targets, communicate his findings to the gunner and loader, and be prepared to guide the driver through difficult terrain based solely on voice commands.

The gunner's response to the TC's identification of a target must be coordinated with the loader's response to the TC's command specifying the type of ammunition to be loaded. The accurate synchronization of these duties is essential.

Three factors contributing to the maximization of crew performance include the ability of each individual to perform his assigned duties, the effectiveness of the communication among crew members, and the psychological cohesiveness of the crew.

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) began research in 1977 to determine the extent of tank crew turbulence, the effects of turbulence on crew performance, and methods to combat any degrading effects of turbulence. That same year, the Tank Force Management Group, headed by retired LTG Kalergis, identified turbulence as a consistent problem that degraded combat readiness.

TABLE 1

Tank Gunnery Performance as a Function of Group Assignment

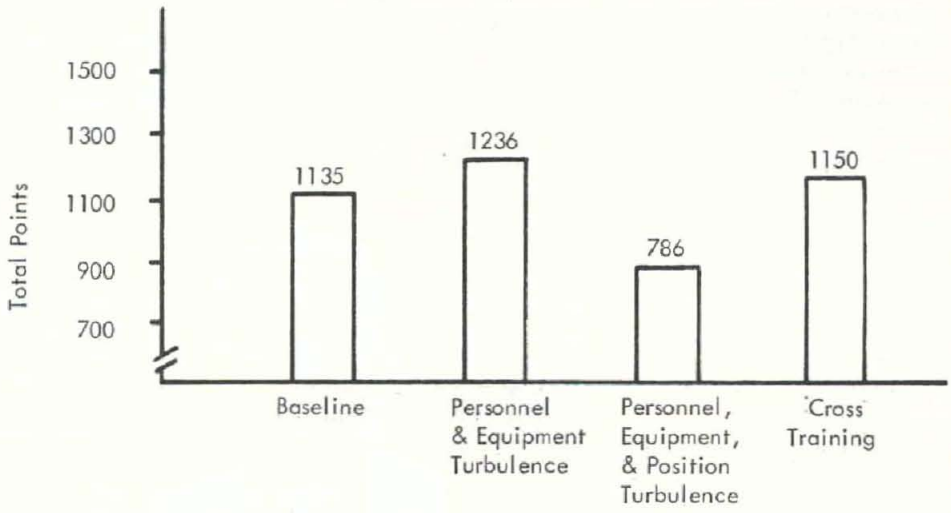

TABLE 2

Percentage of Respondents Experiencing Types of Turbulence

Crew Position	Type of Turbulence: No	Required	Other
Tank commander	45% (22)*	24% (12)	31% (15)
Gunner	31% (16)	47% (24)	22% (11)
Driver	55% (24)	16% (7)	30% (13)
Loader	62% (26)	29% (12)	10% (4)
Average	48%	29%	23%

*Numbers in parentheses indicate number of respondents in the category.

ARI research began with administration of a turbulence questionnaire to 211 tank crews in an armored division in Europe. The results revealed considerable turbulence. While typical tank commander, gunners, drivers, and loaders had held their positions for periods of time varying from 12 to 42, 5 to 12, 5 to 9, and 2 to 6 months respectively, whole crews had normally been assigned together only 1 to 2 months. These findings were consistent with a study by TCATA in 1976, and the Defense Science Board in 1975.

Further results of this research indicated that gunnery performance on the tank crew qualification course at Grafenwohr, GE, was related to the time tank commanders and gunners had been in their crew positions. Specifically, the longer a gunner had trained as a gunner, the more targets his tank hit. The longer the TC had been assigned to his position, the more rapidly the crew opened fire. There was also a slight indication that the amount of time a TC and gunner

had trained together was related to opening time.

These results helped shed light on the effects of three types of turbulence: equipment, personnel, and position turbulence. Equipment turbulence occurs when a crew is moved from one tank to another. Personnel turbulence occurs when crewmen are moved from one crew to another, but kept in their positions. And position turbulence occurs when crewmen are moved from one position to another. Assignment changes which create personnel and position turbulence are always accompanied by equipment turbulence.

From the data, it appeared that position turbulence had a significant degrading effect on gunnery performance. Specifically, for tank commanders and gunners, time in position was related to gunnery performance. However, for equipment and personnel turbulence, little or no effect was indicated.

These findings led to an experiment at Fort Carson, CO, in 1978. The purpose was to clarify the effects of the various types of turbulence on tank gunnery performance. Initially, three groups of crews were assigned to assess turbulence effects. The three were a no-turbulence baseline, a group with equipment and personnel turbulence, and a group with equipment, personnel, and position turbulence.

In the first group, crews were allowed to remain intact on their assigned tank. For the second group, crewmen were assigned to the same crew position in different crews and different tanks. To produce three types of turbulence in group three, loaders were assigned as gunners and gunners as TCs, then all crewmen were assigned to different crews and different tanks.

The gunnery performance of all crews was measured on the Fort Carson Tank Crew Qualification Course. The results are shown in Table 1 in terms of total points, a composite based on day and night targets hit and time-to-fire.

Neither equipment nor personnel turbulence degraded performance as compared to the no-turbulence baseline. The slight superiority of the second group is best attributed to random chance. The third group—those experiencing equipment, personnel, and position turbulence, performed significantly worse than their counterparts. Because no effect was observed for the equipment and personnel turbulence group, the inferior performance of the third group is best attributed to the imposed position turbulence, i.e., changing the gunner to TC and the loader to gunner.

Thus, the detrimental effect of position turbulence indicated in the original questionnaire data was supported by this experiment. Further, the lack of effect for equipment and personnel turbulence was also confirmed.

In the event of a crisis situation where untrained personnel might be required to man tanks, position turbulence could produce serious performance decrements. Because inadequate cross-training was suspected as one cause of the performance decrements associated with position turbulence, a short, intensive cross-training program was developed to supply critical skills.

To evaluate this program,a fourth group was included in the Fort Carson experiment. Non-armor crewmen were chosen to participate in a 3-day cross-training program in gunner and loader duties for gunnery. They were trained by, and tested with, regular armor TCs and drivers.

As indicated in Table 1, the performance of the cross-training group was quite similar to the regular crews. Thus, for the skills required for the Fort Carson gunnery qualification course, the cross-training program seemed to provide an answer to loader and gunner position turbulence problems. Of course, for other gunner and loader duties, such as maintenance functions, additional training would be required.

In the most recent research on tank crew turbulence, researchers returned to Europe in 1979 to administer questionnaires and conduct interviews in 18 battalions. Key personnel—battalion and company commanders, and platoon leaders and sergeants—were asked to describe their beliefs about the extent of turbulence in their units and the effects of turbulence on maintenance and training. Then they were asked for specific information about assignment—how long crewmen had served in their crews and duty positions, and how they performed in gunnery.

Key personnel reported that personnel turbulence had a degrading effect on training and maintenance. They disagreed on the effects of position turbulence. Battalion and company commanders believed position turbulence degraded training. This was consistent with previous questionnaire and experimental findings. Platoon leaders and sergeants, on the other hand, said position turbulence improved training. Interviews with these personnel revealed that they attributed this improvement to cross-training.

Next we looked at crew assignment, and found typical crews were assigned together 1 to 5 months. These data, taken together with the 1977 questionnaire responses and the results from previous studies, suggest that crew turbulence is relatively constant across time. The key personnel described the extent of turbulence as moderate, which indicates that this degree of turbulence has come to be expected.

When we related crew assignment to performance, we found that the time a crew had been together (i.e., personnel turbulence) had no effect on individual tank crew qualification. Further, personnel turbulence had no effect on platoon qualification. These findings were consistent with previous questionnaire and experimental results, but not with the beliefs of the key personnel, perhaps due to the limited scope of the performance measurements compared to the broader view of training and maintenance held by key personnel.

Finally we turned our attention to crew assignment practices, where three basic types were identified. All types of turbulence could be minimized if it were possible to assign each crewman to a permanent posi-

tion, tank, and crew upon his arrival in the unit. However, this ideal procedure is often not feasible, because a sufficient number of trained TC and gunner replacements are not always available to fill vacated positions. Consequently, units must fill TC and gunner positions from available crewmen. To cope with the turbulence required by the assignment system, a unit may frequently move crew members up within crews, where possible, or between crews where necessary.

In the third type of assignment procedure, crewmen are moved from one crew to another, and later change position, or from one position to another, and later change crews. This practice is the least preferable with respect to controlling turbulence. However, such multiple changes may occasionally be justified for disciplinary reasons, mission requirements, or the elimination of personality conflicts.

To evaluate the extent of these three types of assignment practice, data were gathered on a sample of the tank crewmen in the 18 battalions in Europe to determine the number of instances of no turbulence, required turbulence, and other turbulence. The results are shown in Table 2. Across all crewmen observed, half had experienced no turbulence since they had been in the company, more than a quarter had experienced turbulence required by a change in position, and less than a quarter had experienced other turbulence with multiple changes.

Evaluation of the data from units that had undergone tank crew qualification during the three months prior to the questionnaire administration indicated a higher percentage of personnel experienced no turbulence and fewer crews experienced multiple changes than in units which had qualified more than three months before. Overall, these results indicate that key unit personnel are successful in coping with the flow of personnel through their units.

The low level of multiple change turbulence observed in the battalions was apparently due to the concern which key personnel expressed for problems caused by turbulence. Interviews were conducted with personnel in 180 key positions across the 18 battalions. About one half said they had made increased efforts not to transfer personnel within companies, by requiring battalion, company or platoon approval for all crew changes. About one-third of the respondents stated that they monitored all crew changes. Less than one-fifth reported taking no action to control turbulence.

In summary, turnover in personnel has been, and continues to be, a fact of life in tank crews. Crews that have been together more than six months are relatively rare. Thus, the importance of procedures used to effectively minimize turbulence should not be underestimated. To bring about a significant reduction in turbulence necessitates the cooperation of various command levels, an understanding of the problems generated by turbulent conditions, and adherence to preferred methods of crew member assignment.

Fortunately, available information indicates that in operational units during the past three years, turbulence has little effect on measured performance. Platoon NCOs and officers even see some positive effects when turbulence is manipulated advantageously, such as to provide cross-training for crewmen. Turbulence has been shown to strongly affect crew performance only under the most severe conditions, like those induced experimentally in the Fort Carson research. There the cause was attributed to inadequate cross-training for the TC and gunner, to which gunners and loaders were assigned.

As a result, this research by the U.S. Army Research Institute has provided command personnel with the information necessary to evaluate the level of turbulence within their units, to recognize turbulence generated problems, and to minimize the turbulence created by replacement practices within their units.

It has also brought the problems of turbulence to the attention of equipment design engineers and human factors specialists. These individuals should be aware of the problems encountered with personnel changes in operational units and strive to maintain continuity across duty positions in order to facilitate cross-training.

ARI's continuing efforts are directed toward methods to minimize the effects of turbulence inherent in the personnel system. For this purpose ARI has developed two new training programs. The first is a tank crewman skills training program developed to facilitate cross-training of crewmen within operational units. The second is a crew drills package designed to standardize communication among crewmembers and thus reduce the problems new crewmen might encounter. ARI's future efforts in the area of tank crew turbulence will include the implementation and evaluation of these new training packages.

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BARBARA A. BLACK is also a research psychologist with the Army Research Institute–Fort Knox Field Unit. She recently completed a doctorate in psychology at Baylor University and is presently conducting research in armor personnel selection and assignment.

The Case for an Automated Acquisition Handbook

By Gerald Malakoff and David B. Scott Jr.

A project engineer starts his job with one hand tied behind his back and the U.S. Army Mobility Equipment R&D Command is trying to do something about it.

When an engineer is assigned a new project he is, theoretically at least, with it through the entire acquisition process, from exploration of alternative concepts to deployment. He is responsible for hundreds of major events and milestones over a period of seven to nine years.

It is no surprise that he learns too late about missing essential requirements. He often overlooks subtle interrelationships that result in schedule slips, test deficiencies, redesign, cost overruns and inadequate logistic support.

The majority of individual actions that should be performed during the acquisition of a new piece of equipment can be performed quite easily, especially by an intelligent, well educated, trained individual. However, when the total effort is viewed collectively, the task becomes exceedingly difficult.

Existing guidance in the form of regulations, supplements, circulars and handbooks is voluminous, contradictory, vague, confusing and in the end—exasperating.

The problem is compounded because the project engineer, after being on a project for a number of years, is working on the tail end of the acquisition cycle, prior to being assigned to a new project effort that is just starting out at the beginning of the acquisition cycle. When one considers the large number of separate efforts during the total acquisition cycle, the lengthy time frame involved and the high probability of change in requirements to the earlier activities, it is not surprising his experience has limited application to a new project.

Any acquisition project, whether it's a small hardware end item or a major system consisting of many subsystems, must address the same technical management factors. The essential difference is the depth of effort.

In order to improve the current modus operandi, a manager needs two tools. First, he needs an automated project management and tracking system to assist in planning, scheduling and controlling individual project, laboratory and command efforts.

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DAVID B. SCOTT JR. is chief, Systems Technology and Management Division of the Management Information Systems Directorate at the U.S. Army Mobility Equipment Research and Development Command, Fort Belvoir, VA. He has over 14 years experience in all facets of computer applications.

An automated management system would increase productivity and prevent the need for fighting constant "brush fires." With this system, the user could maintain current information on all projects to effectively track milestones and locate problem areas.

Automated project management systems and resource allocation models could be applied in a life cycle management automation effort. With such a tool at his disposal, the manager could maintain a data base of information about project activities, milestones, critical paths, available resources, scheduled resources, resources expended to date, etc.

He could also have a flexible report writing capability to allow the user to specify simple query strings to answer a question and to specify detailed, periodic reports. The user could easily specify a report format that clearly presents information.

These systems could provide the unique capability to assign and constrain resources such as manhours, percent effort, dollars, time, etc. It would also be possible to simulate effects of the constraints.

The manager could then truly manage his resources and get a clear picture of direct and indirect effects of his actions on the entire project.

Another possible output would be a graphical representation of the project showing all events and resource costs in a network model. The model would clearly depict milestones, dates, resource costs and interaction points of a large project.

The entire chart could be plotted for viewing on the wall. A snapshot of a day or week could also be plotted instantaneously at an interactive computer graphics terminal for data checking, correction, review by management, or assignment to project engineers.

Intelligent application of this tool would result in improved interface with internal and external support activities and greater assurance of better products.

Second, the project manager also needs a single document that ties together all the elements of system acquisition. Such a handbook would not only identify elements of the automated management tracking system, but would also detail the what, where, why, when and how of all the events or actions that should be considered.

Many attempts have been made at documenting a "Life Cycle Management" approach. Results were usually brief descriptions of events, general references for responsibility, and a listing of broad reference categories.

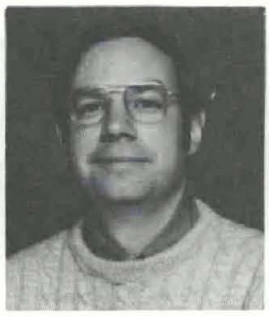
The fatal flaw in this type of approach is that individual actions, although simple in themselves, become complex and incomprehensible when combined into a total materiel acquisition requirement.

A materiel developer needs a comprehensive, current, and detailed handbook that separates all this information into segments small enough for use by an individual in a practical manner.

(Concluded on page 15)

Improving Railroad Safety Through Insulation Technology

By Dr. Charles Anderson



DR. CHARLES ANDERSON, a physicist at the Ballistic Research Laboratory, heads a research program, initiated by the Department of Transportation in 1973, to investigate the origins of cataclysmic explosions. He and his associates were instrumental in the preparation of a federal material transportation hazardous materials regulation. Anderson authored the crucial thermal criteria portion of the new law.

Throughout most of the last decade, researchers at the U.S. Army Armament R&D Command's Ballistic Research Laboratory (BRL) have been putting their technology and skills to work for the nation's railroads.

A rash of railway accidents involving tank cars carrying flammable materials such as propane and vinyl chloride prompted an investigation in the late sixties by the Federal Railroad Administration (FRA), an arm of the Department of Transportation.

Because of BRL's knowledge in fire technology as well as unique skills in high temperature measurements, the FRA sought out that agency for assistance in investigations of train wrecks and derailments.

BRL's capabilities in large scale field testing and precise technology in instrumentation made it an ideal research activity to initiate a railroad safety project. By 1973, testing of both bare and insulated one-fifth size tank car models was underway at the Army's White Sands Missile Range in New Mexico.

Initial tests led to full-scale pool fire tests on two 33,000 gallon tank cars. These cars, except for a few changes to facilitate instrumentation, were just like the 22,000 other DOT 112A/114A tank cars in use.

For the first test, a bare car was placed in a pit, instrumented and filled with approximately 30,000 gallons of propane. The car was then completely engulfed in flames (JP-4 jet fuel was used to provide the source of the fire.)

After 24.5 minutes of fire exposure, the tank violently ruptured, spewing fire and debris considerable distances. Pieces of the car were hurled as far as 1/4-mile and the tank cylinder was completely "ripped" to pieces.

Armed with the data from the test, post-test analyses of the fragments, metallurgical analyses, etc., the mechanism of failure was understood and documented.

Propane and vinyl chloride are shipped under pressure in the liquid form. In a fire environment, heat is transferred to the interior of the car. The temperature of the contents is raised and the pressure increases. Above a specified pressure, the relief valve opens and vents, but the pressure will continue to climb if the total heat to the interior is great enough.

In addition, the steel tank shell is heated, particularly that portion which is not in contact with the liquid. As the metal heats, its strength begins to degrade, especially where metal temperatures are in excess of 800° F.

If exposed to the fire long enough, the interior pressure exceeds the strength of the temperature-weakened steel. A sudden release of the pressurized contents then occurs.

The remaining contents (propane, etc.) suddenly vaporizes, mixes with air, and an explosion occurs. This fuel/air explosion can "rocket" portions of a tank car for considerable distances.

A second tank car was tested in December 1974. This car was exactly like the first car except that one-eighth inch of a spray-on insulation coated the car. The car survived 94.5 minutes of fire exposure before rupture.

The car contained only about 10 percent of its loaded propane at rupture. The rest had vented through the relief valve. The bare was about half-full at rupture. The coated car ruptured into only two fragments and two cylindrical tubs, as opposed to 63 pieces of mangled metal in the first test.

It was demonstrated that by protecting the metal skin from reaching elevated temperatures, the car would retain its integrity while releasing its contents through the relief valve until the car was essentially empty. Also, the rupture, if indeed it did rupture, would be significantly less violent. However, that was not the complete story.

Accident investigations showed that a significant percentage of ruptures, where there was a reliable estimate for the time, occurred in less than 24.5 minutes. Yet, full-scale testing of the bare car was a *full engulfment* pool fire—a "worst-case" test. Hence, another mechanism was contributing to tank car failures—the "torch" mechanism.

A torch can result from ignited liquid and/or vapor rushing out of a hole or tear in the shell. This could be caused by a coupler impact in an accident, or possibly effluent from a relief valve on an overturned car impinging on an adjacent car.

Remembering that the contents are already under pressure, and that any additional heat from a fire would raise the internal pressure, the ignited, high velocity stream acts as a large blowtorch. Higher heat flux from the torch can heat the impinged steel to dangerously high temperatures in only five minutes.

To investigate this phenomenon, the BRL designed, constructed, and operates a torch simulator facility at the DOT Test Center in Pueblo, CO. A BRL team tested the thermal response of steel plates, the same thickness as the shell of a tank car.

Bare and thermally protective plates have been tested. Thermal protective systems are of two basic types: a spray-on coating typically one-quarter to one-half-inch thick, depending upon the insulating ability of the material; a jacket or sandwich system.

The jacket type consists of one inch of a mineral or ceramic insulation covering. It is sandwiched between the tank car and a one-eighth-inch steel jacket. Each system has its advantages. It is up to the user to decide which meets his needs.

Torch tests were also conducted on full size tank cars, both bare and insulated, to insure that the plate results were valid. Good correlation was obtained.

After this research effort, a federal regulation was written. It requires that all DOT type 112A/114A tank cars carrying flammable commodities such as propane, vinyl chloride, etc., be retrofitted with a thermal protective system.

Rather unique was the fact that the regulation specified performance criteria as opposed to design criteria. In the past, regulations normally specified the material, design, construction, etc. No room was left for innovation or improvement.

The present "reg" specifies the minimum thermal criteria of the insulating system. Any potential supplier or manufacturer simply submits his candidate insulation system to the Transportation Test Center for testing by BRL.

If the candidate system meets the thermal criteria, then it can be used on the tank cars. Thus, the performance criteria encourages innovation in the industrial community. This enhances competition and the development of better and cheaper systems.

Besides the thermal criteria, two other performance criteria were specified in the regulation, issued in October 1978. E-shelf couplers were designed to prevent the car's coupler from uncoupling in a vertical or upward direction.

Additionally, in the event of coupler override, head shields, which protect the ends of the tank car, must be added to prevent puncture of the tank shell. The head shield averts puncture, shell perforation, and spilled contents.

In conjunction with this program, the BRL has managed environmental and accelerated life testing of the insulation systems. These included cycling of coated systems in various combinations of high and cold temperatures, and high and low humidities.

Accelerated life testing was also conducted where insulated tank cars accumulated 10 years equivalent mileage and coupler impacts in approximately 18 months. Impact testing is also being investigated to determine the susceptibility of the insulating system to direct and glancing impacts such as in a derailment.

The BRL has assisted in making the rail transport of hazardous materials safer. A solution was found that was technically *and* economically feasible. The solution permits a retrofit of the existing tank car fleet. It also allows new tank cars to be easily built to the performance specifications.

Finally, the solution is being implemented in a reasonable time frame since it provides for the use of "off-the-shelf," commercially available systems. The retrofit program is now beginning the final year of a 3-year program.

Train accidents, with fires, have recently involved the newly insulated cars—and the insulating systems work, precluding rupture and a possible chain reaction sequence of ruptures!

Several BRL scientists have provided many significant contributions to the development and direction of this railroad safety project. One is Mr. Thomas Jeter, a BRL physicist and assistant branch chief, who directs all field testing and manages preparation of instrumentation packages.

Another significant contributor is Mr. Edward Baicy, chief of the Fragmentation Branch in BRL's Terminal Ballistics Division. He provides key leadership and technical know-how in the development and success of the railroad tank car testing program.

The Case for an Automated Acquisition Handbook

(Continued from page 13)

A project engineer assigned to a new program must plan many hundreds of actions. He may be brilliant in certain areas but uninformed in others. Staff elements should provide that missing expertise, but often the staff is undersized or loses a key man.

Frequent manpower reductions are making understaffing a way of life and increasing productivity a necessity. Unessential actions must be eliminated.

A Materiel Acquisition Handbook should be a comprehensive reference source containing a brief description of each action and who is responsible; a list of contributing groups; and precise references for further information. It should also be associated with an automated tracking data system.

The U.S. Army Mobility Equipment R&D Command is currently developing such a Life Cycle Management Model. It will be followed by an expanded handbook that will provide information to simplify tailoring of individual project models.

The authors suggest that the follow-on detail include such information as: The action impact on interrelated events; Constraints caused by other actions; How to make up for actions not included; Criteria for action; What action from a particular phase must be accomplished if that phase is skipped; and Typical time and skills required for the task.

Three shortcomings exist with a manually prepared handbook. Much of it will rapidly become outdated, its large size tends to discourage use for some applications, and its use is limited by the single format of being a hard copy document.

Computer technology provides the tools to overcome these problems. Computers are marvelous management tools that are all too often misused to produce reams of unused data. On the other extreme, many organizations fail to streamline their operation because they don't use computer technology to increase productivity.

Today's computer technology will allow the Materiel Acquisition Handbook to be integrated with an ADP system to provide: narrative update of the handbook on a near real time basis; automated searching to locate sections that bear on a problem; and dissemination of the handbook by electronic media rather than hard copy.

Additionally, it would provide user defined report writing and graphing to produce reports on a section of the handbook, portions of the Life Cycle Networks or other pertinent information; data validity checking; and historical analysis.

The handbook would be centrally maintained (one master copy). However, it could be accessed and updated by multiple users at remote sites. The automated handbook would truly reflect current data critical to making good decisions.

It is no sin to make a project engineer's job easier. We do not need to test his intelligence by making his work more complex. Even with an easy to read road map, he still must decide which route to take.

Improving R
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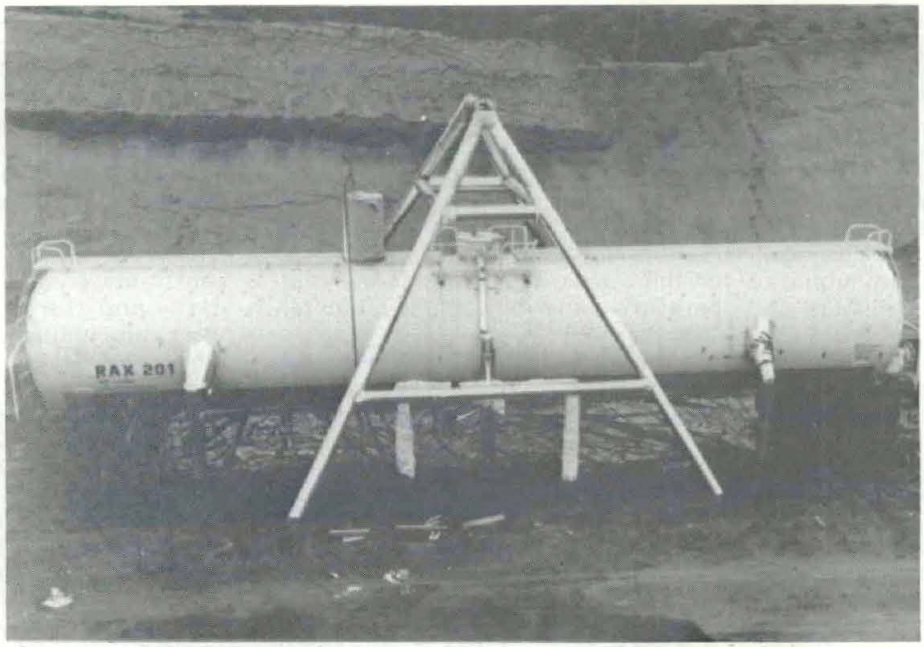
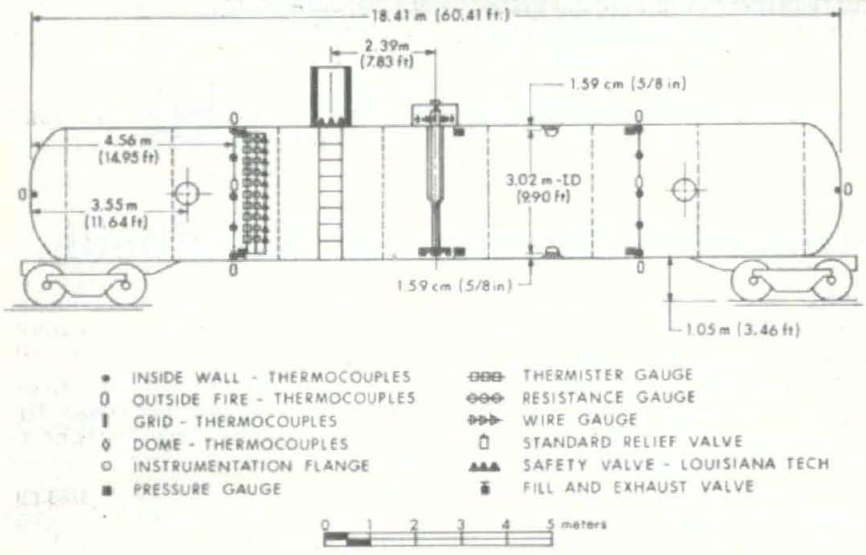
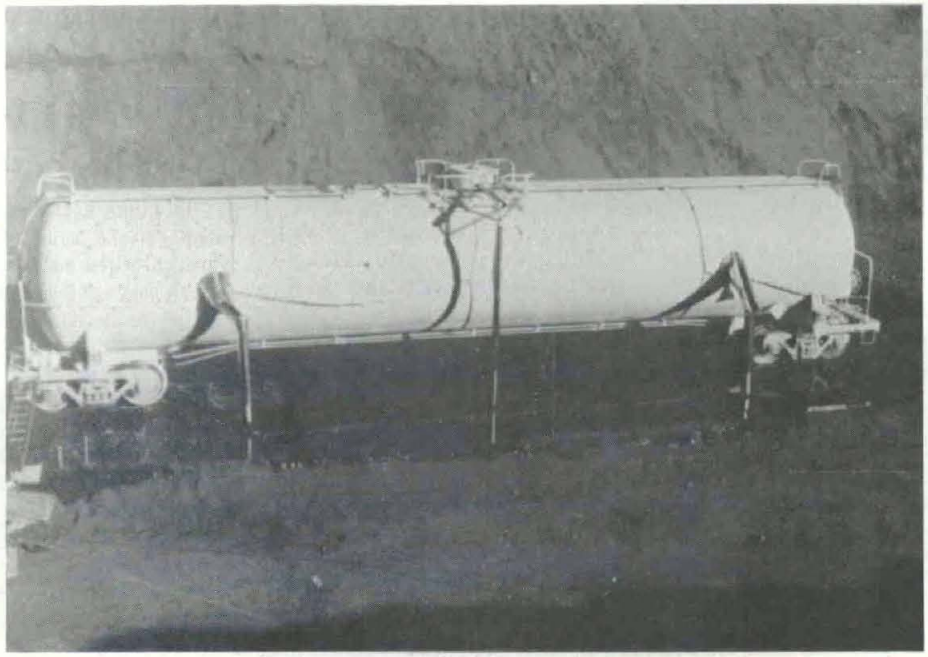




Instrumentation Layout for RAX 201 and RAX 202



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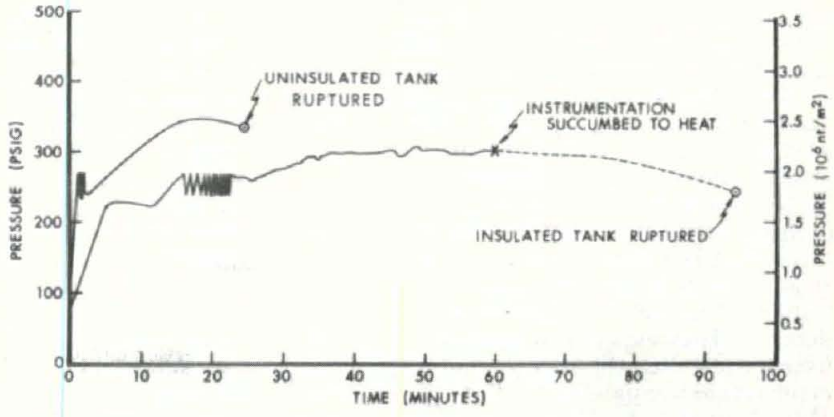

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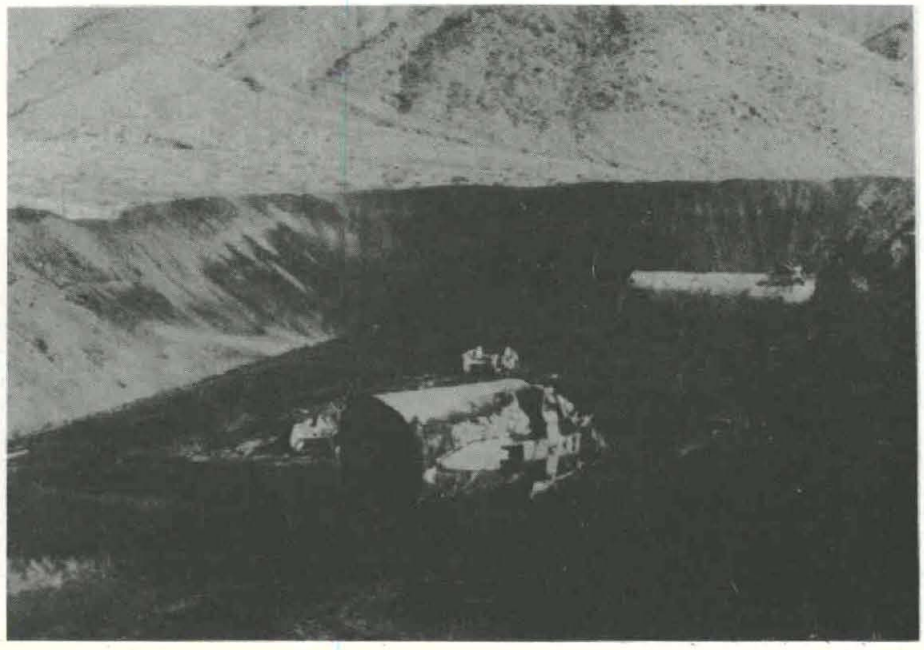


ADPA Sponsors Seminar on Army Requirements

Operational and technological considerations relative to development of concepts and requirements for future Army weapon systems were reviewed by more than 400 U.S. and allied military and industrial representatives, 9-10 January, during an "executive" seminar at the Armed Forces Staff College, Norfolk, VA.

Sponsored by the American Defense Preparedness Association, the Secret meeting was designed to promote discussion of complex problems and potential solutions, and to articulate industry roles and opportunities associated with the next generation of NATO requirements.

MG L. Gordon Hill, commandant of the Armed Forces Staff College (AFSC) opened the meeting with welcoming remarks and a fast-paced review of the AFSC. He then introduced GEN Henry A. Miley Jr. (USA, Ret.), president of the American Defense Preparedness Association.

Miley noted that this meeting represented a long-held dream of his. He stated that the Army must do a better job in letting industry know what it needs. The central question, he added, is "How can the Army and industry work together to produce a better combat capability?"

Mr. Edward A. Miller, general chairman of the seminar, vice president, Engineering, Federal Systems Group, Sanders Associates, and chairman of ADPA's Concepts and Requirements Division, gave an introductory statement. He said that there is now a sense of urgency in national defense.

He stressed that there is a need for a stronger technological/industrial base. Not enough attention is being given to economic realities associated with NATO. He also said that defense budgets must be increased.

Deputy Commander of the U.S. Army Training and Doctrine Command LTG William R. Richardson began the formal presentations with a classified keynote address on battlefield forces and opportunities and requirements for new technology.

The General noted that there is a qualitative and quantitative inferiority in some U.S. fielded systems. He stated, however, that the U.S. is ahead of the Soviets in certain specified technological areas. In a classified portion of his address he touched on the assets and liabilities of the Soviets and the U.S. on the integrated battlefield.

Richardson emphasized that the U.S. *must* optimize allocation of its scarce resources in fielding of advanced systems to achieve force modernization. We must, he continued, articulate our needs better at all levels, to include OSD and the Congress.

The Soviet acquisition process is faster than the U.S. acquisition process, said Richardson. This is because the Soviets don't wait for "total perfection" as we often do. The Soviets use more off-the-shelf and more standardized items than we do.

Relative to the U.S. acquisition process, Richardson said that it encounters too many delays. Said he: "We must learn to produce faster and product improve later." Our system, he noted, results in an extended acquisition cycle and in extended costs.

Richardson called for a compressed acquisition cycle and a broader base research program so that we are not taken by surprise by the Soviets.

We need many things to improve our fighting capability, continued the General. For example, he said, we need a greater volume and range of fire in some of our direct or indirect fire systems. Lethality and accuracy also need improvement relative to air defense. Intelligence, surveillance and target acquisition are other areas that should also be reviewed.

Richardson noted that one of the challenges facing the U.S. is to overcome the complexity of our systems. He said we must also overcome some of our manpower training problems. Additionally, he stated that cooperation must be improved with industry and that both industry and the Army should seek to explain their dialogue.

BG (P) Carl E. Vuono, TRADOC Deputy Chief of Staff for Combat Developments, followed GEN Richardson with a discussion of TRADOC's role in development of concepts and requirements.

The general explained that concepts are used to help develop Mission Element Need Statements. Everything begins, however, with operational concepts. One of the efforts that TRADOC is involved in to improve the Army is the Division 86 Project, said Vuono.

The purpose of the Division 86 Project is to develop the most effective force for the Army's heavy divisions. A target date of 1986 is used because that is when many systems will enter the Army inventory and there is a validated threat for that period.

Vuono also said that TRADOC is looking at the Army's light divisions relative to the 1986 time frame. He called on those in industry to help the Army in developing the Division 86 Transition Plan.

MG D. E. Rosenblum, TRADOC Deputy Chief of Staff for Training, provided a lively discussion on the challenges facing the Army relative to training. He candidly stated that more "below average intelligence" people are coming into the Army than ever before. This, however, can be overcome by motivation. Today's enlistees *are* trainable, he said.

Rosenblum explained that there are not enough training resources. Time, people and facilities constraints are not helping us, he added. All weapon systems are getting more complex and training must be improved. More people with technical aptitudes are needed, he said.

He also discussed the problem of skyrocketing costs. Said Rosenblum: "We need more land, fuel, ammunition, etc., to conduct training." Technology and the economics of the 1980s may make training even more difficult than it is today, he stressed.

Rosenblum indicated that the Army Research Institute is studying an improved type of aptitude test. The image of the military must also be improved and pride and self respect must be built into the new people coming into the Army.

Some other initiatives the Army is taking to improve training, said Rosenblum, are new simulation systems such as the Multiple Integrated Laser Engagement System, and battle simulations for commanders. A new National Training Center is also being established in California to provide essential Army training that cannot be provided at a home station. He concluded by stating that training the force is the most critical issue the Army faces today.

TRADOC Assistant Deputy Chief of Staff for Combat Developments BG John W. Woodmansee spoke on TRADOC's involvement in the Rationalization, Standardization, and Interoperability (RSI) arena. TRADOC's RSI philosophy, he said, is rationalization of concepts must precede interoperability; that interoperability offers the greatest potential for increasing NATO combat power; and that benefits of standardization are

most attainable through a "micro" or indirect incremental approach.

Woodmansee asked the question: How do we get a systematic approach to allied cooperation? He responded by stating that ideally this would happen through development of concepts, then requirements, then evaluation of requirements and finally to cooperation on RSI products.

All nations must have their own requirements process therefore a bridge is required to understand each other's needs, explained Woodmansee. The vehicle for this, he said, is an allied/U.S. military equipment document. It is used to move from concept to hardware and to assist in formulating MOUs. This document can also address the timing of when systems are required and their costs.

Woodmansee closed with a brief discusssion of the Bilateral Staff Talks. The purposes of these talks, he said, are to look at combined joint tactical concepts, achieve tactical interoperability, derive mutual weapon system requirements, and increase standardization of materiel.

A questions and answers panel discussion followed BG Woodmansee's presentation. Panel members were BG Woodmansee, MG Rosenblum and BG (P) Vuono.

Development and Approval of New Concepts and Requirements was the topic of MG Fred K. Mahaffey, Director, Requirements, Office of the Deputy Chief of Staff for Operations. He began with a discussion of OMB Circular A-109, and the organizational aspects of the requirements process.

A-109, said the General, has helped to identify the need by mission, provides strong program management features, and has created an opportunity for industry innovation. In an overview of requirements, Mahaffey explained the uses of mission area analyses, STOGs and MENS.

There is a continuing dilemma in the requirements business, said Mahaffey, because of the necessity of deciding whether to concentrate on today's readiness or tomorrow's modernization. He added that changing requirements often result from changing threats, new technology automation, communications, and munitions.

The role of analysis in the requirements process was presented by LTC Robert H. Cole from the Office of the Deputy Under Secretary of the Army for Operations Research. He indicated that 85 percent of the Army studies are done in-house. When an analysis is done, it is best to think in terms of unit rather than single item systems. Analysis has now become a normal part of the acquisition process, he concluded.

COL Robert A. Wagg, Chief of the DA Internationalization Rationalization Office, gave an overview of the Army RSI program. He also discussed the M240 machinegun program, the NATO Small Arms test competition, the NATO Armaments Planning Review, and the NATO Periodic Armaments Planning System.

The Colonel explained that RSI encompasses more than hardware programs. Doctrine, logistics, and training must also be included. In general, he said that international programs are not unlike our own hardware programs. International programs also require the same degree of complexity, intense management and resource allocations.

Mr. John B. Tower, corporate manager, General Dynamics Corp., provided an industry perspective of the requirements and concepts process. He began with discussion of how the Soviets view U.S. hardware progress during the 1970s.

Moscow, he said, would have to conclude that we are well on the way to achieving modernization. However, he added, we have a long way to go.

Some of the reasons the U.S. is still having to play catch up, noted Tower, are because we are intimidated by the procurement bow wave; because we are intimidated by A-109 and the MENS; because there is no new technology.

Catch-up is a dangerous game, said Tower. Staying ahead is better. He called for much greater participation in the requirements process by industry, the colleges, and the universities.

Former Army Secretary Martin R. Hoffmann, who is now managing partner of Gardner, Carton and Douglas Law Firm, was banquet speaker. He began his address by stressing that the shift in the balance of power in recent times is very ominous. He posed the question of whether a NATO arrangement can compete with the Soviets.

Hoffmann indicated that during his tenure, the terms RSI were used separately. Today, he said, they are packaged together. Lumping them together blurs the idea because the terms are really not interchangeable.

The process of rationalization is really the basis for enlightened cooperation, it is a worthy goal, stated Hoffmann. Standardization, on the other hand, is too often seen as a goal in itself. It is a future possibility. It should be used to optimize interoperability.

Hoffmann cautioned that a narrow focus on RSI is not good. RSI is also not a good substitute for increased defense resources. He added that it is not an end in itself.

The former Army Secretary emphasized that we must have shorter requirement-to-development times. This, he said, may entail more risk than we have been willing to take recently. Relative to OMB Circular A-109, he said that it has helped formalize the industry role in the requirements process.

Hoffmann noted that the U.S. cannot wait for a clear blueprint of where we will end up before we begin the requirements process. Said he: "The emphasis must be on action."

There are times when progress can be made and when it cannot be made, and we must recognize this fact, he added. He stated that there is a need for greater assertiveness by industry and for greater sacrifice for the common good, in general.

The second day of the seminar opened with a panel discussion devoted to the Harmonization of Materiel Requirements and Systems Among and With Allied Nations. This session was chaired by Dr. V. Garber, Deputy Under Secretary of Defense (International Defense Programs and Technologies).

Dr. Garber discussed the key elements of the U.S. requirements process and how the process is conducted within the NATO arena. U.S. success in the next war, he said, will not depend on U.S. troops alone, but on allied troop cooperation. A very capable alliance force is our number one requirement, he added.

Dr. Garber indicated that one of the most important needs is a rapidly deployable force. He concluded by stating that he would like to see 1980 "the year of interoperability."

Vice Admiral Sir Stephen Berthon, Deputy Chief of the Defence Staff (Operations Requirements), UK Ministry of Defence, followed with a review of the UK requirements process. He called for a pooling of resources in NATO in order to deter the Soviets. He stated that the international collaboration is not moving fast enough. He maintained that it is fundamentally important to retain flexibility in the requirements process because unforeseen circumstances occur.

Berthon explained that 15 to 20 percent of UK defense money and time is devoted to collaboration. He echoed Dr. Garber's hope that 1980 would be the year of interoperability. Compromise among the allies in the requirements process is most important, he concluded, because we cannot have our "gold-plated" items.

Other briefings on the inter-

national requirements process were presented by Brigadier Helge Omreng, Norway; Count Corrado Augusta, Italy; and General des Armees Pierre Marais from France.

Deputy Defense Advisor for R&D at NATO Mr. Robert Calaway noted, in his address on RSI, that its progress has been uneven, but that it now appears to be accelerating.

Calaway said that he believed that some Europeans were skeptical about the Long-Term Defense Program and they viewed it as a "Buy America" Program scheme. Many think it is too risky to deal with the U.S., he concluded.

Relative to the Congress, Calaway stated that he believed Congress sometimes thinks that the U.S. gives away too much to other countries and that European quality is deficient.

Some in Congress, he said, also don't believe that Europe is doing its share. He concluded by stressing that the U.S. must support a viable and strong European defense industry and that there are more similarities than differences between the U.S. and Europe.

Army Deputy Chief of Staff for RDA LTG Donald R. Keith provided an in-depth presentation on how the Army is going about the task of fulfilling requirements related to research development, and acquisition. Basic objectives of the RDA program, he said, are to provide the Army with the necessary weapons to deter war and to win a war if one is necessary.

The rate of Soviet investment in military materiel is a key concern to the U.S., noted Keith. In recent years, Soviet investments were double those of the U.S. RDA programs. Keith called for attention to three RDA strategies: concentrations on technologies with the greatest potential; more effective utilization of the available industrial base; and increased allied cooperation.

The management of modernization, along with manning the force is the most immediate challenge facing the Army, said Keith. Technology, noted Keith, remains the source of the innovation concepts and developments which are the foundation of weapons systems, he added.

Keith also discussed some of the barriers to technology application and force packaging methodology. Some of the specific R&D areas he reviewed were precision guided missiles, very high speed integrated circuits, directed energy, advanced composite materials, and computer software technology. He closed with an endorsement of the various cooperative programs with NATO.

DARCOM Deputy Commander for Materiel Development LTG Robert J. Baer followed LTG Keith with a discussion of what DARCOM is doing to further the objectives of the Army RDA program. The cornerstone of the development cycle, said Baer, is the technology base. Without a strong technology base there is trouble building anything, he noted.

More effective utilization of the industrial base is another important factor in the Army's development cycle, explained Baer. The contracting out for research is growing, said Baer, because of diminishing in-house resources. He cautioned, however, that there is a limit to how much can be contracted out.

He noted that computer-aided procedures are helping the Army get more for its R&D dollar and that other efforts to improve the materiel development process include a new test data collection system, improved designs, improved reliability and an improved technology data base.

Relative to RSI, he stated that we have come a long way in the past three years, but that there is still a long way to go. He noted that the main cooperative R&D project at the present is the Multiple Launched Rocket System.

Cooperative programs with short-term goals in readiness, interoperability and modernization were also discussed by Baer. These include non-major items such as ammunition and C^3 interoperability. Non-major items are a direct spin-off of the Bilateral Staff Talks, Baer said.

Dr. Charles H. Church, chairman of the Army's Advanced Concepts Team, described his organization's role in identifying and supporting concepts which offer some potential toward increasing the Army's materiel capability. He highlighted some programs promoted by his office.

Dr. James Tegnelia from the Defense Advanced Research Projects Agency (DARPA) also provided an overview of how his agency transfers advanced technology from the research phase into operational capabilities. Two of the more promising items he discussed were "Tank Breaker" and "Assault Breaker."

DARPA, said Tegnelia, actually undertakes few projects. However, those that it does receive a lot of resources. DARPA, he noted, also has a good working relationship with the Army and with industry.

Director of Army Research Dr. Marvin Lasser spoke on the Army's new emphasis on long-range acquisition planning. The goals that are now being sought, said Lasser, are to obtain technological equivalence with the Soviets at least by 1985 and superiority on or before 1990.

An associated goal, noted Lasser, is to maintain our fielded capability at the highest state of readiness. This, he explained, can best be implemented by the planning of product improvements to overcome difficulties in our systems and to enhance their operational capabilities.

Dr. Lasser called for improved methods of R&D planning and for more user-developer interaction. He concluded that there must be more input from industry during the planning process. This, he said, applies to concepts and systems.

MG James H. Patterson, Director of Battlefield Systems Integration, HQ DARCOM, gave an overview of what BSI is, why the Army has it and what part industry can play with regard to it. He defined BSI as the planning, designing and engineering for total systems integration.

BSI, stated Patterson, should be considered an integral part of R&D planning and therefore greater cooperation is needed between the user and the developer. R&D planning, he added, needs to encompass a standard set of guidelines. All of this is necessary, he explained, if there is to be an "integrated system."

Patterson called on industry to help identify problems and propose solutions. Said he: "The technology base of the Free World, both private industry independent R&D and government laboratories, must be tied closely to current concepts and doctrine—or offer innovative changes. In this manner, he concluded, the goals of BSI can be achieved.

A final panel discussion on the "Risk Attitude" of industry relative to international programs, sparked a lively debate. The panel was chaired by Mr. M C. Baird Jr. of Sanders Associates. Other panelists were Count Augusta, Mr. Ed Bursk, Ratheon, and Mr. Berge Thomasian, vice president of Maremont Corp. Some very candid opinions, both positive and negative, were aired relative to NATO RSI.

DARCOM Commander GEN John R. Guthrie presented closing remarks and summarized his perceptions of the seminar. Generally, he said, that the meeting provided a good interchange between concerned parties.

He added that perhaps there should have been more discussion of what needs to be done in tactical nuclear and chemical warfare. Other areas that should have received more attention are software, integrated logistics support, and personnel.

ETL Developing Quick Response Multicolor Printer

Someday a larger version of the electrostatic color copiers, now found in office reproduction pools, may be installed in the semitrailer vans of the Army Engineer topographic units that produce maps and battlefield graphics.

Researchers at the Army Engineer Topographic Laboratories, Fort Belvoir, VA, are investigating the idea of borrowing the technology used in office copiers and applying it to reproduce large map sheets. This technological innovation now appears to be practical. This is because a recently developed laser scanner has improved the "dry copying" process, making possible the fine resolution needed for map reproduction.

The need for a faster way of copying topographic maps and map overlays was identified in an official postwar study of World War II map usage. The study revealed that only about 10 percent of the topographic maps available in the European Theater of Operations had been used. Compiled and printed in advance, these maps became obsolete by the time they were needed for military engagements, the study concluded.

The Army's need for quickly reproduced, up-to-date maps is even more acute today. If a massive offensive is launched without warning, there will not be time for revision and printing of new maps on presses in the United States or in field support vans.

Commanders will need printed maps overlaid with current information on enemy dispositions, damage to transport routes, and many other recent changes in the ground on which the battle will be fought.

Currently, tactical overlays are drawn in color on transparent sheets. The drawback to using transparent overlays with printed maps, is that they cannot be quickly duplicated in the field. Each additional copy of the overlay must be redrafted by hand.

Chemical engineer Mr. Fred Myers, who heads the Topographic Laboratories' project to develop a Quick Response Multicolor Printer, described a typical combat situation where such a device could save lives and help U.S. forces to win battles.

"Suppose you are an artillery battalion commander," says Myers, "and you have just learned of a shift in enemy forces. The old lines of deployment are quickly erased from your master overlay, and new lines are drawn in. But what about your battery commanders, who also need this information in graphic form? They need it right away.

"Using metal plates, colored inks, and a printing press, the job will take at least three to four hours, and by then the tactical picture may have changed completely. An electrostatic printer could do the job in ten minutes."

Myers also explained that the new technique of scanning the color original with a laser beam instead of flash-exposing the entire original at once with a diffuse light source will give very even exposure from center to edges of a 24 × 30-inch map.

To use the older method of exposure on such a large sheet would have resulted in a reproduction that was too light in the center and too dark at the edges.

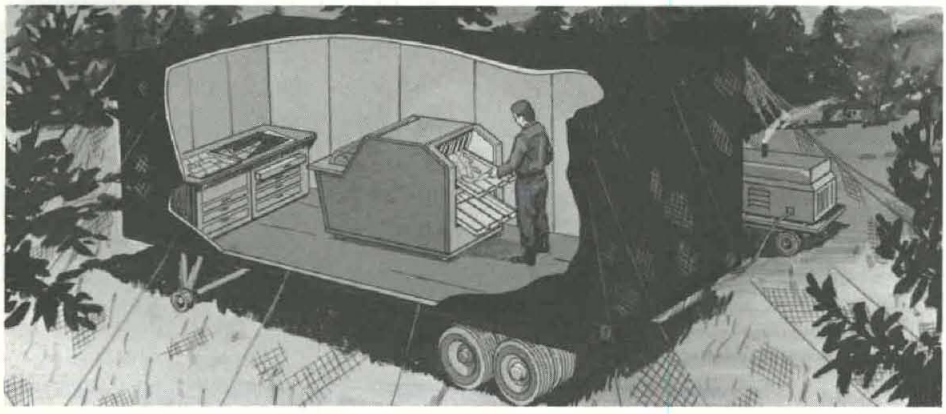
After fabrication and testing of prototypes, it is proposed that the Quick Response Multicolor Printer be produced for use by topographic elements at corps and division headquarters and the engineer topographic battalion at theater Army level. Myers envisions that the printer would weigh about 2,000 pounds and would be housed in a truck or a semitrailer van.

The large-bed color copier would cut down on the logistical problem of producing and storing large volumes of printed maps in the field. As many map sheets as might be required could be printed from a single original kept in file.

Compared to printing presses now in use in the field, the Quick Response Multicolor Printer would require less manpower and a lower skill level to operate and maintain.

If the change to electrostatic printing proves practical for the special conditions of the battlefield, it will be the first fundamental advance in combat map reproduction technology, since single-color offset lithographic field presses were introduced before WW II, Myers said.

"Electrostatic printers will probably not take the place of lithographic presses for large volume map printing, but they would be an invaluable addition for meeting tactical commanders' most urgent needs," added Meyers.



Quick-Response Multicolor Printer

CERL Releases New Report On Seismic Shock Testing

The U.S. Army Construction Engineering Research Laboratory (CERL), Champaign, IL, recently released a report to help establish seismic shock test criteria for equipment used in military facilities, such as hospitals, fire and police stations.

The report, "Development and Use of Seismic Shock Test Criteria for Essential Equipment in Critical Facilities," by Messrs. P. N. Sonnenburg and J. D. Prendergast, also provides guidance for interpretation of test results.

Using existing data from proof and fragility tests on tactical support equipment, CERL researchers determined failure characteristics. These characteristics were further analyzed to provide failure probability estimates.

The report summarizes major tasks in equipment test qualification: selecting the test facility, formulating test units and criteria, establishing test qualification requirements, and interpreting test results.

Test criteria were developed by selection of the test axis (horizontal, vertical, or both); statement of operating configuration (is the equipment turned on or off?); identifying points of failure; and describing the shock environment.

The shock environment description can be transformed into a time history waveform to drive a shaketable.

The report also presents methods for developing waveform test criteria from the output of various types of dynamic building analyses. Requirements for reporting and documenting test results are also discussed.

The Advanced Planning Briefing: Its Evolution and Status

By John F. X. Mannix

Problems of obtaining advanced planning information have always been of vital concern to contractors who do business with the government. Contractors believed they could do a better job if they knew about future military plans as far in advance as possible.

Knowledge of these plans would allow them to plan their company-funded, R&D activities in specific areas that are of interest to government agencies. They would therefore be equipped to respond to government programs faster and with greater technical competency.

Certain preliminary R&D could also be completed, thereby saving the government money. Although many government managers saw the logic in this argument—and some were very sympathetic, until the 1960s, Federal Procurement Regulations prevented release of some information requested by industry.

Since that time, a number of programs have been initiated to meet industry's request. Initially, these were mainly programs that supplied a book of printed problems, which was forwarded to manufacturers who had security clearances and appropriate technical capabilities.

The Problems Guide Program, initiated in about 1960, was typical. Each of the seven technical services published a "Guide." This program lasted a little over three years and assisted in solving a few R&D problems, but it did not adequately fill the need.

The mechanics necessary for a manufacturer to actively take part in the program were slow. After discovering an area where they thought they could help, manufacturers often lost interest while awaiting approval and background reports from the government.

In 1963, the Department of Defense inaugurated the Advanced Planning Briefing (APB) Program. According to DOD regulations, APBs would provide industry and academia with current, factual, and definite information on mid- and long-range plans, policies, and programs in support of future military requirements.

The basic purpose of the APB is to facilitate the mutually profitable exchange of information. It is designed to insure full participation by all interested DOD agencies in applicable APBs; and to assist DOD agencies in effective preparation of optimal plans responsive to their future requirements.

Though both unclassified and classified versions were authorized (and still are used), naturally the classified types provided more depth of information. These briefings would provide a clear and concise presentation of military needs and the scientific and technological advances to meet future military requirements at the least cost and in the most efficient manner. Information previously denied to private industry could be included.

The program was considered a step in the right direction by the industrial community. Subject matter included estimated costs contained in the 5-Year Defense Program, subject matter not incorporated in the approved 5-Year Defense Program, and quantitative figures of projected purchases and quantities (or numbers) to be procured for test and evaluation.

However, although the APB was considered a significant breakthrough by the industrial community, there were still problems to be solved before the program could reach its full potential and be valuable to industry and government.

The APB was a new concept to military managers, whose staffs were accustomed to conducting highly technical symposia on programs concerning their installations' scientific accomplishments. These installations were not experienced at supplying information on long-range future plans.

DOD installation, for years had hosted visits by professional or trade associations whose membership had an interest in national defense. These groups wanted to be told what the host had accomplished to improve our national defense posture. They were interested in recent state-of-the-art advances in those areas under the purview of DOD installations.

Emphasis was on banquets, demonstrations, and exhibits of field equipment. Very little or no attention was given to advanced requirements.

Contractors who attended these functions did so mainly because they served as a vehicle for business contacts. Since this was the accepted practice, many of the initial APBs were conducted along the same format.

Another problem was that some of the first APBs resembled scientific symposia. Detailed technical discussions were presented on each task being pursued by the host installation. Since the attendees were planners rather than researchers, much of the material was appreciated.

Since many programs lasted for three days or more, the attendees were saturated with scientific data. It was difficult to filter out necessary technical and planning data for their future company programing.

To compound the problem, once the program was over, other high-priority projects were assigned to the speakers and program directors. Therefore, it was often six months to a year before the proceedings containing the presented papers were received by the attendees. Consequently, the information was old or the manufacturers had lost interest in the problems at the briefing.

Some agencies used another approach. Rather than presenting a program "across the board," based on the overall mission, they would cover one technical area in detail. This type of briefing was a step in the right direction, but a contractor often had to attend five or six briefings over a period of three or four years to obtain complete planning information on one DOD installation.

It is important that APBs be properly coordinated. Since many contractors are interested in the programs of a number of different military R&D facilities throughout the country, it is important that they attend the briefings at all these installations.

These briefings must not run concurrently or even close together. For example, in the Department of the Army, the Technical and Industrial Liaison Office at Headquarters DARCOM, is the coordinating office to assure that conflicts do not occur.

That office also has the final power for approving technical presentations and for coordinating attendance of foreign manufacturers. For a number of years, Australian, British, and Canadian firms have been invited to APBs in accordance with DA regulations.

Recent emphasis on RSI has also demanded considering NATO attendance when possible. RSI have become central concepts to improve NATO's conventional capability. In March 1977, DOD directed that all its components include NATO standardization and interoperability as fundamental considerations in major and minor equipment programs.

The original DOD directive pertaining to APBs stipulated that military R&D organizations would, except in unusual circumstances, con-

duct a briefing no more than once a year and no less than once every three years.

Many laboratories were surprised at the success of their first briefing, and resolved that if industry valued them, they would conduct additional programs. It was not unusual for one installation to sponsor two briefings a year.

The organizations following this policy soon found they had little to talk about after the second or third program. Research and development usually does not proceed at a pace where new requirements demand two programs a year. This has resulted in a directive that each Army R&D activity will conduct such a program every three years.

The former Electronics Command at Fort Monmouth, NJ, took a lead in the development of effective APBs. They soon found it was not easy to conduct a professional briefing that would furnish industry with the planning information it needed.

A certain amount of experimentation was necessary. Following each program, comments from the attendees were collected and analyzed. Appropriate recommendations were incorporated in the next program.

In the past 13 years, Fort Monmouth has conducted 13 APBs, all of which were well received by the industrial community. However, these programs were two or three days long and required extensive and expensive preparation. In 1973, Fort Monmouth conducted an innovative APB in accordance with Army Regulation 70-35. A completely new format was used.

Invitations were mailed out in December 1972. In early February, the complete classified proceedings, *Electronics Systems Planning for 1973–74*, were forwarded to industrialists interested in attending the briefing. Questionnaires accompanied the proceedings.

Eight weeks were allowed for the recipients to review the document, assign the appropriate members of their technical staff to attend, and submit questions. The actual program consisted of an updating of the material in the proceedings and extensive question and answer periods.

An addendum containing the minutes of the actual program was forwarded to all attendees within six weeks after the briefing. A similar briefing was held in March 1975.

The new format was analyzed by command and industry personnel, and the following conclusions were reached:

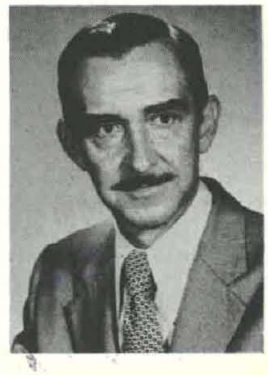
- Preplanning reduced the time required to conduct an extremely professional program from two or three days to one day. The new format also reduced financing.
- The new format saved close to $100,000 in man-days on the part of engineers and scientists in eliminating dry runs, reworking papers, and reducing the workload.
- After reviewing the advanced proceedings, the firms were better able to identify staff members who were best qualified to attend the briefing, ask questions, and satisfactorily report on the program.
- Materials presented were tailored to the more exacting need of the participants. Actual presentations were based on industry questions and indicated real areas of interest.
- Since the proceedings were distributed before the program, authors had no limitation on the amount of material they could present. They could be sure that technological advances were fully explained, problems completely outlined, and requirements fully described.
- When longer more complex programs were held, it was necessary to form a committee to coordinate the many details. This was not necessary with a one-day completely self-contained briefing.
- The new format saved both the government and the industrial community tens of thousands of dollars.

In conclusion, the new format was found to be an excellent way to furnish industry with the planning and programing information it needs to more adequately respond to Army requirements. It is a format that allowed the Army to meet DOD requirements at a minimum cost to both the government and the industrial community.

Other Army commands or DOD agencies may have found another format more suitable for meeting their needs. In any event, it can be stated that after 12 years, the Advanced Planning Briefing Program has matured to the point where industry now has a vehicle for obtaining the planning information it so urgently needs.

On 8 November 1979, the newly formed U.S. Army Electronics R&D Command, Adelphi, MD, conducted its first Advanced Planning Briefing for Industry at the Naval Surface Weapons Center auditorium, White Oak, MD. The program was cosponsored by the U.S. Army Training and Doctrine Command.

DARCOM Commander GEN John R. Guthrie delivered the banquet presentation the evening before the briefing. The new format was utilized. Critique forms and personal comments to staff members of ERADCOM revealed that this program was extremely well received by industry.



JOHN F. X. MANNIX is chief of the Technical and Industrial Liaison Office, U.S. Army Electronics Research and Development Command. He has a BS degree from Upsala College, an MA degree from the University of Oklahoma, and has published a number of articles on research and development, and management.

MPBM Project Office Becomes Permanent Agency at ARRCOM

Redesignation of the Office of the Project Manager for Munitions Production Base Modernization and Expansion as the U.S. Army Munitions Production Base Modernization Agency, has been announced. The mission and organization of the new agency are unchanged.

COL Harry V. Dutchyshyn, who has served as the PM for Munitions Production Base Modernization and Expansion since 1978, will head the new agency as its commander. He will serve also as Army Armament Materiel Readiness Command deputy for Munitions Production Base Modernization.

Establishment of the new organization as a permanent agency was approved by the Secretary of the Army and the DARCOM commander. The change was made in recognition of the long-term need for intensive centralized management of the MPBM Program in support of the Single Manager. The new agency reports directly to the ARRCOM commander/Single Manager for Conventional Ammunition.

Natick Evaluating New Emergency Assault Food Packet

Approximately 300 U.S. Marines, participating in cold weather training exercises at the Marine Corps Mountain Warfare Training Center, Bridgeport, CA, will be assisting food technologists of the U.S. Army Natick (MA) R&D Command (NARADCOM) in evaluating a new emergency assault food packet designed for extreme cold environments.

The new rations, various food bars that include 12 different compressed freeze dried entrees, cereal bars, and a variety of confectionary bars developed for the Corps, are the result of NARADCOM's continuing effort to develop food bars which are palatable, may be eaten either dry or rehydrated and are convenient to use.

Six of 12 different meat entrees have been selected for the test. Some of the items provide quick energy and others can be rehydrated with water to produce food products such as beef or chicken stew, pork and escalloped potatoes, pork chow mein, etc.

The packets are unique in that they can be utilized in the extreme cold or extreme hot or temperate climates without freezing or melting. They have considerably less weight and volume per energy unit than current operational rations, and they can be stored for several years without refrigeration.

Previous formulated field rations, as well as the newly adopted Meal Ready to Eat Combat ration, present a number of problems when used in the extreme cold. These items all have a comparatively high water content and, consequently, freeze at low temperatures, and require tremendous amounts of heat to prepare for eating. The new bars, developed at Natick, overcome these difficulties because they are very low in water content, do not freeze, and can be used in all climates.

The development program originated from the Marine Corps need to provide a food packet to be used as a restricted diet during assaults and other situations when feeding is difficult. A restricted diet is one in which the calories supplied in a daily ration are markedly less than the daily caloric output.

The preset design of the food packet contains the minimum nutritional requirements for a restricted diet. The caloric content per packet of the six menus to be tested averages 1,500 calories, and the packets will normally be issued at the rate of one per day for short assault missions.

Research has shown that men can function normally on 1,000 to 1,400 calories per day for up to 10 days, during hard work under normal temperature conditions, provided that certain minimum daily requirements are met for protein, carbohydrate, vitamins, and minerals.

The field test will evaluate this concept in a cold climate by comparing performance levels of those eating the compressed bars at two different caloric levels, 1,500 and 3,000 calories, with others consuming current operational rations during a 5-day tactical scenario.

It appears that most estimates for the caloric needs in cold climates are excessive for the properly clothed and equipped soldier. It has been shown that the amount of physical activity is the principal factor (not the ambient temperature) in determining the caloric needs of an individual.

A number of studies on cold weather nutrition, compiled by Letterman Army Institute of Research, indicate that the increase in caloric *intake* in cold climates is the result of an increase in appetite, not an increase in caloric output.

Based on these facts, the use of the Emergency/Assault Packet as a restricted diet in an extreme cold climate for periods of 3 to 5 days should not be much different than in a temperate climate. For missions requiring extreme physical activity over a prolonged period of time, additional units can be issued to fill any realistic nutritional need with a minimum increase in load weight and volume.

During the training exercises, medical personnel from NARADCOM and the Naval Submarine Medical Research Laboratory, Groton, CT, will monitor body water balance, since dehydration in extreme cold climates is a major problem and contributing factor to the onset of shock following injuries or exhaustion following extreme stress.

Soldier samples one of six food bars being evaluated at the U.S. Army Natick R&D Command for possible use in an Emergency/Assault Packet designed for extreme cold environments.

Participants will be tested not only for their physical performance and physiological responses, but they will be evaluating the acceptance and operational characteristics of the food.

This type of packet may also have a number of commercial applications. The compactness, light weight, stability, and nutritional assets of this packet make it ideal for back-packers and for survival rations for shelters, lifeboats, airplanes and caches in seasonably inhospitable environments.

Double Pin Design Extends Tank Track Life

A double-pin track, designed to provide longer track and pad life, easier maintenance and reduced noise and vibration than single-pin tracks now used on the Army's M113 vehicles, is under evaluation by the U.S. Army Tank-Automotive R&D Command, Warren, MI.

MG Joseph O. Fix (USA, Ret.) of TARADCOM's Tank-Automotive Systems Laboratory, said the new design features increased bushing area to reduce bushing loading, increased pad area and improved shape to reduce loading and wear, and wider sprocket and drive area to lessen wear in these areas.

The new design also incorporates a quick-change pad feature which uses a quarter-inch turn tab on the pad bolt, thereby shortening the time needed to replace worn pads. Pad nut and end-connector bolts use the same wrench size, so only one wrench is needed for servicing the track.

Although the design of the new track is somewhat different from that of the T130E1 concept, the only M113 modification required for mounting this track would be a change to wider sprockets.

Fix noted that upcoming tests, which will include 7,000 miles of operation on vehicles in the field, are scheduled for completion early in 1981, at which time the Army will consider using the new track on the product-improved M113A2, now being introduced into the field.

In its present form the new track weighs 22.9 pounds per shoe, compared to 21.3 pounds for each T130E1 track shoe—which would mean an increase of roughly 200 pounds to the overall weight of the M113A2. It may be possible to eliminate part of the extra weight by making design modifications, according to Fix.

HDL Unveils No-Moving Parts Fluidic Servovalve

A no-moving parts fluidic servovalve, capable of replacing conventional spool valves, and which might save the U.S. taxpayer millions of dollars, has been unveiled by engineers at the U.S. Army's Harry Diamond Laboratories, Adelphi, MD.

Servovalves are typically used to operate moving parts in earth moving equipment, fighter jets, armored vehicles, and commercial aircraft. Scientists from HDL, along with Dr. David N. Wormley and Mr. David Lee of the Massachusetts Institute of Technology, have been studying fluidic servovalves since 1975.

The new servovalve typically weighs only a fraction as much as the conventional servovalve. It also responds faster and may eventually cost far less, be many times more reliable, and last much longer.

The chief difference between this and older servovalves is that this hydraulic system has no moving parts to wear out. It also is compatible with many different kinds of equipment, and is flexible enough to accomplish many different servovalve functions, instead of using different valves for different jobs.

The jet deflection fluidic servovalve can be adapted for either pressure control or flow control by a screw adjustment. The entire piece of equipment can be made as small as a one-inch cube. Part for part, it can directly replace current spool valves.

Servovalves regulate and adjust the pressure of fluids passing into chambers to move rams or other mechanical actuators. Conventional mechanical servovalves must be extremely tightly fitted, causing great wear as the parts slide against one another. As a consequence, spool servovalves usually last only a few hundred hours.

The lightweight fluidic servovalve deflects the pressure stream with tiny amounts of fluid. Signals from both sides of the 2-pronged system are fed back to the main stream input. One signal greatly increases the pressure coming to bear on the actuator. The other limits the amount going to the actuator.

Now in its research and fundamental environmental evaluation phase, the program is expected to have an impact on military equipment by the mid-1980s.

Army Procures Shelters for POMCUS

The U.S. Army Troop Support and Aviation Materiel Readiness Command, St. Louis, MO, recently procured a quantity of Flexible Barrier Shelters for long term storage of Prepositioned Materiel Configured to Unit Sets (POMCUS) in Europe.

The technical characteristics and procurement data for the purchase of 26 shelters, that will hold the items ready for immediate issue in the event of emergency, were developed and prepared by the U.S. Army Natick (MA) Research and Development Command, Natick, MA.

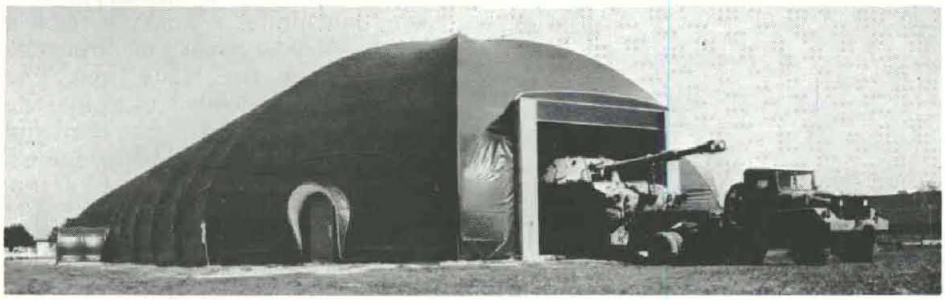
Twenty thousand square feet of unencumbered one-level humidity-controlled warehouse space are provided by the 302 feet long, 72 feet wide and 30 feet high shelters. An industrial coated fabric outer cover, which conforms to critical safety and operational requirements, including resistance to chemical warfare agents, is supported by a sectionalized steel frame which can be quickly assembled without special tools.

A 1,500 cubic feet per minute capacity dehumidifier maintains shelter interiors at a nominal 50 percent relative humidity under all ambient conditions. A complete electrical system includes 26 overhead low energy draw, high pressure sodium lights, as well as outlets for electrically operated tools and equipment.

Electrically and manually operated cargo doors at each end of the shelter provide drive-through capability while a number of personnel doors located at the sides permit easy entrance with a minimum effect on interior conditions.

Tests indicate that when relative humidity has attained equilibrium within the shelter, the automatically controlled dehumidifier will operate less than 50 percent of the time. The Flexible Barrier Shelters system is cost effective for long term storage.

The shelters are earmarked for the 21st Support Command, headquartered in Mannheim, Germany, charged with the responsibility for maintaining POMCUS storage sites throughout Germany, Belgium and the Netherlands. The first six items being procured were delivered to the Combat Equipment Battalion North in Moenchengladbach in March.



Flexible Barrier Shelter for POMCUS Storage Sites in Europe

Alexander Expedites Hydroelectric Energy

Secretary of the Army Clifford L. Alexander Jr. has announced that he has directed the Chief of Engineers to take aggressive and expeditious action to support hydroelectric energy initiatives proposed by President Carter.

In coordination with other federal agencies, the Corps of Engineers is expediting the drafting of legislation requested by the President. The proposed legislation would simplify procedures so that economically feasible and environmentally acceptable hydroelectric projects at federal dams may be completed more quickly.

The Corps of Engineers is completing a major expansion of capacity at its existing hydropower plants. These have more than twice the capacity they had 20 years ago. Additional generators have been installed at Corps projects around the country where the original construction provided for additional hydroelectric units to meet future demands.

Much of the additional generating capacity being installed is at existing projects in the Columbia Basin in the Pacific Northwest. This summer, the Corps completed an expansion of Chief Joseph Dam on the Columbia River, which doubled the capacity of that power house.

A second power house is under construction at Bonneville Dam, on the Lower Columbia River, which will more than double the generating capacity of that project. Planning is also under way for a second power house at McNary Dam, also on the Columbia River.

The Corps' National Hydropower Study, after preliminary analysis, has identified 180 existing Corps of Engineers projects which have a potential for providing over 2.5 million KW of additional capacity.

Watervliet Develops New Concept for Recycling Waste

The idea of reclaiming waste material once routinely thrown away and reprocessing it for use in making "second-generation" goods is nothing new. However, at Watervliet Arsenal, the combined efforts of Benet Weapons Laboratory, and the Product Assurance Directorate and Operations Directorate have given a new twist to the concept of recycling.

In recent projects, these organizations have come up with cost-saving methods of recycling worn-out gun tubes and breech rings—projects that promise to mean million-dollar payoffs for the Arsenal. In a program started about two years ago, Benet scientists have developed and tested a recycling process for making new forgoings out of scrap gun tubes.

According to Mr. Charlie Calderone, project leader in Benet's Advanced Engineering Section, "shot-out" gun tubes, such as the now-replaced 8-inch M2A2 howitzer, have traditionally been sold to scrap dealers for remelt. The scrapped-out tubes sell for only a few cents per pound—a fraction of the true value of the alloys contained in the high-quality steel from which the original tube was made.

The advent of the rotary forge here—with its ability to forge various configurations from a given volume of raw material—opened up a new idea for disposing of worn-out tubes. Why not try re-forging new tubes from old ones, rather than selling the useless tubes as scrap steel?

The first step in testing this concept was the design of a computer program to show potential combinations of tubes that could be re-forged directly from different-size fired-out guns brought back from the field. In the case of the 8-inch M2A2, tube length and diameter showed a potential for yielding two new 105mm M68 tubes after rotary forging.

To test the theory in practice, several scrap 8-inch M2A2 tubes were brought back to the Arsenal from depot graveyards. Gun bores are first cleaned to remove the rifling and any firing damage. Next, some minor machining is done on the outer surface and each tube is cut into three sections—one to be discarded, two to be re-forged into new tubes. Each 8-inch M2A2 scrap tube can produce either two 105mm M68 forgings or two 155mm M185 forgings.

According to Calderone, the potential savings from recycling scrap tubes can add up to millions of dollars. For example, a conventional 105mm M68 forging costs about $3,200 versus a cost of about $1,200 for rotary forging from a scrap tube—representing an estimated savings of about $2,000 per gun.

In another project calculated to save about 60 percent of the cost of producing a breech mechanism for the new 8-inch M201 howitzer, Product Assurance Directorate and Benet Weapons Lab engineers have worked out a proposal to recycle 8-inch M2A2 breech rings and other small breech components. Through a minimum amount of machining, a scrap M2A2 ring can be made into a new ring for the M201 howitzer.

By recycling the M2A2 ring, Watervliet can save both the cost of buying a new breech ring forging and the cost of start-to-finish machining—a savings that PAD puts at almost $5,000 per breech. With more than 400 M2A2 breeches already received at Letterkenny Army Depot and now in various stages of disassembly, the potential savings reportedly add up to a healthy sum.

A third project at Watervliet involves machining a bushing from a 12-inch piece of steel cut from the breech end of the M201 tube. The piece, which is needed to guide the swage mandrel into the gun bore and as a locking groove for lifting clamps, was previously discarded as scrap. However, by cutting step threads and machining the piece, it can be reclaimed as a bushing for the recycled 8-inch M2A2 breech ring assembly, another $1,000 per unit.

CSL Developing New Chemical Protective Mask

Initiation of an intensive effort to develop a new chemical-biological protective mask has been announced by the U.S. Army Armament R&D Command's Chemical Systems Laboratory, Aberdeen Proving Ground.

The mask is being developed for use by all the Armed Services. When fielded, it will replace the current inventory of protective devices.

Designated the XM30, the new mask provides respiratory, eye and face protection against chemical and biological agents. It consists of a molded elastomer facepiece with an in-turned peripheral seal and a large flexible lens bonded to the facepiece.

Canada is assuming responsibility for developing the mask's new canister. According to Mr. Jim Cauller, the CSL development management officer, one of the mask's features is that the Canadian developed canister can be worn on either cheek.

"It's an external canister that can be easily attached to either side of the mask, and this will enable the seven or eight percent of military personnel who are left handed to use shoulder fired weapons without a special mask," says Cauller.

The Army's current protective mask, the M17A1 has a filler in both cheeks, making it difficult to properly sight the Army's M 16 rifle.

"Another feature of the mask," Cauller added, "is a flexible wide angle lens for coupling with field instruments and sighting devices on modern sophisticated weapons."

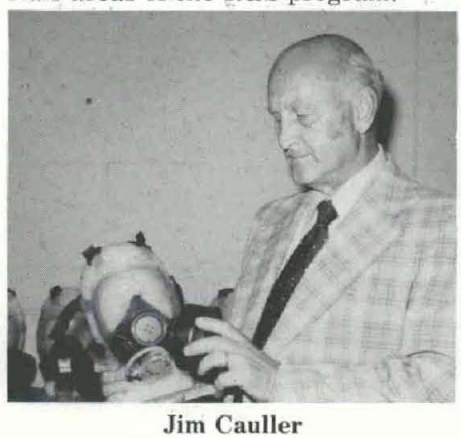
The mask will be produced in small, medium and large sizes to accommodate male and female personnel and assure a rapid donning capability.

Other features include a dual voice-mitter system as well as systems for drinking and providing mouth-to-mouth resuscitation. For aircraft and tank applications, where a chest-mounted canister is required, a hose assembly is provided.

Cauller was assigned to the Tooele Army Depot, UT, as director of the Army's Chemical Agent Munitions Disposal System, prior to heading the new mask development program in CSL's Physical Protection Division.

He is backed up in the current development program by Mr. John Franz, a chemical engineer who is serving as the program's assistant for development; Mr. Frank A. Martin, an industrial engineer as assistant for producibility and logistics; and by Mr. Max Negler, a veteran engineering technician who has made numerous contributions to the Army's protective mask R&D programs.

Mr. John Boardway, Mr. John Scavnicky and Mr. Josiah Mok have been assigned as development engineers for the respective canister, facepiece and components, and materials areas of the R&S program.



Jim Cauller

ETL Announces Production of 99 PAD Systems

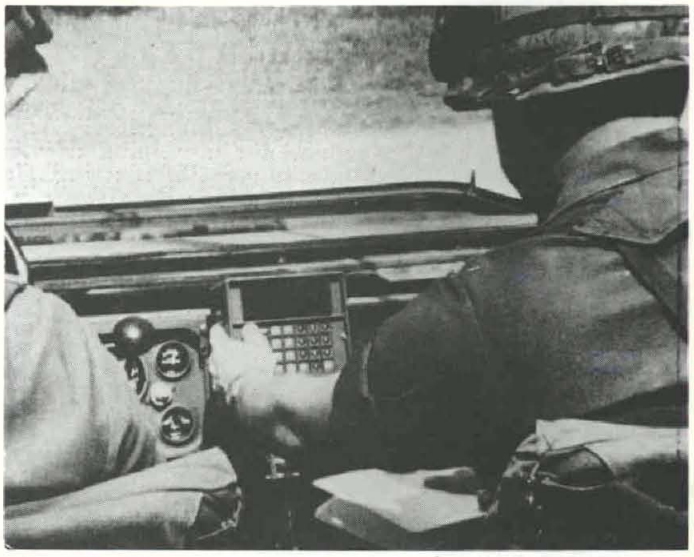
Litton Guidance and Control Systems will manufacture 99 automated inertial survey systems for the field artillery over the next three years, according to a recent announcement by the U.S. Army Engineer Topographic Labs (ETL), Fort Belvoir, VA.

Called the Position and Azimuth Determining System (PADS), the new hardware was developed by Litton under contract to ETL. In operational testing, PADS reportedly proved capable of surveying 84 percent faster than conventional artillery survey equipment.

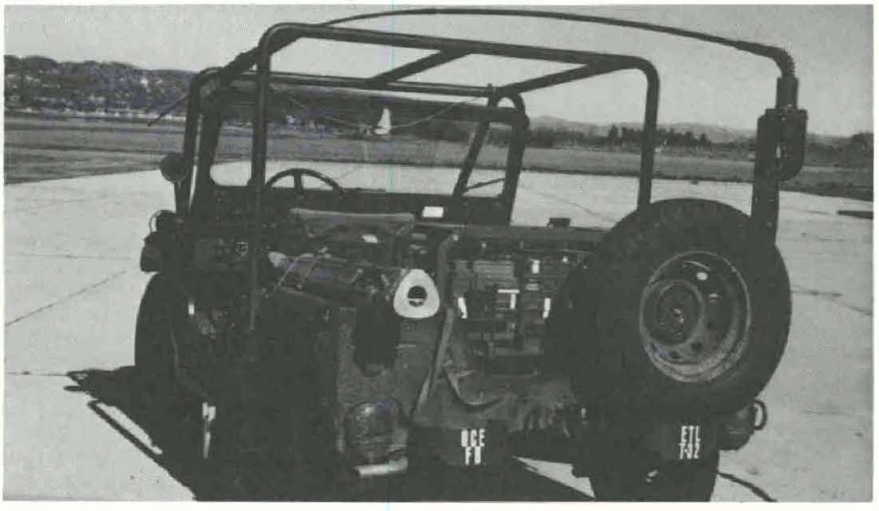
PADS also reduces the manpower required for a survey mission from seven surveyors to two. Carried in a Jeep or helicopter and controlled by one operator and a driver or pilot, PADS provides the vehicle's position, elevation, and azimuth at the push of a button.

Artillery surveyors are said to need PADS' high speed to support highly mobile missile and cannon batteries. These units may be required to change positions as often as eight times in 24 hours.

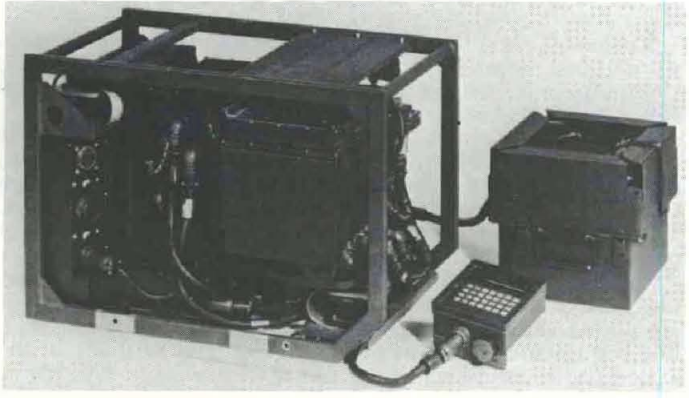
PADS also can provide a common grid needed by battalion and division commanders for massing fire accurately on one target from several batteries.



PADS OPERATOR gives position coordinates from computer in rear of jeep.



Jeep equipped with PADS. The control/display unit is barely visible at the right of the driver's seat; primary pallet and auxiliary batteries are contained in the rear of the jeep.



PADS major components include primary pallet (left), control/display unit (center) and secondary pallet with auxiliary batteries (right).

A river or mountain is no obstacle to PADS. Two soldiers can remove PADS from a jeep and put it into a light observation helicopter without loss of survey, as the PADS power source takes over from the vehicle's power source. Unlike conventional survey equipment, PADS can operate in fair or foul weather, day or night.

Project Engineer Fred Gloeckler says, "today's artillery will certainly benefit from the versatile survey capability, the improved first-round effectiveness, and the fast reaction time that PADS can offer."

Close coordination between the Engineer Topographic Laboratories and the field artillery marked the development and testing of PADS. As a result, PADS met or exceeded all standards of the required operational capability for the system.

Capsules. . .

CSL Developing XM81 Training Device

Army engineers and technicians at the Armament R&D Command's Chemical Systems Laboratory, APG, MD, have come up with a concept for developing a device that will soon provide American field forces with the means for properly training personnel on the Army's M8 Automatic Chemical Agent Alarm (ACAA) system.

Officials of the Army Chemical and Ordance Center and School initially recognized the need for a device that could be remotely activated to simulate agent cloud travel and provide realistic field conditions during training exercises.

Specifically, they were asking for a training device that could be remotely activated by a hand-held battery operated radio transmitter while field training operations associated with the M8 alarm were in progress.

Developers at Chemical Systems Laboratory's CB Detection and Alarms Division feel the simulator detector unit is the answer to this training requirement, pointing out that the concept calls for one simulator to be used in conjunction with four alarms deployed in a tactical situation and that a chemical attack can be simulated by selectively activating the alarms by a radio signal.

Designated the XM81, the training device is currently in exploratory development in the point sampling section of the Chemical Systems Laboratory (CSL) Chemical Detection and Alarms Branch.

When fielded, it will be used worldwide to train military personnel in how the M8 alarm as well as other defense equipment is integrated in a field situation and how individual pieces of equipment interact together to provide total chemical protection.

The device will be used to support TRADOC schools as well as post and division level NBC schools, in unit training, and at the Army in Europe NBC defense schools.

According to Mr. T. L. Strozyk, the project officer, the program will soon enter engineering development with type classification expected in Fiscal Year 1981.

G-76 Generator Nears Completion

An accelerated program to design and develop an improved hand-cranked electrical generator for military use is nearing completion at the U.S. Army Electronics Research and Development Command's Harry Diamond Laboratories (HDL).

The Army Institute for Military Assistance, in support of the Project Manager, Army Tactical Communications Systems, had requested that HDL engineers develop the G-76 generator to rapidly recharge field batteries and to power field radios such as those used by the Army's Special Forces.

Because the G-76 generator fulfills electronic back-up system requirements ancilliary to nuclear weapons, the Project Manager, Nuclear Weapons, Dover, NJ, also became a supporter of the program.

Although hand-cranked generators have been around for a long time, today's technologically advanced field equipment demands greater auxiliary power than is currently available.

Development specifications required that the generator be compact, reliable, lightweight, durable, and air drop sustainable, with replacement parts designed for easy installation.

The G-76 has three major components—alternator head, electronic box, and stand—and two separate voltage outputs. One output provides 0 to 30V, with the voltage regulated to cut off at 30V, and actual voltage dependent on cranking speed and load.

The other output starts at 30V and is unregulated. Maximum current is 8 amperes. Other voltage variations can be obtained by minimal modifications.

This generator uses an alternator having a samarium cobalt magnet rotor. These high-energy magnets allow the alternator to generate 200W at a rotational speed of approximately 7,000 rpm which is much higher than currently fielded units.

Total weight of the G-76 is only 13.4 pounds versus 22 pounds for those now in use.

Generator reliability is reportedly high. The required mean time between failure (MTBF) was set at 750 hours of operation. Reliability demonstration tests proved an MTFB of 1,100 hours and the generators were still "going strong" at the end of the scheduled test.

All phases of developmental and operational testing, including parachute drops, are now complete. The contractor technical data package has also been prepared and it is anticipated that a production contract will be placed in June 1980, with generators fielded in mid-1981.

The U.S. Marine Corps and Swedish Armed Forces have also expressed great interest in the G-76 and have purchased units which they are currently evaluating.

Missile Tractor Tests Concluded

The second of a series of tests to learn how well infrared sensors can detect and track incoming intercontinental ballistic missile warheads has been conducted successfully over the Central Pacific Ocean by the Army's Ballistic Missile Defense (BMD) Program.

During the test of the BMD Advanced Technology Center's Designating Optical Tracker (DOT), an infrared telescope was carried to the outer edge of the atmosphere in a rocket-powered vehicle fired from Kwajalein Atoll. The telescope located a target complex carried by a Minuteman III ICBM launched from Vandenberg Air Force Base, CA.

The target's trajectory was tracked and a significant amount of scientific data was recorded. The vehicle carrying the telescope was then parachuted into the ocean for recovery by a U.S. Navy detechment.

The rocket and its payload were sent aloft by Boeing Aerospace Co.'s Army Systems organization as part of the company's Designating Optical Tracker contract with the BMD Advanced Technology Center, Huntsville, AL. As prime contractor, Boeing builds the sensor vehicles and prepares them for flight, conducts the flight tests, and analyzes data obtained from the flights.

Other companies supporting the DOT program include Hughes Aircraft Co. for the sensor, Teledyne Systems for attitude control and flight computer, and the Brunswick Corp. for booster integration.

The DOT work is part of the Army's BMD Advanced Technology program to study various methods for defending the United States against attack by intercontinental ballistic missiles.

RTL Contracts Exceed $2.5 Million

Research, development, test and evaluation contracts announced recently by the U.S. Army Aviation R&D Command's Research and Technology Laboratories, Moffett Field, CA, total more than $2.5 million.

The largest award, a 31-month $2,350,000 contract, is with Sikorsky Aircraft Division, United Technologies to develop technology for a molded composite rear fuselage transition section for the UH-60 Black Hawk Helicopter. The fuselage will be lighter and cheaper than the current one.

Mr. Dan Good, project engineer, stated that the fuselage will also be interchangeable with the Black Hawk's. He added that use of composite materials will reduce labor requirements because of the reduced number of detailed parts, subassemblies and fasteners.

Contracts for combat maintenance concepts and repair techniques for helicopters were awarded to Kaman Aerospace Corp. ($99,953) and Sikorsky Aircraft Division, United Technologies ($9,000). Work will include a study of

potential ballistic damage to helicopters, development of damage assessment/inspection techniques, and a review of new field repair concepts.

Meterology Research, Inc., under a 9-month $78,003 contract, will evaluate several promising ice phobic coatings for helicopter rotor blade protection. Spectrometer probes have already been installed on a modified JUH-1H helicopter to help analyze the effectiveness of anti-ice coatings.

Under a 6-month $64,500 contract, Advanced Aeromechanisms Corp. will conduct a span flap study to improve the performance of Army fixed wing reconnaissance aircraft. A span flap is a mechanical device to increase the wing span of an aircraft while in flight.

HEL Tests Fatigue Replacements

A replacement for the women's fatigue uniform is being tested at the U.S. Army Human Engineering Laboratory (HEL), Aberdeen (MD) Proving Ground, in cooperation with the Army Natick (MA) Research and Development Command.

HEL is evaluating the size and fit of two candidate replacements. Both are identical to look at but have vast differences in size and fit.

Dr. Arthur A. Woodward, project test director for the program, said the new women's uniform is a spin-off of the new battle dress ensemble now being produced for male soldiers.

HEL is studying whether the Army should extend the sizes of the male battle dress to accommodate women or to produce an entirely new line of sizes for females. The style of the new battle dress uniform differs significantly from the fatigues now issued to women.

Scheduled for issue in 1982, the new uniform will be made of a 50 percent cotton, 50 percent nylon material, and instead of olive drab green, it will be the standard battle dress tri-color camouflage.

Side button style fatigue trousers will be replaced with a front button close, and a "snug strap" has been added for a tighter fitting waist. Accordion pockets are also a new feature, along with reinforced elbows, knees and seat.

Fifty women are involved in the testing of the two candidate uniforms. The test is specially designed to ferret out problem areas in the cut and fit of both candidate uniforms before they go into mass production.

At the end of the six week test, the compiled data will be forwarded to the Army Natick Research and Development Command for further evaluation.

APG Evaluating British Support Boat

The Aberdeen Proving Ground Materiel Testing Directorate is evaluating a British Combat Support Boat (CSB) for possible use by the American Army. MTD is testing the craft's ability to serve as a Ribbon Bridge Erection Boat.

The Army established a requirement for this type of craft in 1972, and MTD has tested all candidates to determine a suitable boat, according to Mr. Peter Kamenik, senior test director. The British Army is in the process of purchasing the boats.

Development testing of the bridge itself was concluded at APG in the fall of 1975, and the structure has been deployed for use by Army units in Germany and Korea. The Army is looking for boats to be used with bridge sections.

The British CSB is designed to support bridging and amphibious operations. "We're primarily interested in bridging support," Kamenik said. "The boat may also be used as a general purpose work boat."

MTD will test the boats in "slow water." They will then be taken to the Granite City Army Installation, IL, for "fast water" testing.

Kamenik said testing is divided into individual boat operations testing, and how the boats operate in conjunction with the Ribbon Bridge and with crafts. The tests are part of the International Materiel Evaluation Program supervised by the U.S. Army Test and Evaluation Command.

The British CSB moves by water jet propulsion. It has twin Saber marine 212 turbo-charged diesel engines, each rated at 180 horsepower. It is propelled by two 300mm hydrojets.

The craft is 8.2 meters (26.9 feet) long, has a beam of 2.5 meters (8.2 feet) and a draft of .56 meters (22 inches). It weighs 4,000 kilograms (8,818 pounds) with full fuel tanks, and has a demonstrated thrust of 16 kilo newtons (3,600 lbs. of force) in forward and 9 kilo newtons (2,000 lbs. of force) in reverse.

While at APG, the boats will undergo technical and functional performance testing. Technical performance testing will gauge maneuverability, speed, turning radius, thrust, endurance, and stability of the boat by itself.

In functional performance testing, the crafts are used to assemble and disassemble a Ribbon Bridge. They will also propel sections of the structure into place, propel rafts, carry bridge accessories, and deploy the anchoring system. They can also be used to transport troops and materiel.

Each boat normally carries a 3-man crew composed of an operator and two assistant operators. A Ribbon Bridge company has nine boats, each of which is transported individually by truck.

Air Force Assists in Patriot Testing

Air Force jet fighters have swarmed over the sprawling White Sands (NM) Missile Range since early January 1980 in tests involving Patriot, the Army's newest air defense system.

In what has been described as the largest operation of its kind at this National Range, up to 50 Air Force fighters were used during large scale operations. The tests, according to MG Oliver D. Street, Patriot project manager, were designed to demonstrate troop proficiency in operating the Patriot system against large numbers of aircraft.

Personnel from Army Air Defense Center, Fort Bliss, TX, and WSMR's Army Materiel Test and Evaluation Directorate (ARMTE) formed a test battalion to demonstrate man/machine interface in air defense operations.

Patriot, the Army's air defense system of the 1980s, has undergone extensive testing at White Sands Missile Range and is now in preproduction operational testing.

According to Mr. George Clegg, ARMTE's project engineer, the test is believed to be the largest of its kind in terms of aircraft used to test Army missile systems at White Sands.

Aircraft were provided through the 12th Air Force, based at Austin, TX. Holloman Air Force Base's 49th Tactical Fighter Wing and its 479th Tactical Training Wing provided F-15s and T-38s.

The 27th Tactical Fighter Wing, based at Cannon AFB, near Clovis, NM, flew F-111s, while the 388th TFW from Hill AFB, UT, and the 474th TFW, Nellis AFB, NV, provided F-4 aircraft. The Air National Guard's 150th Tactical Fighter Group, based at Kirtland AFB, NM, flew A-7 aircraft during the tracking tests.

Campbell Soldiers Test Black Hawk

Using an Air Force C-5 transport aircraft, soldiers of the 101st (Air Assault) Airborne Division at Fort Campbell, KY, successfully tested the air transportability features of the Black Hawk during a recent simulated deployment exercise.

A team comprised of six soldiers, alerted only a short time before the exercise began, took approximately one hour and 45 minutes to prepare each helicopter for air transport and another two hours and 45 minutes to completely load the helicopters aboard the C-5.

Another purpose of the exercise was to provide the soldier team with experience in breaking down, loading, unloading and reassembling the aircraft to flyable statue and to a combat ready condition. To prepare the helicopters for shipment aboard the C-5, principal tasks included folding the main rotor blades, folding the tail rotor blades, and the removal of the stabilator.

The 101st Division Black Hawk team first loaded five of the helicopters aboard the transport aircraft, simulated their deployment and then reloaded the original five plus another one making a total of 11.

CPT William Zanow, commander of the exercise said "it was a good test for the soldier team who did very well for the first such exercise." He also noted "the soldiers remained in good spirits despite the long hours involved."

Ribbon Bridge Upgrade Tests End

Almost two months of near round-the-clock upgrade testing of the class 60 ribbon bridge at APG to determine if the Army's standard class 60 bridge can be upgraded to do class 70 work has ended, with the results termed generally successful. However, immediate results have been mixed, Materiel Testing Directorate (MTD) officials said at the conclusion of the tests.

A class 60 bridge is generally one that can support 60 tons of weight on its sections. A class 70 bridge should support about 70 tons. Testing revolved around putting a class 60 bridge in place across a pond and running heavy tanks and other vehicles and loads over it 5,000 times.

"What we've been doing with this project is trying to establish whether this type of class 60 bridge can be used in a higher class role. We did some strain gauge work and ran the crossings to test for stress and wear," said Mr. Ed Mahan, civilian bridge test director. There had been some minor failures in the tests, "but that is to be expected."

Mahan said information gained from the tests is being evaluated locally and at the Army's Mobility Equipment R&D Command. "We're finished here with our testing. The next state of testing will be the fast water tests MERADCOM will do on the Mississippi River later this year," Mahan said.

Hand Device Alerts Troops to Toxins

Designated the XM207, an illuminated, audible, chemical attack signal—designed to alert troops to the presence of toxic chemicals—is in the engineering development stage in the Munitions Development Branch at the U.S. Army Armament R&D Command's Chemical Systems Laboratory, Aberdeen Proving Ground, MD.

A hand-held cylindrical self-contained munition, the device is hand fired by hitting a cap containing a firing pin against a percussion primer. This action ignites a rocket that ascends to more than 500 feet (152 meters) where it ejects a payload consisting of a pyrotechnic whistle as well as a cluster of three pyrotechnic stars, two white and one red.

Field troops are alerted to a chemical attack by either the audible signal or by the cluster of stars resembling a spectacular fireworks display, or a combination of both.

Mr. Mitchell Penn, a CSL chemist heads the developing team that includes Mr. Cecil Hassell, a chemist, and Ms. Mary Kraybill, a chemical engineer.

Penn said current plans call for each military field company to carry eight XM207 rounds. The signal munition is expected to be fielded in 1984.

Black Hawk Undergoes Tropic Tests

The U.S. Army's Black Hawk UH-60A Utility and Troop Transport Helicopter #715 has arrived at the U.S. Army Tropic Test Center (USATTC) Corozal, for seven months of testing under the most punishing jungle conditions.

The test will be conducted by personnel from the U.S. Army Aviation Research and Development Command (AVRADCOM), St. Louis, MO, in coordination with USATTC. The aircraft will be evaluated for high performance in a steaming tropical environment with a minimum of maintenance support.

The Black Hawk can carry 11 fully equipped combat troops and a crew of three. It cruises at speeds in excess of 145 knots. It is designed to operate with little maintenance as compared to current helicopters in the Army inventory, resulting in lower life cycle cost.

When initial testing has been completed, Black Hawk will be flown to USATTC's test area for four months of exposure testing after which final flight testing will be accomplished. Built by Sikorsky Aircraft of Stratford, CT, the Black Hawk is scheduled to replace the Army's long-serving UH-1 Hueys during the 1980s.

Conferences & Symposia . . .

White House Conference Aids Availability of Information

The availability of unclassified Army RDA literature may be enhanced as the result of a recent conference.

In 1908 Theodore Roosevelt convened the first White House Conference on a subject of conservation and natural resources. Since then, 60 White House conferences have convened, however, few have had the impact on public policy as is expected from the most recent one held 15–19 Nov. 1979 on "Library and Information Services."

This conference, first proposed in 1957, was nurtured in the library and information circles and received active support from Presidents Johnson, Nixon, Ford and Carter. In 1974 a joint resolution was signed into Public Law 93-568 which set forth the goal: "To develop recommendations for the further improvement of the nations libraries and information centers and their use by the public" consistent with seven policies set forth in the law:

1. Access to information and ideas. 2. The preservation and the dissemination of information. 3. The growth and augmentation of the nation's libraries and information centers. 4. New achievements in technology. 5. Use of advanced technology by libraries and information centers. 6. The National Commission plans for meeting national needs for library and information services. 7. Expanding access to libraries and information centers will require public understanding and support.

For the past two years pre-White House conferences, were held at the regional level, and were attended by as many as 100,000 people. These resulted in the selection of over 700 delegates, alternates, and observers from the 50 states, six territories, Indian reservations and the District of Columbia to attend the White House Conference.

Two-thirds of the participants at the pre- and final conferences were, lay citizens, users and potential users of library and information services and one-third were from the library and information science community.

The President's opening address was followed by presentations and discussions of five major conference themes: 1. Meeting Personal Needs. 2. Enhancing Lifelong Learning. 3. Improving Organizations and the Professions. 4. Effectively Governing Our Society. 5. Increasing International Understanding and Cooperation.

The delegates, alternates and observers discussed these themes in 34 workshop sessions. These sessions resulted in numerous resolutions which were presented at the final plenary session, were voted upon by the entire delegation and were reduced to 17 final resolutions. These resolutions plus 16 petitions independently submitted will represent the product of the conference to be submitted to the President. The President will present a report to the Congress within 120 days.

The last session of the conference was a joint congressional hearing cochaired by Senator Claiborne Pell and Representative William Ford, who are chairmen of the Senate and House Subcommittees that have jurisdiction over most federal library and information services.

Some of the issues and resolutions of the White House conference which relate to the Army's research and development address: Access to government publications,

develop a National Information Policy, preservation of library and information resources, and adoption of national and international standards (publishing, producing, organization, storing and transmitting information).

Mr. Edward J. Kolb at HQ DARCOM is the Army's principal technical information officer, and is responsible for management of Program Element 6.58.03 Technical Information Activities, for improving technical information access and flow, and for the policy and technical coordination of all of the Army's technical libraries.

He was a staff member of the White House Conference on Libraries and Information Services, and in that role coordinated the "facilitators" of the 34 simultaneous workshops, and assisted in staffing the delegations sessions. Questions on the Army program involving the technical Libraries and Information Services should be addressed to Mr. Kolb, telephone: AC 202 274-9828, or Autovon 284-9828.

Natick Hosts Clothing/Equipment Meet

More than 150 representatives of the combat arms of each of the four services met recently with clothing and personal equipment developers at the U.S. Army Natick (MA) Research and Development Command to determine needs of the combat soldier in cold environments.

During the 3-day conference, troop experiences in cold weather activities were related by Army, Navy, Air Force and Marine Corps field commanders and included several recommendations for changes in equipment design and utilization.

Prior to the conferees adjourning into three individual workshop sessions on clothing, footwear, personal and oversnow equipment and then reconvening into a summary session, three major presentations were heard.

Mr. John V. E. Hansen, director of Natick's Clothing, Equipment and Materials Engineering Laboratory (CEMEL), discussed the current developmental aims of his laboratory. Mr. George Assai and Ms. Rosalie Boynton, Army Foreign Science and Technology Center, presented their assessment of cold weather operations and cold weather clothing used by a potential threat nation.

The comments and recommendations emanating from the 3-day session, chaired by Mr. Leonard Campbell, chief, Clothing Branch, CEMEL, will form the basis of both a short term and long range development technical plan for cold weather (wet and dry) clothing and equipment.

HDL Will Host Smoke Symposium IV

COL Samuel L. Eure, project manager for Smoke/Obscurants at Aberdeen (MD) Proving Ground, has announced scheduling of Smoke Symposium IV at Harry Diamond Laboratories, Adelphi, MD, 22–23 April 1980. Primary goal of the symposium will be to present papers and conduct discussions within the obscurant/electro-optical community.

The meeting will include dissemination of information gathered by field and laboratory testing, modeling, research and development, training, tactics and doctrine, and smoke toxicology. Papers are being solicited from government, contractor and academic communities.

The tentative agenda will cover: modeling; testing, instrumentation, and methodology; smoke/obscurant technology and hardware development; doctrine and training, concepts and systems evaluation; and, health hazard assessment of smoke.

The symposium will be classified Confidential. Attendees should forward security clearances, referencing Smoke Symposium IV to Project Manager, Smoke/Obscurants, ATTN: DRCPM-SMK-T/MAJ Golly, Aberdeen Proving Ground, MD 21005. Additional information can be obtained from Project Manager, Smoke/Obscurants by calling Autovon 283-5411/5605 (Mr. W. Klimek or MAJ L. Golly).

Awards . . .

Operation Cherry Blossom Winners Return From 9-Day Visit to Tokyo

OPERATION CHERRY BLOSSOM winners, Elisabeth Bryenton and David Dvorak flank Japan Student Science Award winner Kaoru Wada, during ceremonies in Tokyo, at which about 400 Japanese students were recognized for their high school science projects.

Elizabeth A. Bryenton and David J. Dvorak, returned home recently, after a 9-day visit to Japan where they represented the United States at the 23d Annual Japan Student Science Awards Program in Tokyo.

The two were guests of honor during the awards ceremonies at which about 400 Japanese students were recognized for their high school science projects. The young Midwestern students also met and talked with the Prince and Princess Hitachi during the ceremonies.

Miss Bryenton of Fairview Park, OH, was selected winner of the "Operation Cherry Blossom" trip by a panel of Army judges at the 30th International Science and Engineering Fair (ISEF) held last year at San Antonio, TX.

Now a freshman at Princeton University, she spent four and a half years researching her project "The Effect of Natural Nitrogen Fixation Through Algal Inoculants on Plant Growth and Development." The exhibit demonstrated that treatment of various plants and grain crops with an algal inoculant was found to produce results at least equal to, and in many cases better than, those obtained with synthetic nitrogen compounds that require large amounts of petroleum.

Dvorak, now a freshman at the Rose-Hulman Institute of Technology in Terre Haute, IN, was chosen by a separate screening process by the Navy as their representative to the awards program.

The Army has been participating in Operation Cherry Blossom since 1963, when it was initiated in cooperation with the Japanese Newspaper *Yomiuri Shimbun*, as part of an effort to stimulate, encourage and reward exceptionally talented high school students in physical and life science fields. The Association of the U.S. Army contributes $100 to the Army winner of the trip.

In addition to participation in the Japanese Student Science Fair Awards Ceremonies, on a non-competitive basis, the itinerary included a visit to the Telecommunications Science Hall and the National Institute of Agricultural Science in Tokyo. At the American Embassy, the visitors met with Mr. J. L. Bloom, counsellor for Scientific and Technological Affairs, and Dr. Leon H. Fisher, senior scientist of the Office of Naval Research Scientific Liaison Group.

They also paid a courtesy call on BG Joseph H. Kastner, Chief of Staff, U.S. Army Japan (USARJ), and LTC Joseph E. Burlas, chief of the Public Affairs Office, USARJ, which coordinated and arranged their visit.

Following Tokyo area visits, the students spent three

days in Kyoto and stopped in Hawaii where they toured points of interest before returning home.

Both ISEF winners of Operation Cherry Blossom felt the trip to be a most memorable and educational one. "I learned that even though Japanese may do things differently than Americans, they have a very efficient and workable society," Miss Bryenton summarized. "For example, a bow is not a customary greeting for us, however, neither is a handshake for the Japanese. I've also discovered that there doesn't have to be a certain gesture or language spoken to communicate. Almost anything can be accomplished through a universal expression, a smile."

U.S. Army participation in the ISEF is arranged by the U.S. Army Research Office, Research Triangle Park, NC. Anne G. Taylor was ARO action officer; Mr. James P. Williams Jr., ARO, was escort for the student's visit to Japan.

Career Programs . . .

NRL to Present Software Course

The Naval Research Laboratory will present a 2-week course on "Software Engineering Principles" 14–25 July 1980. The course will be given at the U.S. Naval Academy, Annapolis, MD.

The course will concentrate on technical problems of software design. Topics to be covered include program families, formal specifications, responses to undesired events, documentation, and cooperating sequential processes.

All DOD civilian and military personnel involved in the acquisition or development of software are eligible. The course is unclassified.

Applicants should have a basic knowledge of DOD software problems and policies, and be familiar with FORTRAN or some other programing language such as PL/I or COBOL.

Course enrollment is limited to 50 students. There will be a $300–$400 registration fee and a $35 activities fee. Persons interested should contact Mr. Louis Chmura, Code 7503, Naval Research Lab, Washington, DC 20375, telephone (202) 297-3249 or Autovon 297-3249; or Ms. Janet Stroup, same address, telephone (202) 767-3212 or Autovon 297-3212.

Personnel Actions . . .

Johnson Joins ATACS PM Office

The U.S. Army Communications Research and Development Command has announced the appointment of Mr. Walter E. Johnson as deputy project manager for Army Tactical Communications Systems (ATACS).

Johnson was previously assigned to Systems Division, Joint Tactical Communications (TRI-TAC) Office as team leader for the definition of portions of the TRI-TAC Systems architecture for Tactical Switched Communications Systems. His responsibility included the surface Trunk Transmission Subsystem, the Ancillary Subsystems and the TRI-TAC system specification.

Johnson also served as TRI-TAC representative on several committees, including the Networks Working Group of the Committee for Interoperability of DOD Telecommunications, the JINTACCS Data/Communications Technical Coordination Committee (DCTCC) and the ECOM Equal Employment Opportunity Advisory Committee.

Johnson began his civilian service with Field Engineering Division, Procurement and Maintenance Directorate of the Signal Corps Engineering Laboratories as a contracting officers technical representative on production contracts for radio test equipment.

Other assignments have included project engineer, COMSEC Division, COMM/ADP Laboratories; program manager in the Avionics Commodity Office, ECOM, and later as data manager in the Configuration Management Division, Joint Engineering Agency, Mallard Project until its termination in 1970.

He has a bachelor's degree in electrical engineering from Howard University, and he has also attended numerous DOD sponsored technical and managerial courses including the Defense Weapons Systems Management Course and Personnel Management for Executives.

Diedrichsen Directs SE&I Center

Loren D Diedrichsen

Mr. Loren D. Diedrichsen has been appointed director of the Army Communication R&D Command's Center for Systems Engineering and Integration. He will serve as technical advisor on systems engineering technology.

Diedrichsen was formerly assigned as chief, Systems Division, Joint Tactical Communications (TRI-TAC) Office, DOD, and as chairman of the Technical Support Staff of the Committee on Interoperability of DOD Telecommunications.

He began his professional career as an electronics engineer in the Communications Department of the Army Signal Research and Development Laboratory. He later served as the Army member of the DCA Technical Panel for the Overseas AUTOVON Program.

In 1967, he was named director, Systems Engineering Division, Program Manager's Office, Mallard Project and served as chairman of the Systems Aspects area of the Mallard International System Selection Board. He was also chief of the Systems Design Division, International Joint Engineering Agency of the Mallard Project.

Diedrichsen holds a bachelor's degree in electrical engineering from Iowa State University, and a master's degree in operations research from Stevens Institute of Technology. He has received an Exceptional Civilian Service award and two MCS awards.

Reader's Guide . . .

Cold Regions Bibliography Available

The Bibliography on Cold Regions Science and Technology, published by the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) Hanover, NH, is now available through an on-line computer retrieval system.

The retrieval services are available to the general public by on-line computer from the Systems Development Corp., Santa Monica, CA. The Cold Regions Bibliography may be accessed on-line by keywords, authors, titles, or accession number.

The bibliography, prepared by the Science and Technology Division, Library of Congress, is recognized as a foremost source of worldwide literature on snow, ice and frozen ground, and their relationships to engineering, navigation, behavior and operations of materials and equipment and transportation.

The Bibliography has been published since 1951, originally by the Snow, Ice and Permafrost Research Establishment, a predecessor organization of CRREL. Over 4,000 entries are added annually to the publication.

The retrieval system contains all entries in the Bibliography since 1968 (Volume 23). In addition, entries from the Antarctic Bibliography, published by the National Science Foundation, from 1962 (Volume 1) are included. For more information on access to the system contact Systems Development Corp., 2500 Colorado Ave., Santa Monica, CA 90406.

Summary of Selected RDTE Systems Planned for FY 1981

The following is a summary list of selected FY81 RDTE systems, the funds requested to carry out these programs, and a brief description of work to be performed. The list appeared in a Statement to the Congress on the FY81 Army RDTE and Procurement Appropriations by Assistant Secretary of the Army (RDA) Dr. Percy A. Pierre and Army Deputy Chief of Staff for RDA LTG Donald R. Keith.

FY 81 Planned Program: Selected RDTE Systems

System	Budget Request ($ in Millions)	Capsule Summary of Work to be Performed
Advanced Attack Helicopter	171.6	Contractor and Government testing continues culminating in OTII. Long lead time item contract award in Feb 81. Production decision in Dec. 81.
AH-1S Cobra/TOW	9.1	Begin full scale ED to add FLIR capability to gunners sight.
Army Helicopter Improvement Program	5.0	Perform risk reduction analysis of air-frame modification and develop preliminary designs for system integration. Release RFP for air-frame modifications.
ATGM Improvements	21.2	Conduct demonstration of technical alternatives for flight test in FY 82.
CH-47 Modernization	.6	Complete PEP effort to assure effective producibility.
Chaparral	20.6	Complete FLIR development. Begin development of improved guidance based on POST concept.
Copperhead	6.0	Begin warhead enhancement program. Complete targeting to provide TACFIRE programming data.
Corps Support Weapon System	7.6	Flight test of total endgame will be conducted under DARPA technology demonstration program. Preparation for ASARC/DSARC.
DIVAD Gun	64.7	ASARC/DSARC production decision requested.
Fire Support Team Vehicle (FISTV)	8.1	Complete integration of GLLD and north-seeking gyro into vehicle. Fabricate six prototypes.
General Support Rocket System	64.2	Complete design update; start maturation development tests.
Guardrail	3.9	Complete prototyping of one unit set with two aircraft.
Hellfire	54.8	Complete developmental tests and tech data package; award contract for IPF and prepare for Milestone III decision. Complete Black Hawk Hellfire demonstration. Start ED on fire-and-forget seeker.
High Survivability Test Vehicle—Lightweight (HSTVL)	7.7 (Army share)	HIMAG and HSTVL System tests will be completed and a final report will be prepared.
Infantry Fighting Vehicle/Cavalry Fighting Vehicle	41.9	Continue development of training devices, test measurement and diagnostic equipment and logistic support.
Patrolt	51.6	Testing of support concepts and tests of first production units will be initiated.
Pershing II	146.0	Procurement and fabrication of prototype hardware for DT/OT II will continue. Fabrication of seven prototype RV's.
Position Locating Reporting System	12.0 (Army) share)	Complete development; initiate testing.
Remotely Piloted Vehicles	54.2	Complete design. Critical design review. Fabrication of hardware and software. Complete initial system and integrate contractor hardware.
US Roland	12.6	Complete classroom trainer; develop maintenance training simulator. Hold DSARC III B.
Stand Off Target Acquisition System (SOTAS)	55.0	Integrate subsystems (airborne radar, data link, ground stations). Initiate DT II.
Stinger	9.9	Complete Stinger-POST ED and DT/OT II.
TOW	20.8	Continue development of 6" warhead and launcher and missile modifications.
Viper	5.8	Hold In-Process review to obtain limited production approval.
XM1	51.3	Complete DTIII; continue ILS maturity program; conduct ASARC/DSARC IIIA for full production and deployment decision.

A detailed description of these and all other Army RDTE programs is contained in the Congressional Descriptive Summaries.

Total RDTE FY 81 Budget Request:
$3.233 Billion

DEPARTMENT OF THE ARMY

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U.S. Army Materiel Development & Readiness Command
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OFFICIAL BUSINESS

POSTAGE AND FEES PAID
DEPARTMENT OF THE ARMY
DoD-314

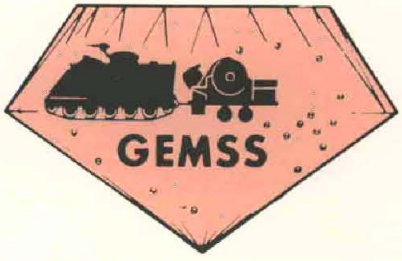
CONTROLLED CIRCULATION RATE

RAAM

(Remote AntiArmor Mine)

ADAM

(Area Denial Artillery Munition)



(Ground Emplaced Mine Scattering System)

FASCAM

FAMILY OF SCATTERABLE MINES

mopms
mopms
mopms

(Modular Pack Mine System)

MINE SYSTEM