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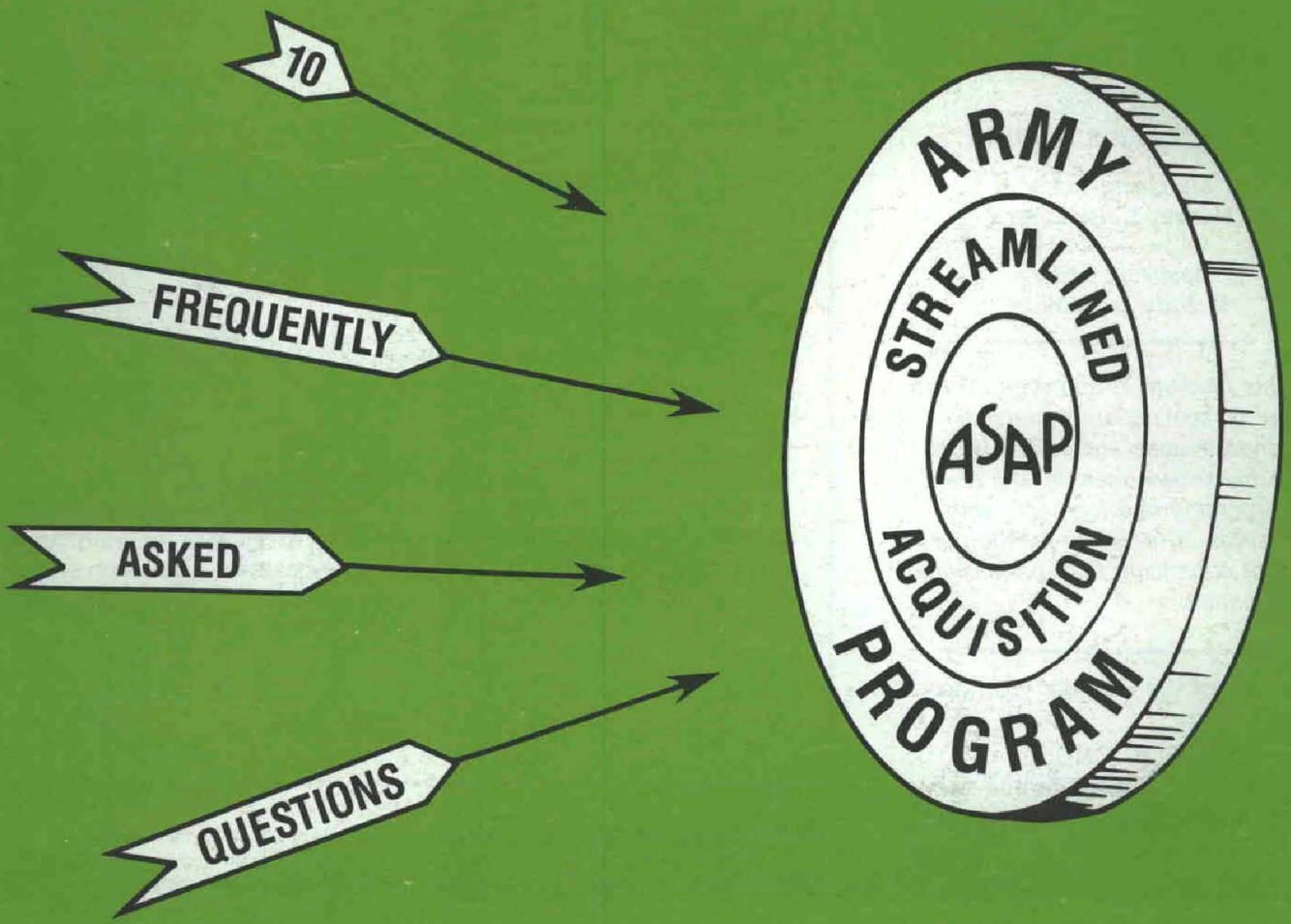

ARMY
Research
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PROFESSIONAL BULLETIN OF THE RDA COMMUNITY

This medium is approved for the official dissemination of material designed to keep individuals within the Army knowledgeable of current and emerging developments within their areas of expertise for the purpose of enhancing their professional development.

By order of the Secretary of the Army:

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General, United States Army
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FEATURES

DEPARTMENTS

ABOUT THE COVER

The front cover article is devoted to a series of the most frequently asked questions regarding the Army's Streamlined Acquisition Program. Answers are provided by Robert O. Black, Army advocate for acquisition streamlining. The back cover shows an aviator's night vision imaging system which is related to an article on image intensification technology.

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Streamlined Acquisition . . .

THE 10 MOST FREQUENTLY ASKED QUESTIONS

Robert O. Black, Army Advocate for Acquisition Streamlining, provides some very informative and candid answers to questions on the Army Streamlined Acquisition Program (ASAP).

Q. What is the impact on streamlining of the DOD acquisition reform initiatives (e.g. Program Executive Office organizations, etc.)?

A. Implementation of the DOD acquisition reform initiatives should serve to reinforce the principles and concepts of the Army Streamlined Acquisition Program. Much of what we have been attempting to accomplish through ASAP was validated in the DOD acquisition reforms. In particular, the elimination of obstacles in the review process has been institutionalized through the establishment of program executive offices (PEO) and the requirement for direct reporting channels on programmatic issues. The new streamlined PEO channels should make it even easier to apply to a given program the basic ASAP keystones:

- maximum use of already-developed systems, items, components (e.g. non-development items);
- careful identification, selection, and maturation of technologies; planned technology insertion (parallel preplanned product improvement);
- early proveout of technologies, and operational concepts prior to engineering development;
- tailored life cycle phases;
- early involvement of the logistics community;
- integrated test and continuous evaluation;
- production proveout during engineering development to include hard-tooled prototypes; and
- system evolution through block improvements;

Q. In the streamlining process, will there be any efforts made to reduce the amount of regulations and changes that are issued at all levels, especially those dealing with formats, forms or administration?

A. Definitely. One of the missions of the Acquisition Policy Review Task Force, which is undertaking the revision of AR 70-1 to accommodate the DOD reforms, is the consolidation and elimination of duplicative or unnecessary regulations and directives. Inherent to the task force charter is a two-tier effort:

- The first tier consists of the consolidation of AR 70-61, Type Classification, and AR 70-28, Popular Names of Weapon Systems into AR 70-1, Systems Acquisition Policy and Procedures; plus the cancellation of AR 15-16, DA System Coordinator; and cancellation of DA PAM 11-25, Life Cycle Management Model with applicable coverage integrated into AMC/TRADOC Pam 70-2, Materiel Acquisition Handbook (which will be adopted by HQDA for broader use).
- The second-tier effort will consider further consolidation of the AR 70-series regulations, e.g. AR 70-15, AR 70-17, AR 71-3, AR 70-10 and AR 70-2.

In parallel, overall program management documents and plans (such as those described in Appendix F, AR 70-1) will be reviewed for additional simplification or consolidation; for example, combining applicable portions of the Acquisition Strategy with the Acquisition Plan.

Q. By advocating the elimination of requirements, doesn't streamlining unnecessarily increase program risk?

A. Absolutely not. The principles of Acquisition Streamlining, as embodied in DOD Directive 5000.43, advocate insistence on only essential (not zero) requirements. Allow me to quote: "Acquisition streamlining is based on the concept that by applying pertinent contract requirements and allowing early industry involvement in recommending the most cost-effective solutions, the Department of Defense can reduce the cost and/or time of system acquisition and life

cycle cost without degrading system effectiveness."

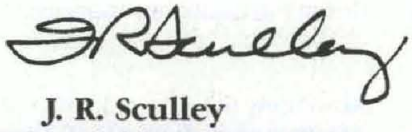
DOD and Army policy call for "limiting the contractual liability of referenced documents to only those that are essential . . . Requirements that are not mandated by law or established DOD policy and that do not contribute to the operational effectiveness and suitability of the system, or effective management of its acquisition, operation or support, shall be excluded."

Now, nowhere in that explication of policy does it imply that we will indiscriminately discard valid requirements. It does imply that we should pay more attention to justifying those requirements that we choose to impose, and the directive does state that we must be more attentive toward stating specifically what those requirements are. In other words, make a conscious effort when applying specifications, standards, and referenced requirements in solicitations and work statements, rather than relying on "boiler plate" methodology, or falling back on what worked before.

Understand the requirements contained in the first tier documentation, and avoid depending on second and third tier references as a security blanket. In the long run, that security blanket just increases cost and contributes to program delays by forcing the contractor to execute unnecessary "requirements." Ultimately, by zeroing in on the essentials, we should be able to reduce (not increase) risk.

ASAP - The Effort Continues

The Army Streamlined Acquisition Program (ASAP) remains one of our principal efforts to reduce the time, cost and complexity of developing, producing and fielding quality weapon systems and equipment. We must continue to develop requirements, acquisition strategies and business strategies to get the most for our money while providing the best possible warfighting capability for our soldiers. Especially today, streamlining is essential and ASAP describes the diverse means and tools for streamlining Army programs.



J. R. Sculley
Army Acquisition Executive

Q. When does the clock start on ASAP, and does it really save any time?

A. It is a common misperception that there is an arbitrary ASAP clock that says you will accomplish a program within rigid time constraints to the exclusion of all else. The proper message is that by concentrating our effort more on the early phases of the program, we can eliminate activity and the resultant waste of resources (both time and fiscal) during later phases, both as a result of not having to redo previous efforts and beginning significant activities at the last minute.

Simply stated, ASAP is the most efficient and effective use of resources at the most appropriate point in the life cycle. Also, ASAP is not a shell game. It is a combination of lessons learned with new ideas. By incorporating the ASAP keystones mentioned in question one above, we believe a program will reduce the time and effort necessary to field a system.

Q. Does ASAP have the support of OSD and the Army leadership?

A. Much of the ASAP philosophy is contained in the thrusts announced by Dr. Robert Costello, the new under secretary of defense (acquisition), and have been embraced by the streamlining advocates of the other services. And, as Army advocate for Acquisition Streamlining, I can say that ASAP is truly Army policy, as evidenced principally by the fact that the current AR 70-1 contains the elements of ASAP policy.

The former under secretary of the Army demonstrated his support by personally challenging requirements, acquisition strategies and business practices on every program which he reviewed. Under Secretary Ambrose was the principal Army speaker at the OSD Acquisition Streamlining Conference held in Crystal City, VA in March 1987. His example has been consistent and unwavering.

Assistant Secretary of the Army (RD&A) Dr. J.R. Sculley participated in the acknowledgment of the benefits of ASAP by personally presenting the Army Acquisition Streamlining Excellence Awards in August 1987. I can assure you that the Army leadership supports streamlining; our challenge is to get the message to you in the field, who are involved daily in executing individual programs. More education is needed on how to apply these principles; we're working on that.

Q. Does ASAP unwisely reduce the amount of testing on a system?

A. No. The intent of the test and evaluation initiatives under ASAP is not to reduce the amount of testing, but to eliminate duplicative testing. Why test twice when

once can do? Through integrated test and continuous evaluation, we get away from the "final exam" syndrome and make testing more efficient in terms of the overall program milestone decisions. We seek ways to streamline test programs through consolidation and collaboration in terms of locations, facilities and repetition. We seek the joint participation of contractor, development and operational testers throughout the test phases. Similarly, through responsive access to and sharing of test data and corrective actions we can speed the evaluation process with no loss of accuracy or independence.

Finally, and equally important, is a stronger role of the user in testing prior to full-scale development. This can provide invaluable feedback on both technical and operational concerns, provided it is done early enough to influence engineering prototypes and system integration efforts. The earlier it is accomplished in the program, the less cost accrues to the Army and the less impact there is on subsequent program events.

Q. Why do you need R&D dollars for non-developmental items (NDI)?

A. Prior to procurement of the item, a number of activities are properly financed by RDTE dollars. Among them are: formulating the requirements document; drafting program management documents; preparing the independent evaluation plan; conducting the user/market investigation; preparation of the purchase description, technical data package and manuals; preparation of the materiel fielding plan, prototype test program sets, training aids; and the purchase or lease of sufficient NDI candidates required to conduct test and evaluation, plus the conduct of the test and evaluation itself. For a more comprehensive list, I urge you to consult the AMC/TRADOC Pamphlet 70-2, chapter 17.

Q. How feasible is the Packard Commission recommendation to increase the number of non-developmental items on major weapon system acquisitions?

A. Not only is the Packard Commission recommendation feasible, the Army is actively implementing the recommendation and has already achieved positive results. Examples of major Army weapon system NDI acquisitions are the Commercial Utility Cargo Vehicle, Mobile Subscriber Equipment, Army Command and Control System, and the 9mm Handgun. These programs demonstrate that this objective is achievable.

Further evidence of the Army resolve on the NDI issue is shown by the fact that over 35 percent of our programs are now NDI, a quantity increase from 178 to 194 since the first quarter of fiscal year 1987. This is almost equal to our total number of developmental programs (i.e. NDI = 194; developmental = 217).

Q. Is the payoff we receive from draft request for proposals (RFPs) worth the time it takes to execute them?

A. Draft RFP's help us listen and respond to industry. They are a valuable tool to shorten lead times, promote competition, eliminate restrictive elements and may provide cost savings. The intent behind issuing draft RFPs is to make the solicitation process more of a two-way street, of benefit to both government and industry. Policy encourages touching as broad an industry base as practical, affording that base an opportunity to provide comments which may materially and substantially improve the solicitation.

To ensure broad-based industry response, our procuring activities announce draft RFPs in the *Commerce Business Daily*. As a safeguard against "double work" for industry, AMC policy provides for any changes between draft and final RFP to be identified when the final is released. As to the gain, I'll let you be the judge.

Early response has been mixed. Fifty-two drafts were released in FY 86; industry replied to 33. However, more than 2,500 issues were raised in those replies, 46 percent of which triggered changes to the final RFPs. Now, 1,150 changes suggest that this process resulted in that many fewer requirements imposed on the contractors, which should translate into substantial savings in time and effort spent executing and monitoring those contracts.

Q. What is the streamlining-quality connection?

A. We have for some time appreciated the streamlining-quality connection. John Leslie of Texas Instruments has articulated it best (see his article in the January-February 1988 issue of this bulletin). But the basic message deserves to be repeated, and provides a fine summary of streamlining. Leslie notes that "roughly half the world's quality experts support 'conformance to requirements' as the proper definition of quality, and the other half supports 'fitness for use.'"

He then correctly proposes that a better working definition of quality is "conformance to a set of requirements which, if followed, will result in a product that is fit for its intended use." The message here is that in the current environment of including literally thousands of documents by reference, neither government nor contractor can fully understand the contract into which they have entered. This creates a situation where the contractor feels that we must not be really serious about all of the referenced requirements, and often proceeds to selectively comply. If we tailor our requirements to those we actually need, then both parties will treat every requirement with the seriousness it deserves. In other words, focusing on only the essential and correct requirements fosters, rather than inhibits, quality.

AIRCRAFT SURVIVABILITY EQUIPMENT

By Edward Knierim

Introduction

The Aircraft Survivability Equipment Project Manager's (PM) Office was established in 1970 to coordinate programs which existed at that time to provide infrared countermeasures for Army aircraft. The office was originally designated the Infrared Countermeasures Project Managers Office (IRCM-PMO).

The introduction of heat seeking missiles into Viet Nam and the subsequent quick reaction deployment of IRCM developed by the PM provided graphic evidence of the potential benefits of survivability equipment. It was evident, however, that the problem of surviving on the modern battlefield required a much broader range of countermeasures. The PM's responsibilities were quickly expanded to cover other forms of aircraft self protection systems.

Today, the project manager operates under the Combat Aviation Program Executive Office and has a much broader mission. The PM is responsible for the development, acquisition, and life cycle management of Aircraft Survivability Equipment (ASE). Program objectives are to: provide self-protection for the current Army aircraft fleet on the modern battlefield; contingency protection equipment and plans as required; vulnerability analysis and development of survivability techniques and equipment for aircraft project, product and weapons system managers; and a viable technical data base within the U.S. Army Materiel Command (AMC) to interface with future aircraft development programs.

Challenges

The diversity of the mission of Army aviation and the large number of Army aircraft (more than 8,000) provide some significant challenges in accomplishing this mission. Additional factors which complicate the problem are space, weight and power constraints on Army aircraft and the broad range of threat systems.

In order to consider each of these factors and achieve his mission, the PM established a structured program for defining system requirements, evaluating potential benefits and establishing priorities. The key elements of this program consist of survivability analysis and cost/benefits analysis. Candidate ASE systems are then scrutinized in these analyses to assess their relative benefit, establish an overall priority for development, and set baseline performance requirements for each item of ASE. In the following paragraphs I will discuss the basic philosophy employed in these analyses in general terms.

The key factors in the survivability analysis are the mission, the threat and the effectiveness of the ASE suite. The mission will generally fall into one of three categories related to the type of aircraft involved. These categories are scout attack, special electronic mission and utility/cargo.

Even though there may be a number of distinctively different missions in any one category, they are generally similar enough that the results of the analysis can be categorized in this manner. The exception to this is special operations force missions which generally have to be considered independently.

The threat and threat lay-down are generally divided into current, near term and future. This allows for the establishment of a range of threat systems, threat capabilities, threat densities and methods of employing the threat based on intelligence data and projections. Candidate ASE systems are then defined following the Army protection strategy.

The Army protection strategy covers five distinctive areas of tactics, signature reduction, warning, jamming and vulnerability reduction. By following this strategy, we are able to provide successive "layers" or "degrees" of protection which allow the aviator to accomplish his mission.

Tactics and signature reduction allow the aviator to avoid the threat. He can accomplish many missions by simply selecting the proper firing position to allow delivery of his weapons without exposing his aircraft to the threat. Signature reduction can greatly enhance this ability by limiting threat capabilities as well as enhancing the effectiveness of active jamming.

Warning systems allow the aviator to "visualize" threat systems and take maximum advantage of tactics. If the mission cannot be accomplished without exposure to the threat, jammers allow the aviator to stand and fight and survive. The addition of vulnerability reduction features enhances his ability to survive in all of these situations if engaged.

The effectiveness of each item of ASE is defined based on the best available information (e.g. test results, simulations, estimates, etc.). The performance and cost penalties associated with each item of ASE is also established for later use in the cost/benefit analysis.

Survivability Analysis

The survivability analysis is then performed. In its simplest form, this analysis consists of determining the rel-

The use of the computer is essential when you consider the large number of threats, missions and ASE involved.

ative attrition of an individual aircraft or type of aircraft to any given threat. The analysis can be performed in any number of ways and is well suited to the use of the computer.

The use of the computer is essential when you consider the large number of threats, missions and ASE involved. The basic analysis is repeated for each mission and threat category using different individual items of ASE separately and in combination with one another.

The results of the analysis provide the basic information necessary to determine the probability of survival of an aircraft against an array of threats for various ASE suites. The results also provide insight into the relative influence of one type of threat over another, the relative benefit of one type of countermeasure over another and the trends in both threat and countermeasure which help establish program priorities and visualize technology gaps.

Cost Benefit Analysis

The cost benefit analysis is now performed using the probability of survival determined in the survivability analysis as the measure of benefit. The measure of cost is established using the performance and cost penalties defined for each item of ASE. Given this information, benefit can be plotted as a function of cost for each ASE suite analyzed. This then allows for the selection of the ASE suite which provides the most benefit for the cost.

Given this information and the trends and priorities identified in the survivability analysis, the appropriate programs can be established and prioritized. Of course the decisions are not always as clear as this discussion might imply and there are other factors which can influence overall conclusions, but this approach does provide for a structured systematic method of guiding key decisions. This approach has been used by the PM on a continuing basis since the 1975/76 time frame.

Conclusion

The ASE-PMO has fielded two generations of infrared suppressors as well as low reflectance IR paint, the M-130 multi-purpose dispenser with both flare and chaff cartridges along with the only proven missile warning system (AN/ALQ-156(V)1) in use today.

We have also fielded two generations of radar warning receivers (AN/APR-39(V)1/2) and infrared jammers (AN/ALQ-147 and 144) as well as the first generation of active radar jammers (AN/ALQ-136(V)1/5) feasible for use on Army scout attack aircraft.

In addition to the above fielded systems, the AN/ALQ-156(V)2/3 SEMA Missile Detector, AN/APR-39A(V)1 Advanced Scout Attack Radar Warning Receiver, and the joint Army/Navy AN/ALQ-162 CW Jammer are all in production nearing fielding. The AVR-2 Laser Warning Receiver is nearing production and the SEMA AN/ALQ-136(V)2 Radar Jammer and the AN/ALQ-144A Advanced IR Jammer are preparing for production in-process reviews.

Additional ASE programs in development include the AN/APR-48 Radar Frequency Interferometer, AN/APR-39A(XE-2) Advanced SEMA Radar Warning Receiver, Radar Frequency Expendable Decoy and ASET II, III and IV Training systems.

This list represents significant effort on the part of the total community and provides significant improvement in the ability of Army aircraft to fight and survive on today's battlefield. However, just as we have made strides in protecting our aircraft, there have been significant improvements in threat capabilities which will require continued efforts and improvements in our defenses.

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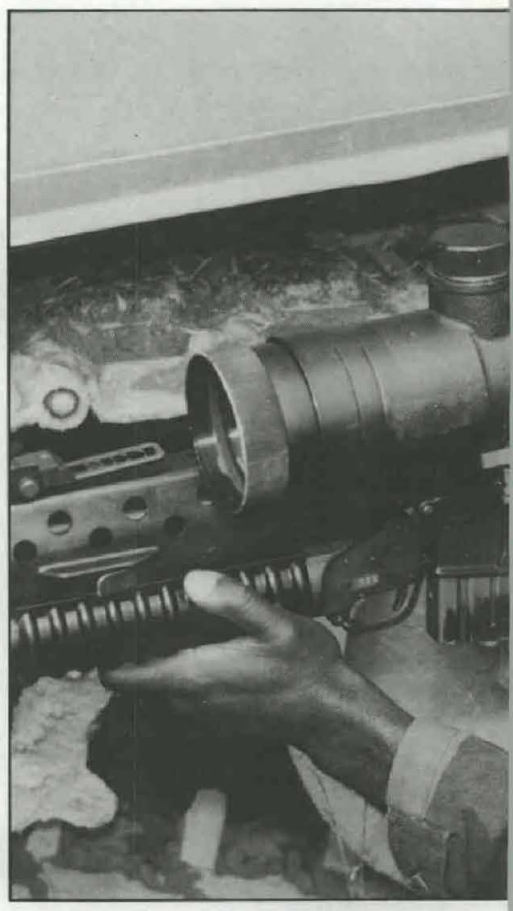
IMAGE INTENSIFICATION TECHNOLOGY

By Mavis DeZulovich



New developments for image intensifiers increase the Army's night vision capabilities.

Introduction

More than two decades of advances in image intensification technology have significantly improved U.S. military capabilities to take the night away from the enemy.

Equipment using this technology has been in military use since the mid-1960s to improve visibility during periods of low light levels by amplifying faint moon and starlight reflections. Image intensifiers detect visible as well as near infrared light.

The image intensifiers' capability to see near infrared light was not brought about by chance but was well planned in advance to detect enemy use of near infrared equipment. The Center for Night Vision and Electro-Optics (CNVEO), located at Fort Belvoir, VA, has been the innovator throughout the evolution of each generation of image intensification technology.

Technological advancements during the past two decades, such as the microchannel plate and the gallium arsenide photocathodes, have significantly improved the image intensifier's projected life and performance capabilities. Improved manufacturing techniques have also contributed to extended life and expanded performance capabilities. This continued progress shows that the image intensifier continues to be a viable sensory extension helping the Army to prevail during periods of low light.

An image intensifier is an electronic viewing device that amplifies dim ambient light reflected from objects and presents this amplified image on a florescent screen. An image intensifier thus provides a means of multiplying the available reflected light so it can be seen by the eye.

The evolution of the image intensifiers from the first generation to the current third generation — including operation, capabilities and limitations, and performance comparisons, provides an interesting study of the advances which have occurred in equipping today's Army to fight effectively at night.

A look back in history shows that searchlights were one of the first night vision enhancement devices. They were simple and effective, but were cumbersome and required large amounts of energy to operate. Their biggest problem, however, was that friend and foe were able to take advantage of the light. A covert night vision enhancement device was needed that could be used only by specially equipped individuals.

The high-power searchlights were modified with infrared filters which blocked visible light and passed only near-infrared (700 to 1,200 nm) energy. In addition, a simple image converter tube was used to view the illuminated scene. This approach had its draw-backs as near-infrared viewers became com-

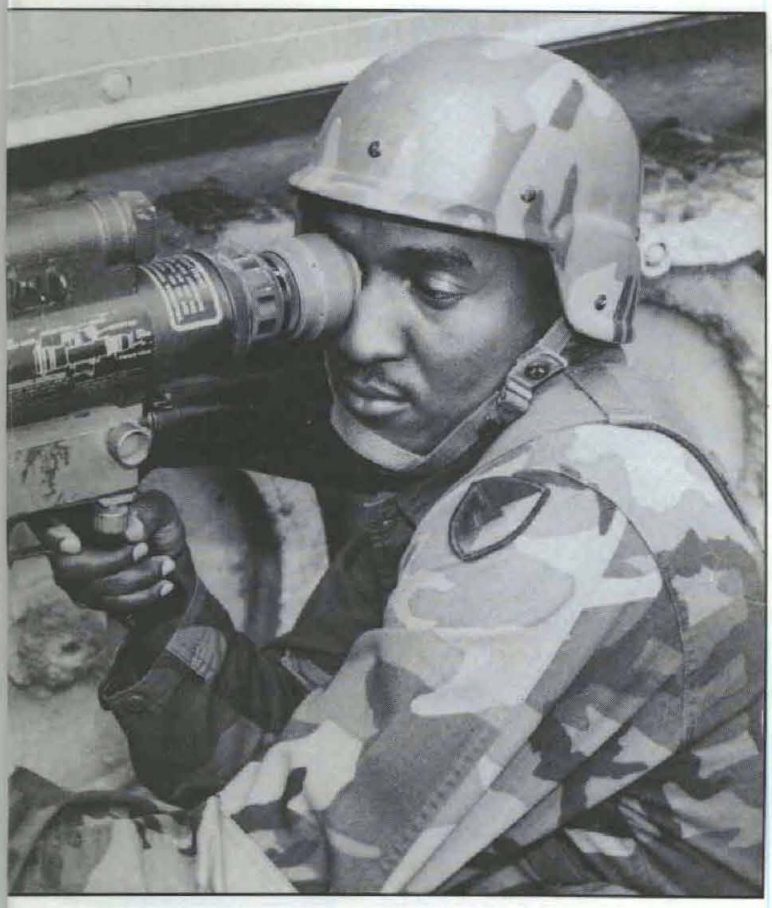


Figure 1.
Soldier holding first generation AN/PVS-2, Night Vision Sight, Individual Served Weapon.

monplace and useable by friend and foe. A passive viewing device was needed that did not emit detectable radiation, and used available light. The image intensifier was the answer.

Image intensifiers are completely passive, and not detectable by the enemy. There are currently three generations of image intensifiers developed by CNVEO and used by the U.S. Army. Each represents a tremendous technological advancement over its predecessors.

First Generation

First generation image intensifier tubes consisted of a three-stage configuration. The three-stage configuration is formed by a fiber-optic coupling of three single-stage unity-magnification tubes to achieve the desired amplification (Figure 1).

The scene being viewed through the image intensifier device is focused on a photosensitive material, the photocathode, which emits electrons from its surface proportional to the amount of light striking it from each point in the scene. The emitted electrons are accelerated from the photocathode toward a phosphor screen by an electric field. The light emerging from the phosphor screen is proportional to the number and velocity of the electrons striking it at each point. The observer views the amplified scene image appearing on the phosphor screen through an eyepiece.

The amount of amplification, or gain, of an image intensifier is expressed as the ratio of light-in to light-out. Three-stage tubes typically have a gain of about 40,000.

The first generation intensifiers are very susceptible to blooming from bright light sources. If the light source is sufficiently bright, the protection circuitry in the intensifier power supply momentarily shuts down the intensifier.

Second Generation

Many of the first generation intensifier limitations were overcome by the second generation intensifier tube technology. The second generation image intensifier tubes are significantly smaller and lighter than the first generation. In fact, one version of the second generation tube is so small that two intensifiers may be used in a binocular head mounted system, the Night Vision Goggles. This miniaturization is achieved by the use of a microchannel plate (MCP) which is used in conjunction with the photocathode to produce the required light amplification.

Light from the scene being viewed is focused on the photocathode, the same way it was in the first generation intensifier. The photocathode material is also the same, but now, the electrons emitted from the photocathode impinge on a microchannel plate.

The MCP is a thin one millimeter wafer of tiny glass tubes which channel the electrons from the photocathode to the phosphor screen. As the electrons pass through the millions of glass tubes, they strike the emissive material coating the channel walls and cause the emission of secondary electrons. The tiny channels are tilted about eight degrees so the electrons will strike the walls many times on their way to the phosphor screen.

Thousands of electrons exit the MCP for each electron that enters from the photocathode. The emerging electrons maintain their relative spatial position

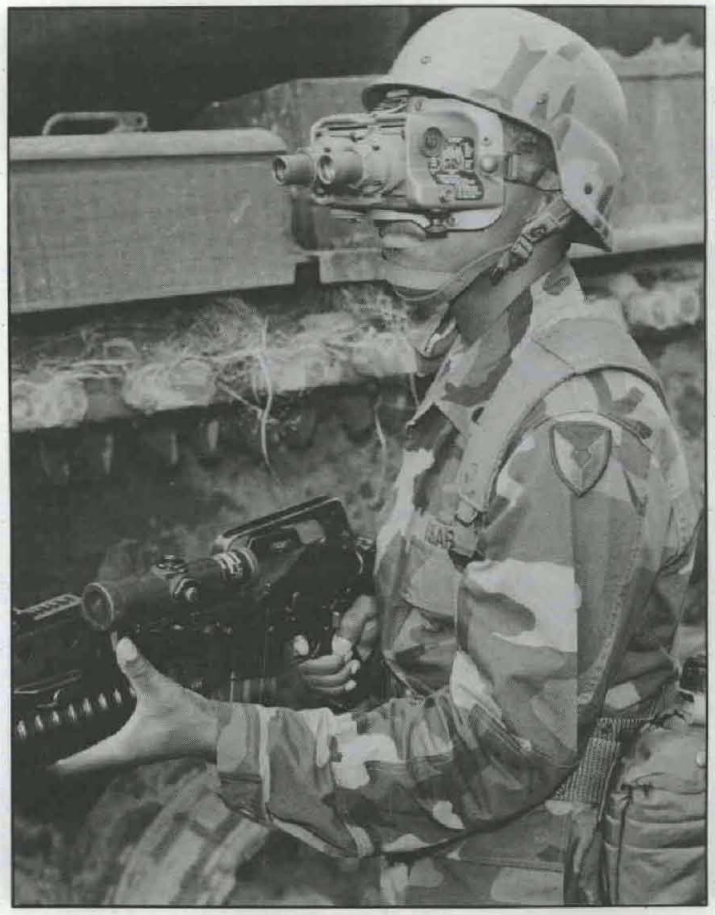


Figure 2.
Soldier wearing second generation AN/PVS-5 Night Vision Goggles.

and strike the display screen phosphor. The photocathode, MCP, and phosphor screen are located very close to each other, so that the electrons do not diverge and blur the image.

The phosphor screen is usually deposited on a fiber optic inverter which twists the image 180 degrees so that the scene appears erect when viewed through the eyepiece. (Figure 2)

The mass production of the MCP developed by CNVEO scientists was the technological advancement that made second generation possible. The MCP minimizes the contrast reduction imposed by bright light sources in the image intensifier's field-of-view. Individual channels can saturate without causing the entire device to saturate as in the first generation systems. However, local area contrast degradation still results from the localized saturation.

A bright light source produces high electron densities at the MCP and phosphor screen. The high electron densities may cause the formation of a halo around the image of the bright light source. This halo degrades the contrast of adjacent portions of the intensified image.

An automatic brightness control helps to protect the observer from bright flashes, but this device does not control the number of electrons released from the photocathode. It controls the MCP voltage to hold the output tube luminance to a specified level. Generally, second generation tubes operate for 2,000 to 4,000 hours at one-quarter moonlight illumination.

Third Generation

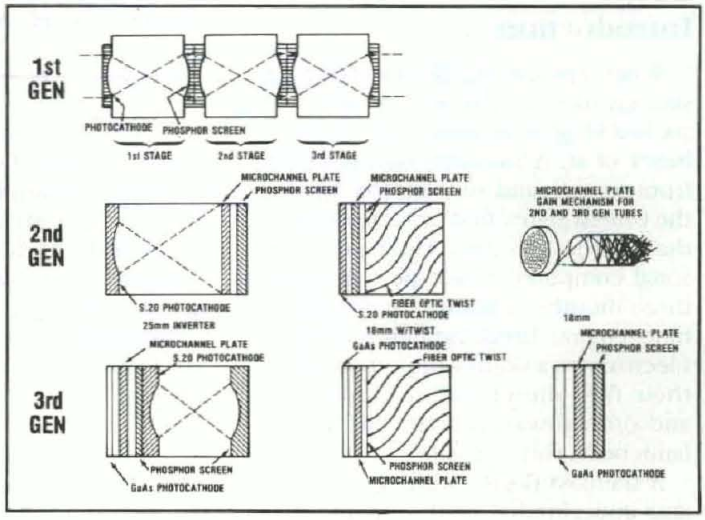
The third generation image intensifier tubes perform much better than the first second generation tubes under starlight illumination levels. These tubes are as small as the second generation tubes, yet live as long as the first generation tubes, greater than 10,000 hours.

Third generation intensifiers schematically look like second generation intensifiers. Light from the scene being viewed is focused on the photocathode. The third generation tubes, however, use a gallium arsenide photocathode bonded to a glass faceplate. The gallium arsenide photocathode surpasses the photosensitivity of the S-20 multialkali photocathodes. The sensitivity of the third generation photocathode is more than 1,000 microamps/lumen compared to the 350 microamps/lumen average of the first and second generation photocathodes.

Two configurations of the third generation tube are currently in production. One has a fiber optic inverter and a miniaturized power supply and is used in the Aviator's Night Vision Imaging System (ANVIS). The objective lenses in this system are coated with a dielectric film (called a minus blue filter) that rejects wavelengths less than 600 nm, so the ANVIS is compatible with the blue-green crewstation lighting. The other third generation tube configuration has no fiber optic inverter and is used in the AN/PVS-7, One Tube Night Vision Goggles (Figure 3).

The luminance output of the first,

Figure 3.
AN/PVS-7 (Single Tube) Night Vision Goggles.



Comparison Chart

second, and third generation devices is determined by the amount of current the power supply provides. The total current drawn by the display is limited and the light generated by this current can be concentrated in one spot or distributed over the entire screen. The values discussed here are for full screen illumination; half the screen would be twice as bright. Small areas can be much brighter than the full-display luminance quoted in the tube specifications (see Comparison Chart).

Conclusion

Image intensifier developers tend to agree there will probably not be a fourth generation of devices. There are, however, several improvements they would like to make on the third generation intensifiers. The third generation demagnification tube for example may be a low-cost, efficient image intensifier. For some applications, small size may not be a controlling factor, so the elimination of the expensive MCP and the enlargement of the photocathode may prove to be an alternative to present designs. Developers are also improving the photocathode manufacturing techniques and expect to make photocathodes with greatly improved luminous efficiency in the near future.

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SKUNKWORKS: SPEED, QUAL

By Benny G. Doyal

Introduction

When a practical innovation occurs, a skunkworks, usually with a nucleus of six to 25 highly-skilled workers, is at the heart of it. A skunkworks developed from scratch and successfully test-flew the United States' first tactical jet fighter, the F-80, in 143 days. The first Vic personal computer prototype was built in three months. A major aircraft gas turbine engine breakthrough at General Electric was a skunkworks effort, as was their first diesel-electric locomotive and off-highway vehicle, and the air-launched cruise missile.

A skunkworks is a small, overworked, and underfunded team operating in a garage or warehouse, physically removed from the rest of the company. The most effective teams are composed of volunteers, are of limited duration, and set their own goals. The team is functionally complete, acts autonomously, and stays together until the project is completed.

Groups of 12 or fewer have a cohesiveness and supportive team spirit not found in larger groups. They are routinely more innovative than fully-equipped research and development teams with hundreds of employees. Large commercial aircraft manufacturers use this method to develop a prototype, or a big hunk of it, in 60 to 90 days. Something can always be pieced together in that time.

What about quality? Quality is actually better because skunkworks haven't the time to reinvent the wheel. Time constraints prevent building or developing everything in-house. Team members search for components which have already been proven dependable for their system.

Current Situation

"It takes five years to develop a new car in this country. Heck, we won World War II in four years." — H. Ross Perot

The Army has, for many years, employed the DOD sequential step system for developing equipment. This multi-segmented Life Cycle System Management Model (LCSMM) has resulted in system development programs averaging 11 to 15 years with many taking more than 20 years. At least three-fourths of these systems employ mature technology; one such system has been under development for 24 years.

The Army's new Streamlined Acquisition Program (ASAP), though an improvement, is still improperly perceived and practiced as a miniaturized version of the traditional LCSMM: Instead of identifying reduced number and scope of tasks/events to be accomplished and performing many of them concurrently, there is a tendency to continue to execute in the lock-step "rut" of the traditional model.

The Need To Expedite Development

"A good plan violently executed right now is far better than a perfect plan executed next week." — George S. Patton

Threat

Military operational effectiveness, simply defined, is having the ability to deter aggression, and should that fail, the ability to defeat the aggressor. Our most threatening challenge continues to be the Soviet-Pact nations. A recent article on the modernization of Soviet armed forces stressed the fact that the conventional quantitative force gap continues to grow in the Soviets' favor and they are rapidly modernizing their forces by qualitative improvements in individual weapon systems.

Some say we still have a qualitative edge. Consider the Soviets' airborne armor capability and weigh their artillery and air defense systems against ours. Perhaps we have an across-the-board qualitative edge today, but how much? And for how long?

A recent U.S. Army briefing stressed that the Soviet system development cycle takes 10-12 years while ours averages 15 years. If these patterns continue, the Soviets could go through three to our two cycles by 2017 or six to our four by 2047.

If we can accept that the Soviet systems are not so inferior to ours today, and that because of our slowness they will pass through more development cycles in a relatively short period of time, isn't it also conceivable that the Soviets could achieve technological superiority while maintaining numerical superiority during the next few years?

Cost Effectiveness

The employment of a project team is cost effective because the project cost is front-end loaded, progress is rapid, and should an unsurmountable problem arise, the project is abandoned. Dollar savings and more expedient developments are realized because speed requires the use of available proven components rather than in-house developments.

Military Application

Having a number of approved requirements documents available, any

TY, AND COST EFFECTIVENESS

individual or command such as HQDA, Forces Command (FORSCOM), Training and Doctrine Command (TRADOC), Army Materiel Command (AMC) or a TRADOC proponent school could propose establishment of a skunkworks to resolve a problem. Discussions between AMC and TRADOC (or FORSCOM if the project were to be established on one of their posts) would be held and result in a memorandum of agreement (MOA) presenting the specific responsibilities of and resources to be provided by each command in the establishment and maintenance of the skunkworks.

Leaders

"Whenever anything is being accomplished, it is being done, I have learned, by a monomaniac with a mission." — Peter Drucker

Leaders are the key to accomplishing anything, but leadership does not normally reside in the person who comes up with the great idea. The majority of creative people aren't usually forceful enough or trained to take their ideas to a successful conclusion. That task falls to an entrepreneur. He is the gutsy guy who adopts the idea and has the training, leadership ability and courage to make it happen.

In addition to Drucker, others describe the team leader as being persistent, egotistical, competitive, passionate, irreverent, impatient and a pain. He has vision, killer instinct, and is a good finisher. He is always a volunteer because one cannot be ordered to have the attributes necessary for success. Volunteer team leaders might be drawn from the pool of Project Management Course graduates.

Sponsor

A project will not survive without the aid of a powerful and dedicated sponsor. In many cases such a sponsor will step forward to adopt and defend the project. Powerful sponsors such as the TRADOC commander, the three TRADOC deputy commanding generals, the TRADOC deputy chief of staff for combat developments and commander, Combined Arms Combat Developments Activity have sufficient real power to acquire resources and protect a project. Similar situations exist on the AMC side and at the Department of the Army level.

A major requirement for a sponsor is that he must be voluntarily "sold" on the project. A truly worthy project will probably get the attention and support of one of these powerful leaders.

Recruiting the Team

The initial requirement in the recruiting process is to assess and determine the skills required to perform the task. Skills such as combat developer, materiel developer, hands-on engineers, designer/draftsmen, human factors engineers and testers will be required on every project. Special skills like mechanics, electricians, welders, cutter/fabricators, etc., will be project dependent. It is the job of the team (project) leader to recruit his team, but he will need leads from others to guide him to the good people. The Army has literally thousands of people from which to form skunkworks.

Motivation

There are hosts of motivational aspects to serving on a skunkworks. These include the adventure of working on an important, meaningful project, a burning desire to be the best, or the thought of being average scares the hell out of them. Good enough just isn't good enough.

Being accountable, undermanned, overworked, underfunded, and having to meet over-tight deadlines are also strong motivators. A final motivational key is ownership — the team members aren't assigned, they buy into the project. It's theirs — all that goes with it; and they are going to see it through to a successful conclusion.

Test and Evaluation

As the system is developed, a process of test-fix-test keeps the project progressing along a positive path. The major effort is aimed at making, nonstop, small improvements in performance that inch productivity along. Rapid development requires experimentation and modification on-site. When a problem is identified, determine the fix and do it, now!

User Involvement

As has been noted in the civil sector, user involvement is, in most cases, the key to developing an item that truly satisfies user needs. Some of the advantages of having user involvement in the process are:

- acquisition of real world training requirements that can be used by the training developers in designing effective training programs;
- small, but significant, oversights will be corrected during the development process because the developing system will have to interface with the real soldier, support concepts and other equipment in the operational organization;
- information will be gained on maintenance manhours and repair parts requirements to enable development of a realistic system support package that should be available on or near the system fielding date;
- user suggestions and team member observations of the equipment in the hands of users performing real world missions will result in refinements during the process rather than in a follow-on product improvement program;

- identification of representative soldier inabilities to perform specific tasks, thus requiring and enabling engineers to redesign the system to be soldier-compatible; identifying deficiencies during the final operational test usually comes too late to make effective changes or to do so is cost prohibitive, thus requiring users to live with the problems; and
- decision makers will be more confident in their decisions to field the item because the system will be known to be operationally effective and supportable in the hands of the user.

Location

As opposed to industry, Army materiel developers are not concentrated at a single location. A key aspect of a skunkworks development project is the user organization involvement addressed above. Unless it is found acceptable to move a unit to an R&D laboratory, thus taking the unit out of its training program and tactical environment (highly unlikely), we will by necessity have to establish our project at the home base of our supporting user organization. Why not a "Truckworks" at Fort Eustis — perhaps even a "Boatworks", or a "Gunworks" at Fort Sill and a "Tankworks" at Fort Knox?

Information Management

To reduce paperwork yet track events and results of various efforts, standalone personal computers could be employed as a means of retaining information on experiments conducted and results achieved. The system would feature engineering software to include computer-aided design on site.

Special Military Requirements

Army equipment requires hardening to withstand rough handling, special weapon effects, harsh environments and enemy actions. A perception abounds that any development other than a full-blown, start-from-scratch development program requires that the Army accept less than what is required to do the job. That is not the intent of this proposal. It must be accepted, up front, that the system will be an assemblage of proven components mander is encouraging: "We are concentrating on making tailored acquisition the norm rather that the with meeting only 70 percent of the soldiers' needs, but on the other hand, we must refrain from "gold plating" the system.

Perceived Legal Constraints

Discussions with combat and materiel developers reveal a perception that Army regulations impose constraints on or actually prohibit in-house developments. Real world skunkworks operators say that "regulations aren't the problem — it's their interpretation. You can find those which would seem to impede you and others which support the process. Use the ones which benefit the process and interpret them in a positive light. The regs aren't the problem — it's the people who perceive nonexistent problems that must be overcome.

Reducing Opposition to Change

Army project leaders must acknowledge that many players are involved in the process, and if they want to "stack the deck" in their favor, they had better get the others' participation in, or at least tacit approval of, the development program.

Reducing opposition can be achieved by inviting and seriously considering comments from the combat and materiel development communities, resolving disagreements, achieving consensus of need and plan prior to project initiation, stabilizing the requirement, notifying all participants in advance of any real need to change the program, and acquiring a high-level respected sponsor to defend the project.

Conclusions

As has been presented, there doesn't appear to be any real restriction to expediting the acquisition process. We need and are presently undergoing a cultural change that should jolt us out of this "slow track" rut.

The current Army leadership is supportive of expeditious materiel developments. The following comment from the recently-departed AMC com- woven into a unique configuration adapted to meet military requirements. We cannot and must not be satisfied exception." All we need is a real push from this leadership in the form of supporting tailored acquisition projects. This could be accomplished by establishing and supporting a few skunkworks.

Will there be failures? Of course there will be. In fact, most of the experiments will fail, but consider all the ideas that have been and will be proposed that we could test and employ or put to rest with such efforts.

We must simply get out of this rigid lock-step development and final test mode — neither is required. Let's do it dirty — all at the same time — we build it today, test it tonight, assess the problems noted and refine it the next morning and test again the next evening . . . Big things always begin with a single person — Who will be the first?

BENNY G. DOYAL is a retired Army officer with two tours of duty in the Republic of Vietnam. He currently serves as the chief, Combat Service Support Branch, TRADOC Independent Evaluation Directorate. He has a bachelor's degree in business administration, a master of arts in management, and a master of arts in human resources development.

By LTC Thomas J. Quigley

THE STANDARD ARMY AUTOMATED CONTRACTING SYSTEM

Improving the way the Army's contracting offices do business

Automation of installation contracting offices is no longer a dream or a wish. It is happening, it is a reality. The Standard Army Automated Contracting System (SAACONS) is the vehicle for this change. It is an aggressively executed worker-class designed program that provides contracting offices with state-of-the-art hardware and software.

In the short span of 20 months, SAACONS leaped from a concept to a functional system that will have a major impact on Army contracting. It is now being fielded to improve the way that contracting offices support the Total Army. The need for this program has existed for many years but it's real start began when the Department of the Army Office of Inspector General published its findings on Army contracting in 1985.

The IG found that contracting offices were not being all they needed to be. Consequently, the then Deputy Chief of Staff for Logistics LTG Benjamin Register tasked BG John M. Thomson and his Procurement Management Division to tackle the problem. When DA reorganized, BG Thomson's division became part of the Directorate of Contracting under MG Harry Karegeannes in the Office of the Assistant Secretary of the Army (Research, Development and Acquisition).

After the appointment of LTC(P) Philip Yenrick as the product manager, the small staff began delving into the world of procurement automation and the best way to make contracting more effective and efficient.

An acquisition approach was formulated. The approach involved surveying the systems currently in use in various commands of the Army and the Air Force. It was found that some automated systems were limited to command unique environments and others concentrated on small purchasing. None were found to have the comprehensive capability needed to best serve installation contracting.

The PM office decided that SAACONS would be developed from existing, proven commercially available software. This software could then be modified or enhanced to meet the Army's needs. This approach avoided some of the risk inherent in software development and also could allow faster deployment of the system.

The next concept was to define the operating environment or the bounds SAACONS would operate within. The chosen boundaries were the four walls of the contracting office. SAACONS would be responsible for automating the functions of the contract specialists and purchasing agents of a contracting office. Although SAACONS will have the capability to interface with other standard Army information systems and tier II systems, interactive networking with other offices or higher headquarters is being left to the future. For the time being, the scope of SAACONS will be confined.

The last idea was to utilize hardware that was already developed and available to the Army, namely Intel 310 microcomputers and the Sperry 5000/80 minicomputers. Using existing competitively awarded requirements, contracts would speed the program considerably. The equipment would be purchased by HQ, DA along with the installation and training needed to automate the contracting offices. With the acquisition strategy formed, thoughts turned to how the software contract would operate.

Contracting for the software was the responsibility of the Information Systems Selection and Acquisition Activity. In conjunction with the PM, a contract was formulated to require the contractor to be wholly responsible for software development, fielding, training and maintenance. This would keep the responsibility for fielding SAACONS in the hands of the contractor under the supervision of the PM office.

The PM office held the cards as system integrator, melding hardware and software together. In August 1986, the preaward processes were concluded with the award of a contract to CACI, Inc.-Federal of Fairfax, VA. SAACONS was in motion.

The Vice Chief of Staff GEN Maxwell Thurman was briefed on the program in July 1985. He concurred with fielding the system in Forces Command in 1986, followed by the remainder of the Army through 1991. A total of 256 sites are to be automated. The Fort Bragg installation contracting office was chosen as the prototype test site.

Before fielding could occur, the system had to be tested. This functional testing was performed by the Army Procurement Research Office (APRO) in conjunction with the Information System Electronic Command (ISEC) at Fort Lee. APRO continues to provide functional contracting advice and ISEC provides technical advice to the PM.

CACI began testing the first version of the software in January 1987. The software was finally accepted in May 1987 and approved by the Army Major Automated Information System Review Council (MAISARC) at Milestone III. This approval authorized Army wide fielding and distinguished SAACONS as the first tier III Standard Army Management Information System.

Following the MAISARC, CACI immediately began fielding the software to sites that had their hardware in place. Forts McPherson, Clayton, Buchannan, Meade and others were soon operating on SAACONS. In October 1987, CACI began a very aggressive fielding schedule, beginning with four sites per month thru December and then increasing to six sites per month in January 1988. However, many events must take place before a site is operational.

In preparing for SAACONS, each contracting office begins by ordering equipment in the configuration provided by the PM. Once the equipment is delivered and installed, the SAACONS software is installed and the work actually starts.

Each site is responsible for building the data base by input of local contract clauses, vendor information, addresses, stock item descriptions and other information. At the same time, the contracting office has use of the word processing capability of the SAACONS software. In some instances, this is the first office automation made available to the contracting office. For some, it is the first transition beyond electric typewriter technology.

CACI personnel make a pre-production visit to each site well in advance of SAACONS training. This visit assures that the site is on track for receipt of SAACONS training and provides professional assistance in that perspective. Training the contracting staff on the use of SAACONS follows 60 to 90 days after the software is installed. After the first three days of training, SAACONS is normally producing contract documents.

SAACONS improves contracting wherever it is installed.

The first week of training concentrates on small purchases, the second, on contracting and finally, CACI trainers provide one week of on the floor assistance to users. At Fort Bragg, the training took place in April, 1987. The system was put to the test at the close of the fiscal year in September — the busiest time for any contracting office. The productivity that SAACONS gave allowed the Small Purchasing Branch to award all of it's contracts five days before the end of the fiscal year! Mr. Walt Warfel, director of contracting, describes SAACONS as the best thing to happen to contracting in the last 20 years.

Recent study by the Army Procurement Research Office compared before-SAACONS operations with after-SAACONS operations. The study showed the procurement administrative lead time was nearly cut in half. Another study compared Fort Bragg with a similar sized Air Force contracting office. Fort Bragg was able to produce contract actions nearly twice as fast with one-half the staff.

SAACONS improves contracting wherever it is installed. The Fort Bragg experience demonstrates what SAACONS can do for the contracting community. It standardizes contracting procedures, reduces procurement lead time, yields accurate and timely reports, reduces backlog, all allowing more time in the office to train employees, administer contracts and concentrate on quality.

All forms are produced and printed on SAACONS equipment. The Federal Acquisition Regulations, DOD and Army Supplements are on line and available.

The program now falls under the purview of Program Executive Office, Management Information Systems, Arthur Rosenblum. The future looks promising for SAACONS. As of February 1988, 127 sites have ordered SAACONS hardware, with 69 sites installed and 32 sites operational. The operational sites are in Forces Command, the Corps of Engineers, Army Materiel Command (Depot System Command), Western Command, Southern Command, and Health Services Command.

Version two of the software is being tested and other interfaces are being planned to accommodate the Commercial Accounts Payable System and AMC's Depot System Command supply system. Version three will consist of an enhanced contract administration and management information module. Planning is underway to continue automating the remaining Army major Commands.

It must be emphasized that the information provided in this article cannot diminish the fact that all aspects of automation are exceedingly difficult. Technical problems are frequently encountered. Yet, through maintaining the focus on the limited specific objective rather than trying to hit a world series home run, the requirement to automate the functions within the four walls of the contracting office is able to continue.

In summary, there are many reasons why SAACONS was able to move forward. There has been support from the Army leadership primarily through the exceptional efforts of BG Thomson. The automation requirement has not changed and remains definable.

CACI has been able to use fourth generation software to make the SAACONS application software actually work. In a combined effort, the government, CACI, SMS Data Products (providing Intel equipment) and UNISYS (providing Sperry equipment) have been able to make SAACONS a reality, an authentic automation program that is improving the way that contracting offices support the total Army. It is happening, it is no dream or a wish.

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LASER SYSTEM MAY HELP ARMY DEPOTS

A joint program involving the U.S. Army Tank-Automotive Command's RDE Center, Tooele Army Depot in Utah and Mechanical Technology Inc. (MTI), Latham, NY, is under way to develop a computer-controlled laser system that can detect malfunctions in automotive gearboxes, such as transmissions, by measuring and analyzing surface vibrations.

Such a system would be used by military depots to test and inspect vehicle gearboxes before and after being rebuilt. An engineering prototype of the tester has been fabricated and its capabilities have been demonstrated to the Depot System Command community and to the other military services. It's operation is being evaluated at Tooele Army Depot.

By George Taylor III

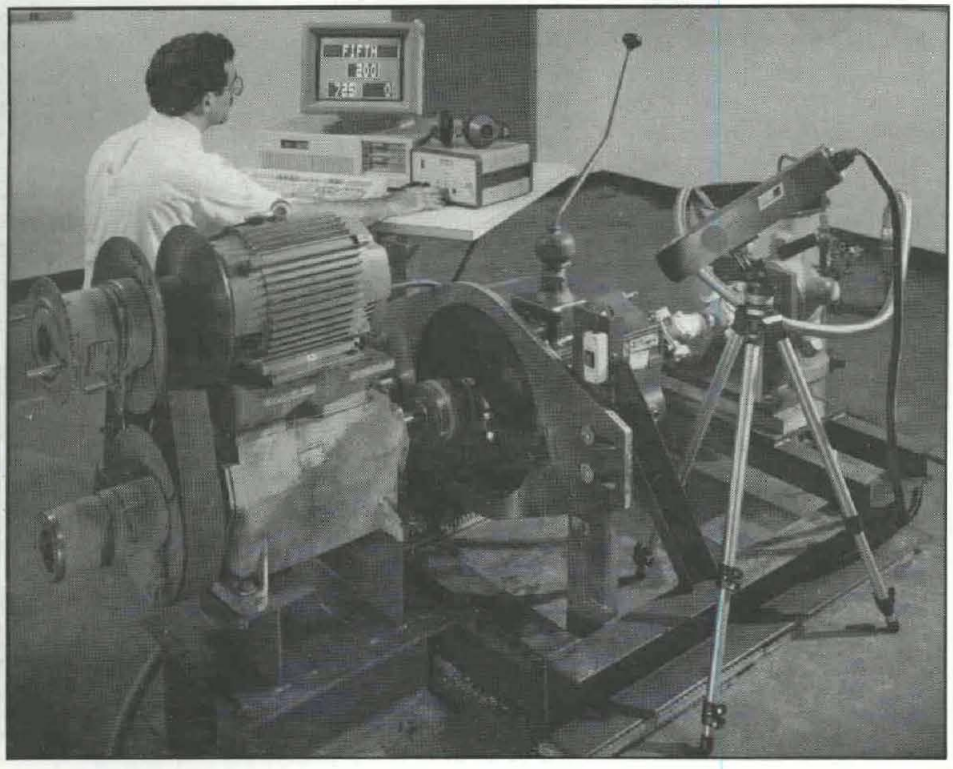
Depots currently inspect gearboxes by disassembling them, and cleaning and visually inspecting each part for wear. Those parts considered to be unusable are then replaced with new parts and the units are reassembled.

After reassembly, each gearbox is placed on a test stand, where it is driven by an electric motor under a load to simulate operation in a vehicle. An inspector then listens to the gearbox while it is running and rejects it if he hears any unusual sounds.

"Overall," said the RDE Center's Robert J. Watts, in charge of the laser tester project, "this process has not worked that badly. We don't have a lot of gearboxes falling apart in the field. But the system we are looking at now is going to enable depots to do their jobs more efficiently and, we hope, more cost-effectively."

The tester engineering prototype at Tooele was built for TACOM by MTI, and is called the Laser Vibration Sensor Inspection Test System (LVS/ITS). It is a portable system consisting of a laser sensor and electronic control unit, which generates the laser beam and receives vibration signals; a computer and associated electronic hardware for processing and analyzing the vibration data; and a monitor and control panel for the operator.

To inspect a gearbox, the operator



LVS/ITS being used to test a 2½-ton transmission.

first positions the laser vibration sensor approximately 20 inches from a test-stand-mounted gearbox. He then turns the test-stand drive motor on and presses the appropriate switches on the LVS/ITS control panel to begin the inspection.

During the inspection, a laser beam from the sensor strikes the vibrating surface of the gearbox. As it does so, any vibration present in the surface alters the laser beam's wavelength — the extent of the alteration being determined by the amount of vibration present and its frequency.

The laser beam is then reflected back to the sensor, and information about its wavelength is fed into the computer. There it is compared with base line vibration data recorded earlier from known good and bad gearboxes to determine if the vibration is normal or an indication of faulty parts. The display then furnishes the inspector with the results of this comparison, providing him with a list of any parts found to be malfunctioning.

Watts pointed out that, although the primary emphasis now will be to use the LVS/ITS to inspect gearboxes, it could be used to check other major components as well.

"This is a generic tester," said Watts. "It doesn't really matter what you are testing because it is a non-contact system. In fact, TACOM has procured a second system and it will be evaluated at Anniston Army Depot during the 4th quarter of FY88 for possible application to turbine engines. Additionally, we plan to procure a third unit and place it at Mainz Army Depot in Germany.

Discussing some of the ways the LVS/ITS would improve depot operations, Watts said the most important benefit is that it would allow evaluation of gearboxes prior to disassembly.

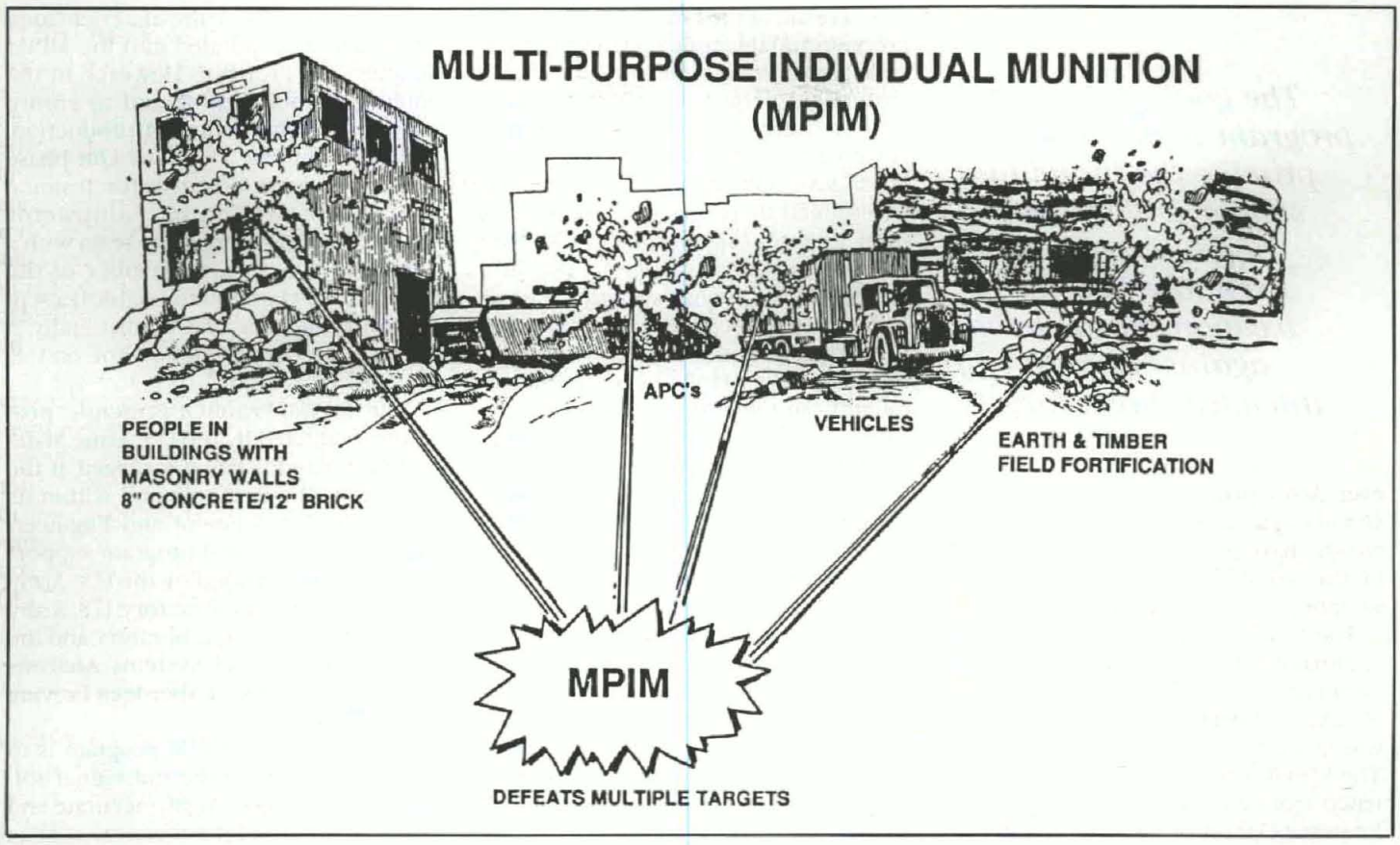
"When a gearbox comes to a depot," Watts explained, "this doesn't necessarily mean that there is something wrong with it. It may have been that it was newly installed in a vehicle only a week or two before that vehicle was turned into the depot for a complete rebuild based on a mileage requirement. "So," he added, "if we had a preshop test that would be suitable for identifying the condition of the internal components to verify that a gearbox was okay, we could essentially save the teardown and overhaul of that unit."

Watts also said that a preshop inspection would benefit the maintenance area by reducing the handling of scrap material. "Right now," he said, "the internal parts have to be cleaned and individually inspected. But if bad gears and bearings could be identified in a preshop inspection, the man who disassembles them could be given a list of those components he should send into the shop for cleaning and those he should discard."

Watts said that efforts are under way to get a competitive procurement specification for Armywide use of the system. He urged any persons in other TACOM offices or PMs interested in obtaining additional technical information about the LVS/ITS to contact him on AV 786-8531 or Commercial (313) 574-8531.

Discussing some of the ways the LVS/ITS would improve depot operations, Watts said the most important benefit is that it would allow evaluation for gearboxes prior to disassembly.

GEORGE TAYLOR III is a technical writer-editor for the Army Tank-Automotive Command. He holds a bachelor's degree in journalism and a master's degree in communications from Michigan State University.



THE MULTIPURPOSE INDIVIDUAL MUNITION

By William E. Zecher
and James A. Bass

New weapon will give individual soldiers more firepower.

The U.S. Army is about to enter a Proof-Of-Principle (POP) technology demonstration to develop an effective lightweight personal self-defense weapon that will allow the individual soldier to rapidly respond to any tactical situation and exploit his own firepower without dependence on specialized support weapons. No single lightweight weapon currently has this multipurpose capability.

The Multipurpose Individual Munition (MPIM) is intended to be a complementary system to the currently fielded M72A2/A3 and AT4 Light Antiarmor Weapon (LAW) systems. These fielded systems, by their nature of being maximized to defeat rolled homogeneous armor, are not highly effective against other types of targets.

Accordingly, the MPIM shall have the ability to not only defeat future and postulated light armor threats, but will also be lethal against enemy personnel inside structures of reinforced concrete, brick or earth and timber field fortifications.

Due to the lack of a truly multipurpose weapon having been developed to date, the U.S. Marine Corps elected to field the Shoulder-Launched Multipurpose Assault Weapon (SMAW) (weighing 29.5 lbs) as a bunker buster to complement the AT4. The U.S. Army also considered a limited buy of SMAW for selected contingency forces; how-

The goal of the MPIM program is to ultimately provide the individual soldier with a rugged, highly accurate and reliable lightweight weapon that is lethal against a variety of intended threat targets.

ever, Army priorities and funding constraints, as well as concerns over system weight, have prohibited the acquisition of this specialized (bunker buster) weapon.

The history evolving into the MPIM requirement is extensive. The user began an attempt in 1966 to replace the M72A2 LAW (weighing 5.3 lbs.) which was fielded in the 1960/61 time frame. The VIPER development program emanated from an Improved LAW (ILAW) Required Operational Capability (ROC) document that was approved in June 1975. A full scale development (FSD) contract was awarded in early 1976 for the development of VIPER to meet the ILAW ROC.

Production of VIPER (weighing 9 lbs.) began in December 1981. Due to program cost growth and the system's lack of performance against advanced tank armors, the program was killed.

In the FY83 budget, Congress directed the Army to test both foreign and domestic lightweight antiarmor weapons as potential alternatives to VIPER. The U.S. Army Missile Command structured and executed the "LAW Alternatives Program," which resulted in the testing of seven weapon candidates (four of which were foreign). The AT4 Recoilless Rocket System was subsequently selected as the best technical approach to enter detailed development and operational testing. Upon completion of a 1,000-round test program, the AT4 (weighing 14.6 lbs) was approved for entry into production in August 1985. The AT4, considered an interim system by the Army, is currently being fielded to USMC and U.S. Army forces.

As a result of the LAW alternatives test program and the rapid improvements in tank armor, it became obvious that a truly lightweight system could not defeat tanks head-on. The user reviewed the operational use of the M72A2/A3 LAW and AT4 systems and determined there was still a need for a light weapon (approximately 10 lbs) for the individual soldier to use in a multitude of combat situations; however, the weapon must have a multipurpose capability since it can no longer defeat modern tanks head-on. Subsequently, an Operational and Organizational requirements document was written for the MPIM.

The U.S. Army Materiel Command is supporting the user's MPIM requirement through a structured development program using the new Army Streamlined Acquisition Process. The first phase of the program will commence with entry into a Proof-Of-Principle test phase. The purpose of this phase is to demonstrate through actual testing that various existing technologies can innovatively be married to provide a warhead capable of defeating all projected threat targets with the required accuracy and range, including the capability to fire from within enclosures.

The MPIM POP technology demonstration is to be full and open competition in which up to four contracts will be awarded. Each contractor will be required to deliver 150 systems, 20 warheads and 16 inert handling systems 15 months after award of the contract. Contract award(s) is planned for May 1988. After hardware delivery, the contractors will fire their weapons over a three month period at targets constructed on government test ranges. The Army will then evaluate the test results and determine the system that can best satisfy the User's requirement. Upon Army approval to enter Phase II of the program, the winner of the "shoot-off," as determined through evaluation of test results and contractor proposals for Phase II effort, will enter the Development and Production Prove Out Phase.

To ensure that all available candidate technologies are considered for contract award and to allow maximum participation by our close allies, updated (generic) threat descriptions were developed by the Army Materiel Command and incorporated into the MPIM Request For Proposal. However, in the interest of mobilization and to ensure maximum competition in production, the Development and Prove-Out phase will be done as a contractor teaming effort and any foreign contractor selected will be required to team with a U.S. contractor. Each member of the team will be required to establish a separate production line. Additionally, a weapon system production line on U.S. soil will be required.

The MPIM Proof-Of-Principle program conducted by the U.S. Army Materiel Command is being managed at the U.S. Army Missile Command within its Research, Development and Engineering Center. Technical program support is also being provided by the U.S. Army Ballistic Research Laboratory, U.S. Army Human Engineering Laboratory and the U.S. Army Materiel Systems Analysis Activity, all located at Aberdeen Proving Ground, MD.

The goal of the MPIM program is to ultimately provide the individual soldier with a rugged, highly accurate and reliable lightweight weapon that is lethal against a variety of intended threat targets. The acquisition approach chosen to accomplish this goal is designed to emphasize competition in every phase, reduce program risks and minimize (life cycle) program acquisition costs.

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MAKING TECHNOLOGY TRANSFER A REALITY

By Dr. L.R. Shaffer

Introduction

The U.S. Army Construction Engineering Research Laboratory (CERL) has one of the most active technology transfer efforts of any federal laboratory. Our success has centered on our ability to leverage our resources by involving universities, other public organizations, and the private sector. The resulting joint ventures ensure technology transfer occurs by providing high quality products responsive to Army needs and ensuring mechanisms are in place to assist Army users of those products.

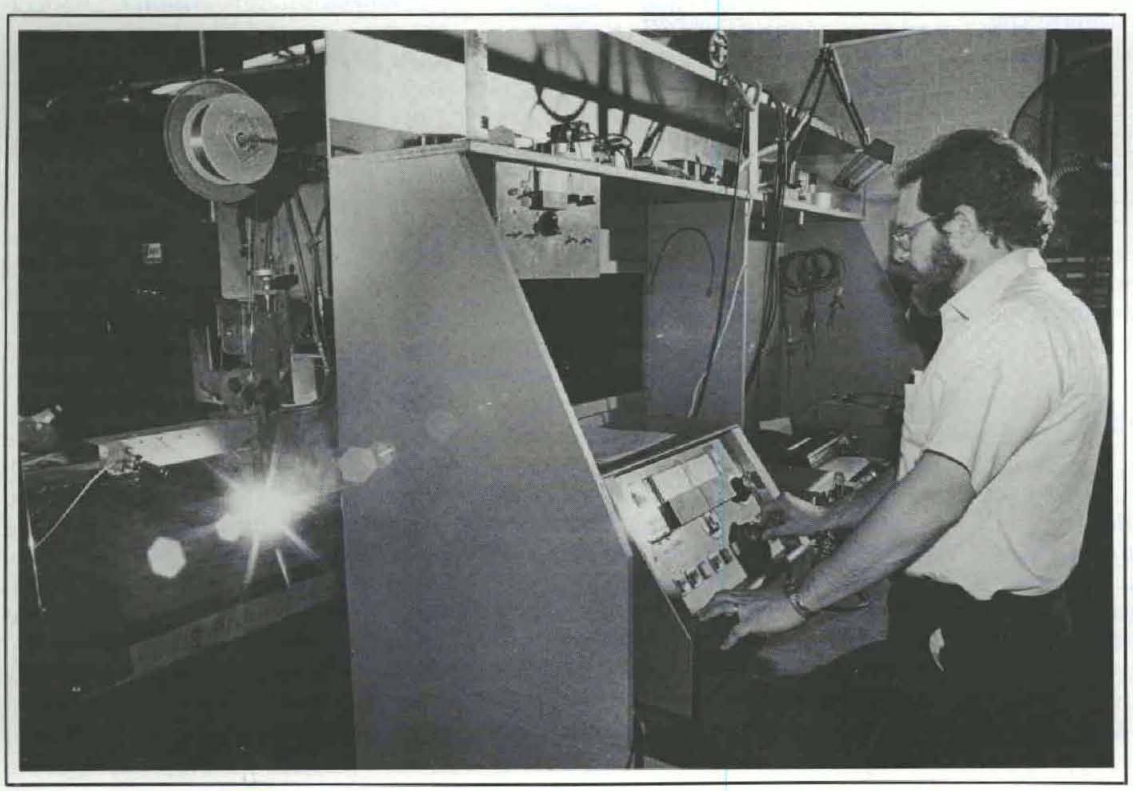
Base Support

The Army finances research and development (R&D) in support of its construction, operations, and maintenance of facilities — or what we call the base support mission. CERL is the Army's lead laboratory in base support research. Our research philosophy centers around the idea that quality products are those that are routinely used by our Army customers. If this does not occur, the Army is not seeing a direct benefit from its research investment.

The transfer of base support research products into Army use poses a challenge uncommon to most Army research organizations. The challenge is to integrate new technologies into the daily activities of the wide variety of public and private sector organizations involved in the Army's base support mission. This has to be done without the benefit of special Army funds to implement the technology. In the base support arena there is no 6.3b and 6.4 money available for implementation.

Many of the research products from the base support program will be incorporated into military facilities largely through the civilian construction industry. Approximately 80 percent of the architectural and engineering services required are provided by civilian firms. Almost 100 percent of the construction effort is provided by civilian contractors. Thus, for the Army to benefit from its own R&D products, it is essential that the civilian providers of services and equipment use those products in supporting military needs.

The responsibility for the management and oversight of base support activities belongs to the U.S. Army



A CERL researcher conducts lab tests on the CERL Weld Quality Monitor. (Photo courtesy of the Champaign-Urbana News Gazette.)

Corps of Engineers divisions and districts, and the Directorate of Engineering and Housing (DEH) at each installation and major command (MACOM). These organizations make up another major user of base support technology.

The Corps offices are largely responsible for the design and construction management of new and rehabilitated facilities. The DEH offices are largely responsible for the programming of new construction and repair projects as well as the daily operations and maintenance of these facilities.

The Stevenson-Wydler Act of 1980 and the following Technology Transfer Act of 1986 have provided CERL and other federal laboratories with the mechanism for delivering a research product to users. These acts have cleared the way for federal research organizations to enter into business arrangements with outside organizations to make technology transfer a reality. Our experience at CERL has shown that taking the product to the marketplace can be achieved more effectively by working with private industry and other public organizations.

These outside organizations are often better suited to market government products back to our Army users. They bring into the venture a source of funding unfettered by restrictions often associated with appropriated funds. The private sector has invested over $2.5 million towards the development and marketing of CERL products.

The marketing orientation of these outside organizations better prepares them for developing a technology package that can be easily used by our Army customers. Their involvement ensures that after-the-sale support will be available to our Army customers once the technology has been procured.

Marketing Technologies

Federal laboratories typically are ill-prepared to market technologies to users both within and outside the Army. These activities begin with publicizing the availability and applicability of a technology. The technology must then be made available to Army users through existing federal procurement procedures. Finally, after-the-sale support must be provided to assist the users in implementing the technology.

The challenge is to integrate new technologies into the daily activities of the wide variety of public and private sector organizations involved in the Army's base support mission.

As discussed earlier, other public and private sector organizations are better suited to do some of these activities. CERL has used several mechanisms to market the use of technologies. Many of these mechanisms came about as a result of authorizations provided by the technology transfer legislation.

Marketing Mechanisms

Military Transfer Initiatives. Several mechanisms exist within the Army to authorize the use of a technology and provide guidance on its application. Technical manuals, guide specifications, and engineering regulations are some of the formal guidance documents used to provide information on innovative technologies. Training on the technologies is incorporated into PROSPECT courses administered by the Corps of Engineers Huntsville Division. Also, presentations on technologies are made at conferences or workshops attended by Corps and DEH personnel as a way of generating awareness.

Exclusive Licensing Agreements. Exclusive rights to government R&D products can be awarded to firms for patented products. The Department of the Army has entered into an exclusive five-year licensing agreement with two firms to complete product development, manufacturing, and marketing of two inventions patented by CERL. These inventions are the weld quality monitor and the ceramic anode.

The firm bears the entire cost of the manufacturing and marketing effort. CERL provides consulting and technical assistance to the firm on a cost-sharing basis during the initial tooling-up process. CERL's involvement in this stage is to ensure that the final product meets quality and performance standards required by the Army. The federal government receives a royalty — in these cases five percent — based on the gross sales of the product.

These licensing agreements can include provisions for a continuing joint research effort between the firm and CERL to further improve the capabilities of the invention. The licensee on the anode has developed four different versions of the anode for specific applications.

The licenses were awarded for these products in 1984. They were the first agreements of their kind in the history of the Corps of Engineers. APS Materials of Dayton, OH, sold their first order of anodes within a few months of the signing. The Corps of Engineers has been using the anode to prevent corrosion on lock gates, water towers, and underground piping systems.

The National Standard Corps of Niles, MI, began marketing their ARCHON II system in early 1987 following an extensive development program. Their marketing efforts have been directed toward assembly line type manufacturing activities.

Cooperative Research and Development Agreements. Cooperative Research and Development Agreements (CRDA) were an outcome of the Technology Transfer Act of 1986. In Fall 1987, CERL entered into CRDAs with industry for two software products. The Voice-Operated Inspection System (VOIS) is a system for automating the report writing activity of an inspection using voice input. The Teaching Assistant Program is designed to assist engineers and students in learning concepts of computer-aided drafting and design systems.

Under the CRDA terms, the company will complete the development of the CERL software or update it as needed. The company is expected to provide followup support to Army users of the product after the sale. The company is free to market the technology to non-military users. Royalty provisions have been included in this type of agreement.

The Automated Sciences Groups (ASG) Inc., of Silver Spring, MD, developed a generic program for VOIS to enable users to develop site specific

inspection reports. This followed CERL research which proved the VOIS concept was a viable option for the Army. ASG has opened up a subsidiary solely devoted to market and service the VOIS product line.

Electronic Courseware Systems Inc., of Champaign IL, plans to market the Teaching Assistant program to both commercial users and schools with programs in computer aided design and drafting.

Use of Designs for R&D Products. Prior to the passage of the Technology Transfer Act of 1986 and the establishment of CRDAs, CERL would make designs of its products available to manufacturers. This mechanism was used for CERL products which were not patented.

CERL has provided designs to companies for the Portawasher — a machine for cleaning trash dumpsters in place — and control panels which can be retrofitted onto heating, ventilating, and air-conditioning (HVAC) systems in Army facilities. Another technology released to industry under this arrangement is the Paint Test Kit used in evaluating paint.

ERL provided designs of its products to firms with the technical expertise and interest in furnishing the product to the Army. CERL reviews and tests prototypes to compare performance versus military standards to ensure production models meet Army needs. The designs are provided to the firms at no cost. The firm bears all production and marketing costs.

At last count there were three firms marketing various versions of the Portawasher. The HVAC control panels are available from Johnson Controls Inc., of St. Louis, MO, and Staefa Industries out of Lynnwood, WA. Other firms have inquired into producing these panels. The Paint Test Kit is currently being produced by the Nucleus Corp. of Madison Heights, MI.

Professional Association Adoption of R&D Products. This mechanism is for a professional society or trade association which chooses to make a non-patentable product developed by a CERL researcher available to its constituents. The American Public Works Association (APWA) has assumed sponsorship of CERL's Pavement Maintenance Management System (PAVER). CERL provided the PAVER program to APWA at the cost of reproducing both the program and documentation.

APWA modified the PAVER program to meet civilian needs using its own resources and paid CERL consultant fees to assist in this effort. APWA provides over the phone support to users, maintains the computer program, and offers training courses in its use. APWA makes PAVER available to member cities, counties, and consultants for a cost designed to cover its expenses for managing these transfer activities.

In 1987, APWA began making available to its members a microcomputer version of the PAVER program which was also developed by CERL. Over 90 counties and municipalities are using PAVER and Micro PAVER as a result of APWA's efforts.

Support Center Arrangements. Centers have been established at the University of Illinois at Urbana-Champaign (UIUC) to assist military and non-military users apply CERL products in support of military activities. A center can also support the use of the technology for non-military applications via private arrangements with the center management.

These centers work especially well for providing support to computer programs developed by CERL. Centers have been established for the Environmental Technical Information System (ETIS), Building Loads Analysis and System Thermodynamics (BLAST) program, the use of microcomputers for managing DEH activities, and Micro PAVER.

The sponsoring academic department of UIUC responds to phone requests on using these computer systems, handles users fees, provides training courses, and assists CERL in continuing research on the system. Support centers are funded by the Army and by users fees from non-military users.

The Technology Transfer Payoff

The research program at CERL has provided a 34:1 return on investment for the Army. This number was identified by an outside auditor examining 22 CERL products. This potential savings will not be realized Armywide unless these and other technologies are put into daily use. Before this can happen, the Army needs to establish better mechanisms to bring the products to the Army marketplace.

The financial investment and expertise from these organizations help stretch available federal research money and result in high quality products for the ultimate users.

The recent technology transfer legislation has given us the tools to enlist the aid of non-Army organizations. The financial investment and expertise from these organizations help stretch available federal research money and result in high quality products for the ultimate users. Their participation ensures our products are available to our Army customers. Our success at CERL shows that technology transfer, as envisioned by the recent legislation, can become a reality.

DR. L.R. SHAFFER has served as technical director of the Construction Engineering Research Laboratory since its inception in 1969. In 1987, he received the Peurifoy Construction Research Award from the American Society of Civil Engineers and was named as engineer of the year by the Army Corps of Engineers.

THE ACQUISITION INFORMATION MANAGEMENT PROGRAM

A new program which will provide an integrated source of materiel acquisition information has been approved by the assistant secretary of the Army for research, development and acquisition (RDA). Known as the Acquisition Information Management (AIM) Program, it is intended to support the Army's overall acquisition mission through more timely and comprehensive information resources.

Today's Army acquisition information systems are, for the most part, independent of one another and contain redundant and inconsistent data. These "islands of information" performed adequately prior to the 1987 Army reorganization. Changes in systems technology, organizations, missions, and staffs have made a revision in the information systems needed to support the future Army acquisition process both necessary and possible. Thus, was born the AIM Program.

The AIM Program, once implemented, will provide the Army's acquisition community with a readily accessible, comprehensive information network that is interactive and responsive to Army-wide requirements. Data in the AIM network will be obtained from authoritative sources and will be continually reviewed to insure that it is both valid and useful.

AIM will integrate acquisition information from a variety of data bases in order to satisfy specific requirements. The program encompasses the entire range of procedures associated with the materiel acquisition process including R&D, procurement, technology, contracting, costs, scheduling, and performance.

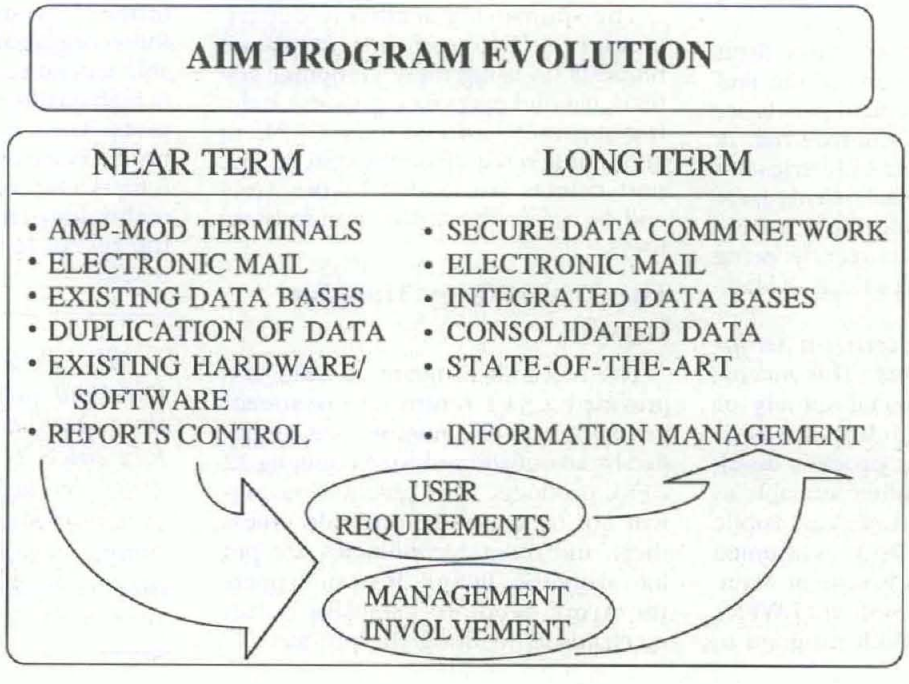
When fully implemented, AIM will electronically connect all program managers, program executive officers (PEO), the Information Systems Command, the Army Materiel Command, the Training and Doctrine Command, the Strategic Defense Command, the Corps of Engineers, the Surgeon General, the Operational Test and Evaluation Agency, HQ, Department of the Army, and the Army secretariat and staff.

AIM will evolve from user requirements, be developed in a well documented modular process, and be flexible to accommodate organizational change and emerging technology. Army acquisition community participation will be ensured through functional user groups which will integrate and articulate their information requirements. Thus, implementation of AIM will be practical, cost effective and evolutionary. Figure 1 shows the near and far term approaches to accomplish the AIM mission. These approaches use preplanned product improvements, block modifications and the Army's streamlined acquisition process.

In the near term, one to three years, AIM will use existing systems and data bases to integrate current classified acquisition information sources via a single logical network such as ARPANET and MILNET. Currently, phase one plans call for AIM to provide the following:

- collection and definition of requirements from users of acquisition information;
- support for the Planning, Programming, Budgeting and Execution System operating environment;
- provision for limited transmission of classified data from

Figure 1.



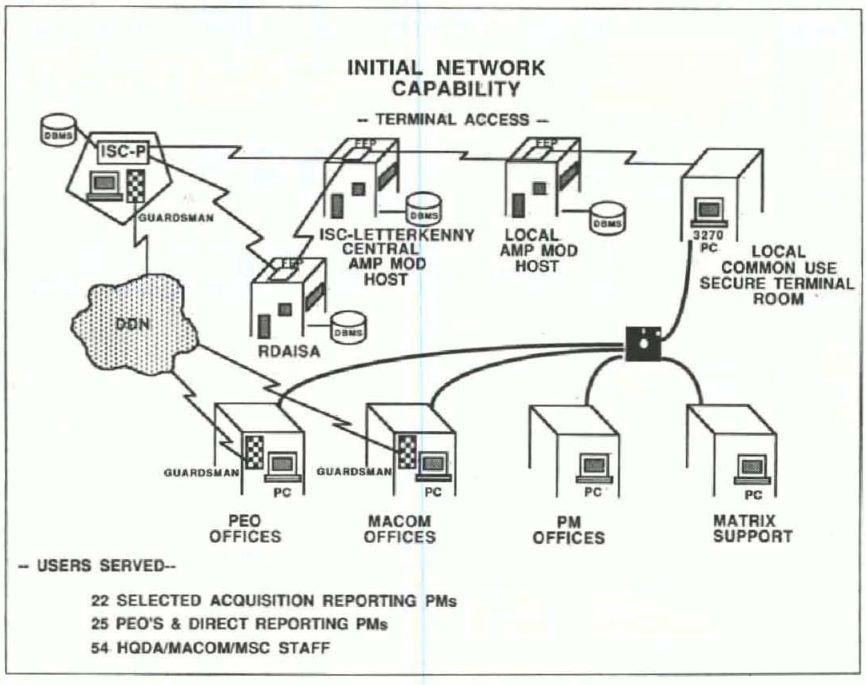


Figure 2.

acquisition data bases at the Research, Development and Acquisition Information Support Activity, the Logistics Program Support Activity, and the Materiel Readiness Support Activity;

- establishment of a classified electronic mail network to assist in implementing the PEO concept;
- development of an automated tool for decision support and management analysis of critical acquisition processes and report formats for reporting program status to the Army Acquisition Executive and the HQDA staff;
- assembly of an integrated acquisition data element dictionary;
- assignment of ownership of source data elements to the responsible organizations;
- synchronization of the update of information; and
- inventory of the existing RDA hardware and software systems.

The initial AIM capability is being developed around the AMPMOD network which was developed to provide classified data transfer between the Information Systems Command at Letterkenny and most of the AMC major subordinate commands. That established capability is being upgraded to include faster, more flexible and reliable secure communication and to include enhanced services at key sites such as the Information Systems Command at the Pentagon, the RDA Information Support Activity, and HQ, AMC.

Provisions are being made for each of the PEOs to have access to the file transfer capability provided by Army Materiel Plan Modernization (AMPMOD) and its newly developed E-mail system. As a separate but related capability, Guardsman encription devices are being fielded to various key participants in the AIM network. This new technology provides the capability for personal computers to transmit and receive classified information over otherwise non-secure communication lines. While transmission speeds are limited, this Guardsman combined with this improved AMPMOD network will provide a substantial interim classified capability (as shown in Figure 2) while overall requirements are developed in greater detail.

The AIM Program includes the implementation of a standard specialized information system for PEOs and PMs. This effort is centered around requirements under development by a user group consisting of PM, PEO and Army Materiel Command representatives. The goal is to provide PEOs and PMs with the capability to maintain one integrated data base within their office.

The PEO/PM data base will provide a single consistent source of project data to the numerous data systems throughout the acquisition community. This initiative will also include a commercial project scheduling application which will run on UNISYS 500/80 minicomputers.

Other features of the PEO/PM Program Management Information System are office automation and other functional applications performed within PEO and PM offices. Two "Beta Test Sites," PM AIM and PEO Combat Support Aviation, will be used to demonstrate initial automated capabilities and validate requirements as they evolve.

In the long term, FY 91 and beyond, the user requirements that are defined in the initial effort will be used to design relational, distributed AIM data bases and interactive network solutions. Such a design will be developed on a top-down basis to satisfy the top levels of Army management, but will be based upon validated requirements built from a bottoms-up perspective of the ultimate users.

AIM will also provide a fully secure network to access and extract data, either locally or remotely, from state-of-the-art hardware systems. Through automated support and executive analysis tools, it will also assist users in their decision process, and facilitate communication and reporting through an integrated electronic mail system.

The AIM Program should significantly enhance the Army's goal of fielding the best possible equipment to support the soldier in the field by providing a central core of the key management information for the acquisition community.

ARMY ORSA FELLOWSHIP PROGRAM

A major goal of the Operations Research (OR) Career Program, Engineers and Scientists (non-construction) Career Field, is to provide developmental opportunities for OR careerists which will ensure Army analytical excellence while providing for individual career development. One such opportunity is the Army Operations Research and Systems Analysis (ORSA) Fellowship Program.

In 1985, the ORSA Fellowship Program began as an Army Materiel Command (AMC) pilot program designed to provide participants exposure to the role of operations research in Army decision making as well as exposure to new OR techniques/methodologies. The pilot program was allocated one DA (central) long-term-training space which was utilized as two 6-month developmental assignments. Sponsoring organizations were HQ AMC and the Deputy Under Secretary of the Army for Operations Research, DUSA(OR).

Due to the overwhelming success of this pilot program, the ORSA Fellowship was expanded Army-wide in 1986 and allocated four 6-month developmental assignments (two DA LTT spaces). Both sponsoring organizations and participants are competitively selected to ensure that the best developmental opportunities and most qualified careerists make up the program.

To date, the following organizations and individuals have participated in the program.

	Sponsor	Fellow/Organization
FY85	DUSA(OR)	Sharon Vannucci, Ballistic RDE Center
	HQ AMC	Wesley McElveen, Test Measurement and Diagnostic Equipment Spt Group (Redstone)
FY86	DUSA(OR)	Kenneth Dalton, Army Materiel Systems Analysis Activity (AMSAA)
	HQ TRADOC	Gwendolyn Jones, Communications-Electronics Command
	HQ AMC	Walter Arnold, AMSAA
	CAA	Lambert Sebastiani, HQ AMC
FY87	DUSA(OR)	Robert Orlov, Concepts Analysis Agency
	HQ TRADOC Analysis Command	Tommy Dean, Corps of Engineers
	DCSOPS	Donald McCoy, TRAC (WSMR)
	Program Analysis & Evaluation	Jimmy Thomas, HQ AMC

After action reports on the fellowship have all been favorable — both from the sponsoring organization and participant. An example of one participant's experience follows:

Lambert Sebastiani, formerly HQ AMC, was selected for the FY86 fellows program at the Concepts Analysis Agency (CAA). His assignment focused on development and application of diagnostic checks for wartime requirements for ammunition materiel, and petroleum results. He also participated in a war game excursion conducted on the island of Hokkaido which used the contingency force analysis wargame model.

In his after action report, Sebastiani stated that the Army ORSA Fellowship was the highlight of his federal career and significantly contributed to his being selected for his current position with The Joint Chiefs of Staff. Although Sebastiani is no longer an Army employee, we feel that the goal of the fellowship to provide developmental opportunities is exemplified by his success.

A synopsis of comments from sponsoring organizations include the following:

- "In line with the purpose of this program, her exposure to the Department of the Army Headquarters and a sample of our current activities should not only enhance her career, but also make her more valuable to your command and increase mutual understanding within the analytic community."
- "The ORSA Fellowship Program is exceptional. Both the individual and CAA have benefited by this program."
- "I am continually pleased with the caliber of people we are attracting to the program and hope the program grows allowing other headquarters organizations to participate in the fellows program."

Although the Army theme for 1988 is Training, funding for the ORSA Fellowship (and many other fine civilian training programs) is in doubt due to mandated federal budget cuts. We are fighting hard to keep the fellowship program but there are many difficult choices ahead for senior Army leadership, given the need for difficult reductions and other national priorities.

The RDA community has been instrumental in making the ORSA Fellowship Program a success. We look forward to your continued support of this exciting development opportunity.

The preceding article was written by Marie Acton, the functional proponent for operations research in the engineer and scientists career field.

NEWS FROM THE MAM PROPONENCY OFFICE

Ziomek Succeeds Oliver

LTC "Ollie" Oliver has moved on to a new assignment and has been replaced by LTC Dan Ziomek formerly of the Natick RD&E Center.

AR 611-101 Change

A major change in AR 611-101 (Commissioned Officer Classification System) will now allow Materiel Acquisition Management (MAM) (6T) positions to be coded with either the branch or functional area in the primary position of the MOS code, i.e., 11A516T or the reverse 51A116T. If the primary duties require R&D expertise, then the 51 should be in the first position. The change should be published in October 1988.

6T Requirements Validation

The number of MAM position requirements has grown rapidly in the last two and a half years, from just under 2,000 to over 3,000. Because of this growth, the MAM Proponency Office has initiated a project to validate the Army's total 6T requirement. The proponency office, in association with the U.S. Total Army Personnel Agency (TAPA), Soldier Support Center, National Capital Region (SSC-NCR) and U.S. Army Manpower Requirements and Documentation Agency (USAMARDA) will be conducting a scrub of all 6T positions in the near future.

As a first step to help us better define valid requirements at each grade, we have asked USAMARDA to delete the 6T from all positions that are not coded IAW AR 611-101. This action was previously coordinated with each MACOM and will eliminate most of the administrative errors in TAADS. A second step in the TAADS scrub will involve MACOM review of remaining 6T position descriptions to confirm acquisition duties. In the interim, officers should review their job descriptions to insure that the acquisition duties are clearly highlighted and skill 6T is properly entered on the job description, ORB and OER as part of the duty MOS.

In an associated action, the SSC-NCR has been asked to conduct a survey of all MAM officers. The results will help us to identify the skills, knowledge and attitudes needed at each grade for MAM officers and will also establish requirements for key MAM positions (LTC and COL). Current plans call for the survey to be distributed to all 6T officers late in FY 88.

Under Secretary of Defense (Acquisition) Robert B. Costello Discusses . . .

DOD EFFORTS TO

The following remarks by Und Robert B. Costello were presente Officials and High Level Acquisitio VA. His comments, which have bee with some current DOD efforts to "buying best value" — the theme

As we in the Department of Defense continue to do everything we can to improve our armed forces with affordable, workable, and quality systems, certainly the requirement for "buying best value" is one of our major objectives.

This theme appropriately encompasses many of our department-wide efforts now underway. These efforts include not only competition, but a number of related activities. We anticipate that these activities, when in place institutionally in headquarters and the field, should give us a more efficient and prudent means with which to get the job done.

I'd like to touch on three of these activities which fall within my "ten strategies," a goal I set for defense acquisition at the time of my confirmation hearings. I earnestly believe these strategies are do-able and work-able, and am pleased to report they are receiving positive reactions from industry and within the department.

But first, let's talk a moment about competition. Let me add my congratulations to the Army for having achieved a very significant record in recent years.

Here, statistics do tell a story. The number of annual competitively-awarded contracts has risen in the past five years from 48 percent to 88 percent. In 1984, you were competing 42 cents of each procurement dollar; today that figure is almost 59 cents. When we see this, we know the Army is living up to the intent as well as the spirit of competition. This record obviously reflects the leadership shown by Army acquisition senior management.

Now, I want to talk about three major strategies of interest and concern to you which are related to the subject of competition. These are concrete things we are doing in DOD to solve our problems, on which we have made substantial progress in the past.

The three areas are: Improving product quality, and reducing the cost of poor quality through total quality management; Acquisition regulatory reform; and Instituting a process called "could cost," which can be used in both a sole source environment and on competitive procurements.

These strategies range through all program milestones during the acquisition life cycle and are intended to streamline both:

- The methods by which we conduct business, by bringing them more in line with commercial business practices, while recognizing certain nuances peculiar to defense acquisition;
- The procedures used to increase quality and reliability and reduce weapon systems costs.

Now, on to the subject of improving quality through "total quality management."

What does quality mean? First, the word alone means: the composite of material attributes, including performance features and characteristics of a product or service to satisfy a given need. Translation: is the product good, and will it do the job for which it was intended?

In DOD, we have expanded application of the word quality and speak of total quality management. This management philosophy is a strategy being woven into the fabric of our acquisition system, awaiting only the eventual acceptance as daily routine. Simply, the goals are to: improve the quality of DOD products; and achieve substantial reductions in the life cycle cost of ownership of our weapon systems.

What will it take to achieve the goals? A lot. We must change the traditional inspection oriented focus on quality which comes too late in the development and production process, to emphasize a built-in quality process much earlier.

We must emphasize competition based on quality as well as cost, schedule and performance, and lowest bid. As you may know, DOD was directed by Congress in the FY87 Authorization Act to consider quality as well as price when evaluating competitive proposals.

We must continue to motivate and exploit the ingenuity and innovativeness of our people to achieve maximum, quality improvements in every program at every level. This is the program manager's responsibility.

We must encourage implementation of successful concepts such as statistical process controls and continuous process improvements. We must emphasize the use of sound, proven engineering design and manufacturing processes.

Our objectives include: making our procurement system more flexible to allow streamlining of our contractual requirements; improving interaction among designers, manufacturers, logisticians and users; effectively addressing quality as a factor in source selection; and giving extra consideration to companies whose products and services embody the new concept of continuous product improvement. To implement the strategy we will:

- Integrate current DOD management initiatives affecting quality, such as acquisition streamlining, competition, improving the transition from development to production, value engineering, and warranties;

'BUY BEST VALUE'

Secretary of Defense (Acquisition) earlier this year at a Senior Army Executives Conference at Fort Belvoir, edited slightly for publication, deal nsure that the military services are the conference.

- Revise all product specifications to replace the "acceptable quality level" concept with a "continuous quality improvement" concept;
- Stimulate use of new technology to enhance quality;
- Guide the radical change from reliance on detecting defects during end item inspection to an effective process control that prevents defects during manufacturing;
- Apply quality technology including automated process controls, self-correcting manufacturing processes, built-in diagnostics, and automated inspections;
- Institute an integrated training program to instill quality principles throughout government, including developing a career program for quality assurance personnel; and
- Encourage our contracting officers to look for ways to increase quality when preparing solicitations and negotiating contracts.

We are trying to change another outmoded concept, that of "minimum acceptable" quality. America's manufacturers have pursued this concept placidly resigned to a persistent level of errors, perceived as irreducible, as being the way of life. It isn't.

OSD is working with the services to identify key approaches. Many excellent tools have been developed. We are exploring more ways to hold program managers accountable for quality. Pilot acquisition programs will be selected. We will make the necessary changes to the federal acquisition regulations to incorporate the new changes.

It behooves both industry and DOD to work together. Industry must provide tangible evidence of its commitment to quality. Statistical process controls and total quality management are not just floor activities. They belong upstairs as well.

Management must openly assume responsibility for their product's quality and insist that "no defective products shall be shipped to the government."

Next, let's discuss regulatory reform. When we say regulatory, we are talking about the defense contracting system. Our goal here is to make it easier and quicker for managers and people in the field to get the quality products and services they require, when they want them, and at a reasonable price.

We want to move into a system where our contracting officers will feel at home using their initiative and innovativeness to provide the government with those products and services, while maintaining proper accountability.

Right now, defense contracting officers are not using all the authority the laws and regulations give them, for various reasons.

We are encouraging them to escape from their perceived constrained and restricted environment to one where they can exercise good judgement more in line with sound commercial business practices, and to make good, solid business decisions. We want quality and timeliness to be decisive factors, not just price alone. We have taken a major step in this direction with our pilot contracting activity program.

This program involves 36 activities of the services and the Defense Logistics Agency. The Army's list includes TACOM, Fort Benning, the Tulsa Engineer District, and Fort Stewart, to name a few. We established this program to capitalize on the enthusiasm of people in the field. We are allowing contracting officers to show initiative and creativeness while working within the law.

We are identifying procurement laws and regulations that are unnecessarily complex and restrictive, testing new and different procurement methods, and testing procurement methods more in line with commercial practices.

Under the test, the services and the Defense Logistics Agency may issue class deviations to the Federal Acquisition Regulations and the DOD supplement, and waive any DOD procurement reg not required by statute or executive order.

We are doing other things of note. We've relaxed the rules telling people they had to buy from a central supply system such as DLA or the General Services Administration. Now they can purchase these items locally when it's a better deal for the government.

Also, we are eliminating DOD's use of GSA's mandatory federal supply schedules and, for items already on the optional supply schedule. Our contracting people no longer have to recompete to procure the items. These changes will save a lot of time and money.

Next, let's discuss the principle of "could cost." This is a new concept in the acquisition vocabulary.

Could cost is designed to achieve the best quality and price for goods purchased. The basic concept of could cost is that every government requirement and every facet of the contractor's operations is open to challenge.

Could cost encourages innovative thinking by both government and contractor to achieve a substantial reduction of the bottom line. It says we should be just as creative in the business sense as we are in the technical sense.

Could cost is what a program could cost if we, the government and contractor, eliminate all the non-value added work done or required by both parties. Could cost examines a requirement's value and determines if its value is worth its cost. There is a basic difference between "should cost," with which you probably are more familiar, and could cost.

Should cost analysis is a specialized analysis form used to evaluate the cost of production programs. It evaluates and challenges a contractor's management and operating systems to identify uneconomical or inefficient practices. Part of should cost is based on lessons learned and other historical factors.

Could cost can be accomplished in conjunction with a should cost, a cost analysis, other methods of evaluating, and negotiating contracts.

If agreed upon by both parties, could cost can be applied at any time during the life of a contract, and at any point during the life cycle of the acquisition process. It is best if introduced early so advantages accrue all along.

Please do not associate the concept of could cost with value engineering, even though, admittedly, there is some similarity. Could cost is like "value contracting," using a like principle of value engineering on a much broader spectrum. Could cost does not confine itself to the technical aspects or the end product per se.

We would use this concept to reduce the cost of follow-on programs and special access programs, and programs in production where we can't compete, perhaps because duplicative tooling would be too costly.

I want to emphasize: could cost does *not* replace competition, and it is *not* intended only for sole source situations. It really is the natural order of how a business decision is made.

It means looking at everything — the type of contract, the number of audits, the organizational structure, required documentation, quality systems, every aspect of business.

Contractors with whom I've discussed this tell me it's possible to reduce costs a minimum of 25-30 percent. Now, that's significant. Since government has the leverage, advantages to the government are obvious, but what about to the contractor?

For us to achieve mutually beneficial relations with contractors, could cost must be attractive to them. Contractors who participate should be rewarded when substantial savings are realized. By playing could cost, the contractor's competitive position will be enhanced. In these days of fewer and fewer defense dollars, he needs every leg up possible. What better incentive?

The could cost principle will be applied to one pilot program from each service.

We'll await the results of these efforts to see whether regulations need to be changed, or new directives written. My feeling is that directives aren't always effective or necessary in getting things done — it's the involvement of people in the process that makes it happen. I must say I'm encouraged and optimistic.

We are calling these and many of our strategies "cultural changes." Such cultural changes take time. They evolve gradually. They require selling and cooperation. It takes leadership to convince people and processes within the established institutions that the changes will make everyone's job easier, and provide the best and least expensive weapons for the field.

To shift gears a moment, I'd like to speak to some relevant points concerning the relationships between program managers and contracting officers, and encourage the Army to keep up the close liaison and communications between them.

The first item concerns DOD's recent move toward more fixed price contracts. This is not intended to get into details or policy on fixed price contracts, but rather to say that the PM and the contracting officer can and should continue to work closely to assure an even-handed, tough-minded fairness in dealing with industry, a balance.

The self interest of the government as an informed and competent buyer must be intrinsic in these dealings. However, such a buyer neither ruins the suppliers he must depend on nor declares open season on the U.S. Treasury. I would like to see the PM, working with the CO, or KO, whichever acronym you prefer, have more leeway on the contract type.

I would like to see PMs including the CO in program planning, if it's a new program, or at various points along the development cycle as it progresses. Include the CO in program management meetings. Make him or her part of your program management team from the outset.

If your acquisition strategy has competition early, good. But it should not stop there. Mid-course corrections to the acquisition strategy can be made at any time. It is still never too late to compete some aspects of your program, such as software and integrated logistic support, even if you are locked into one prime.

To both PM and CO, I suggest this challenge. By answering the basic business questions from day one, you lower the risk of cutting your options later or tying the hands of your successors without adequate maneuvering room.

Before I conclude, let me emphasize DOD's commitment to small and small-disadvantaged businesses. Small businesses are a vital element in our national industrial base. We want them to participate in defense contracting and have their fair share of our market. We want them to prosper and grow. They are the lifeblood of our free enterprise system.

Last year, small business received over $26 billion in DOD prime contract awards, representing some 19 percent of our total prime awards. However, small-disadvantaged business accounted for only $3.1 billion, or 2.3 percent.

Congress has tasked DOD to improve these figures to five percent of all procurement, RDT&E, military construction, and operations and maintenance dollars. To attain this goal, we must rely on our senior officials such as yourselves to adjust the temperature and build the right climate.

Continue to pursue competition, and then consider options such as could cost after you have competed. Remember, best value includes not only competition but also multiyear contracts, quality, common sense adherence to regulations, could cost, and other applications I call "approaches of the 80s."

Work every angle within your authority to buy best value for the Army, and in so doing ultimately help DOD achieve quality products at lower costs.

TACOM Seeks High Survivability Tire

The U.S. Army Tank-Automotive Command (TACOM) is in the midst of a long-term program to develop improved military tires and related components that would permit vehicle operation following major tire damage, thereby allowing troops to complete missions before stopping to repair or replace a tire.

Referred to as survivable tire systems, one such concept is already in use on the Army's HMMWV (High-Mobility Multipurpose Wheeled Vehicle). It is a run-flat system which features a metal insert inside the tire that is shaped like the tire's profile and helps to support the vehicle's weight while keeping the tire on the rim.

This tire can continue to operate for up to 30 miles at speeds up to 30 miles per hour on hard-surface roads after it has lost air pressure. The goal of the current tire program, however, is to develop tires that can provide mission completion capability on cross-country terrain as well as on hard-surface roads at appropriate speeds after sustaining damage.

Engineers in TACOM's RDE Center are looking at survivable tire systems in four categories. In addition to the run-flat concept, there is the self-supporting tire. This is a tire which, by its design and construction, does not require any additional components to make it a survivable tire after loss of air pressure.

The third category includes those tires which use either a liquid or semi-solid sealant or a solid inner liner which prevents them from going flat when damaged. Tires in the fourth category are filled with a solid substance — usually polyurethane — and thus require no air pressure to support a vehicle's weight.

The tire research program, which got under way in February 1986, is a joint effort that also involves the major U.S. tire and wheel manufacturers, several foreign companies, the U.S. Army Training and Doctrine Command (TRADOC) and the Army Development and Employment Agency (ADEA). ADEA, which is located at Fort Lewis, WA, is a DA agency responsible for developing near-term force improvements and the equipment needed to support them, and is a field operating agency of the Office of the Deputy Chief of Staff for Operations and Plans (ODCSOPS).

The program is being managed by a tire task force initiated in September 1985 by then Director of the Tank-Automotive Technology Directorate of TACOM's RDE Center COL John H. Van Zant (now the center's acting associate director for technology).

According to the RDE Center's MAJ Louis Ullrich, who heads the task force, its formation marked the beginning of a new trend toward increased Army involvement in military tire development.

"The Army in the early 70s," he explained, "had made the decision to rely entirely on industry for tire development. As a result, we no longer had a group that was doing any tire work within the RDE Center or within TACOM. However, we found that there were problems that had cropped up concerning tire specifications and making improvements in tires as well as accepting improvements in tire technology as they came along. So it was determined that the Army should set up an R&D program.

"The program has three basic goals," Ullrich added. "These are: to improve the survivability of tires so that they could operate after sustaining damage; reduce life-cycle costs by improving overall tire durability for better tire mileage; and to improve vehicle mobility through such components as central tire inflation systems that would allow a driver to change tire pressure from inside the vehicle to permit operation on different types of terrain."

Ullrich said that in research efforts to date, ADEA and the Combat Developments Experimentation Center Board, with technical and contracting assistance from TACOM, conducted the first survivable tire system tests in April and May 1986 at Fort Lewis. He said the tires and related components used in the tests were produced by several manufacturers.

According to Ullrich, concept prototypes representing each of the four categories were involved. The tests consisted of shooting the tire with small-arms fire and operating them over a combination of paved highways, secondary roads and cross-country terrain with HMMWVs and surrogate fast attack vehicles to see how far they could go.

"We had concepts that achieved 100 miles and were still able to operate," said Ullrich. "Of course," he added, "they were not repairable after the 100 miles, but the important thing is that they were able to go that far."

Ullrich said ADEA is continuing to evaluate other survivable tire system candidates in small quantities as they become available and is providing TACOM with all test data. He also said TACOM awarded contracts late last year for delivery of other prototypes which will undergo more thorough user and technical testing beginning in the first quarter of FY89.

Moreover, Ullrich said TACOM's tire laboratory, which had not been used for tire testing since the early 1970s when the Army decided to discontinue laboratory tire development, is now being upgraded with new equipment, and is expected to play an important research role. "The tire lab will not be a large testing facility," Ullrich explained. "But we will have the capability of validating some of the testing that industry is doing as well as simulating some of our own field-testing."

When asked if he thought the state of the art of tire technology has advanced sufficiently to make widespread Army use of tires capable of operating for 100 miles after sustaining major damage possible in the foreseeable future, Ullrich said: "I think there are some concepts that are close to being useable in the prototype stage. But I think there will need to be some further development to get them to the state where they could be produced cost-effectively in large quantities.

"I also think," he continued, "that there are some things which could eventually happen to give use better mileages than the 100-mile range — at least with some of the lighter vehicles."

The preceding article was written by George Taylor III, a technical writer-editor for the Army Tank-Automotive Command.

Army Studies Rift Valley Fever

A team of virologists and entomologists from the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), at Fort Detrick, MD, travelled to Senegal late last year to study the first documented epidemic of Rift Valley Fever in west Africa. The epidemic involved the countries of Senegal and Mauritania in the Senegal River basin.

Investigators from USAMRIID have studied Rift Valley Fever outbreaks in east Africa and hope to validate their findings in the west Africa setting and apply developing technology to predict and intervene to prevent new outbreaks.

The Army team postulates that Rift Valley Fever virus is spread during periods of heavy rainfall as a result of "cryptic enzootic mosquito foci." In Kenya, they concluded that floodwater Aedes mosquitoes serve as a persistent reservoir of the Rift Valley Fever virus by laying infected eggs, which produce new generations of infected mosquitoes during the flood conditions.

When the annual rainy season is more severe, or when the ecology is perturbed by dams or irrigation projects, these mosquitoes hatch in greater numbers and other mosquitoes reach high densities, resulting in epidemic spread of the virus to domestic animals and man.

Finding a low frequency of Rift Valley Fever antibody in many different areas of Africa during non-epidemic periods supports their conclusion, and argues that the attempt by governments in affected areas to control the disease in livestock through quarantines will be ineffectual.

Initial research indicates that the outbreak in Senegal followed unusually heavy rains, an increase in irrigation projects in the river basin, and completion of a new dam near the mouth of the river that expanded the flood plain and lowered water salinity above the dam. All these factors enhance mosquito breeding.

The studies conducted in east Africa included the use of meteorological satellites of the National Oceanographic and Atmospheric Administration to attempt to predict outbreaks of Rift Valley Fever by monitoring rainfall, growth of vegetation, and other environmental factors conducive to mosquito breeding. The USAMRIID investigators hope to refine the prediction system through application in west Africa.

In support of intervention in the Senegal epidemic, the USAMRIID team demonstrated new methods for rapid and definitive diagnosis of the virus. They identified the virus in patient serum samples using antigen capture ELISA and hybridization with cloned Rift Valley Fever virus DNA tests developed at USAMRIID.

In collaborative studies with the Institut Pasteur in Dakar, Senegal, the team identified antibodies in man and domestic animals, and provided almost immediate diagnosis of acute cases. The test materials were given to the Institut and will be helpful in their continuing research on the disease.

An important mission of USAMRIID is the development of vaccines and drugs to protect U.S. soldiers from infectious diseases that require high containment. Vaccines which protect both humans and animals from Rift Valley Fever have been developed at USAMRIID. Policy decisions on the use of Army vaccines under circumstances such as those recently occurring in west Africa have not been finalized, but use of the vaccines remains a possibility.

ELINT System Will Improve Data Storage

Tobyhanna Army Depot engineers and designers are working on an electronic intelligence system (ELINT) that will give commanders an enhanced data storage capability.

The Worldwide Military Command and Control System Transportable Host Computer van is a system that was designed at Tobyhanna and fabricated in the depot's Shelter Facilities Section.

The depot has been associated with the Transportable Host project for about three years. Design, fabrication and delivery to the first customer, U.S. Central Command (USCENTCOM), the organizational successor to the Rapid Deployment Force, was a depot success story in which the system was designed and built quickly and under budget, says Michael L. Cunningham, supervisory mechanical engineer.

Tobyhanna is designing and building another system for the U.S. Army, Europe (USAREUR). Known as the USAREUR Transportable Host (UTH), it serves the same function as the first system, but has a different configuration, says Charles A. Karcutskie, mechanical engineering technician. "USAREUR wanted to add some equipment that wouldn't fit into the original shelter used by the USCENTCOM system, so we reconfigured the new system into two smaller shelters," he says.

"Both systems will serve as central storage points for intelligence data taken from the memory banks of individual units' intelligence computers. Those units will then have room to process fresh data," he says.

Both systems can communicate through either a line-of-sight mode or via satellite, giving it several deployment options, says Cunningham. They can operate in a stand-alone fashion by attaching a generator shelter and an uninterruptable power shelter which guarantees power for the computers if outages occur, he says.

Both systems can be loaded onto transport aircraft without the use of special equipment. The UTH is carried on custom-designed "air-ride" trucks, and can be directly loaded onto the aircraft, Karcutskie says.

Both Cunningham and Karcutskie see the program as having a long-term depot commitment. "If other commands need this, or similar systems, they'll ask to have one built, and Tobyhanna is in the best position to satisfy that demand," Karcutskie says. "We see a possibility of more systems, either like this, or in different configurations being built here," Cunningham says.

"Tobyhanna will provide initial operator training with the help of specialists from the Army's Information Systems Command, Fort Huachuca, AZ, and the private manufacturers of the computer equipment," he says.

To further the training effort, a team of electronics equipment specialists in the depot's Publications and Procedures Section, Production Engineering Division, wrote the technical manuals for the system.

Ammunition Airdrop Advances

Trends in battle planning, exemplified by AirLand Battle 2000 and Army 21, call for more maneuver, deception, and deep strike. Advanced technology, such as artificial intelligence and robotics, and new weapons with immense firepower and mobility will be integrated into the battle plans. The impact of this technology on airdrop delivery systems is constantly being reviewed so that future requirements can be anticipated and methods of meeting those requirements can be developed.

Currently, U.S. Army Natick Research, Development and Engineering Center engineers are working on several projects to alleviate deficiencies already identified by our review of the impact of the Army 21 concept on air delivery requirements. These include airdropping ammunition, support of the light infantry divisions and rigging air delivery loads at remote sites.

The major impact of Army 21 on delivery requirements is that more supplies will have to be provided to fighting units. Longer and more vulnerable land supply lines will lead to an increased need for airdrop resupply to non-airborne units.

While requirements increase, the number of rigging units will not and, therefore, present rigging productivity will have to be increased. Airdrop rigging is labor intensive and automation must be instituted to increase that productivity and reduce the impact of personnel shortages. Currently, the Natick RDE Center is looking into means of doing this, including the use of robotics for rigging. Modular containers will simplify handling by using either robots or other techniques such as industrial manipulators by providing standardized simplified lift points for all materials handling equipment.

Common transportation assets are also limited. Our capability to deliver increased quantities of ammunition forward will depend upon maximum use of available transportation, including aircraft, trucks, helicopters and fixed wing aircraft.

Another consideration is getting the ammunition and supplies retrieved from the drop zone by combat units in hostile environments as quickly possible. Therefore, airdrop delivered supplies must be organized to facilitate handling on the drop zone; lighter, less bulky modular containers being proposed may be the answer.

Some receiving units will have 2½ ton or 5 ton trucks; others will have High Mobility Multipurpose Wheeled Vehicles (HMMWV) or no vehicles at all. Modularized containers allow the unit to quickly break down the loads into a manageable cargo size portion, be it 2 ½ ton or 50 pounds. Incorporation of straps, handles, forklift slots, hooks or rings will enhance the receiving unit's capability to handle these containers.

If containers have an interlock method designed into them, a one point release mechanism can be used so that derigging time will be reduced to seconds. This decreases the amount of time a unit must spend on the drop zone and reduces their vulnerability to an enemy attack.

Investigation into current rigging methods and automation techniques lead to the conclusion that having ammunition loads placed into modular containers will improve air delivery capabilities throughout the entire system, including rigging, delivery and derigging of airdrop loads and will expedite transition from system mode containers into user portable containers.

Simplified rigging procedures result from use of modular containers and alleviate frequent reference to manuals while reducing the demands for manual labor for preparing specific configurations of loads and honeycomb absorption materials.

Energy absorption materials and tiedowns integrated into the containers will eliminate the need for layers of the honeycomb material presently used as cushioning. The use of metal containers rather than wood, and the requirement to drop at lower altitudes and higher speeds will increase the landing impact to the ammunition. However, the increased protective qualities of modular containers can reduce the impact and prevent damage to the load. This precaution is critical for some of the new large caliber rounds with nonmetal casing.

This move toward modularized metal containers is being driven by the need for NBC decontamination requirements. Specifically, protection for the loads is required to preclude CB contamination by the loads of soldiers, equipment and vehicles, and wooden containers are much more difficult to decontaminate, and are more susceptible to penetration by toxic agents.

The capability to free-drop these containers from low altitudes is also being investigated. The improved energy absorbing characteristics of these containers will allow free drop from low slow-flying aircraft onto many surfaces (sand, brush, etc.) with little or no damage to the ammunition.

A force multiplier effect results from the increased efficiency and reduced vulnerability of soldiers and supplies. Modular delivery will enhance the fighting efficiency and response time of any units being supplied via the modular airdrop system.

Army Tests New Recoil Mechanism

The first "actively controlled" artillery recoil mechanism has been successfully demonstrated at the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ. The mechanism is designed to take the kick out of the artillery, or at least part of it. Military big guns have long been heavy. Heavy was a requirement that enabled a weapon to stay in place or even to remain upright when the weapon was fired.

Based on the principle that every action has an equal and opposite reaction, it is obvious that when an artillery piece is fired, the recoil is earthshaking. With today's faster, more mobile military units, the artillery weight problem is too big a burden to bear, so the Army is attacking the problem at its source — the recoil.

Using ARDEC's large-caliber powder gymnasticator, a device which provides an economical means for experimentally testing and evaluating recoil mechanisms, engineers have tested an electronically controlled recoil mechanism, simulating the live firing of a 155mm cannon. A data base was

generated to describe how the recoil mechanism behaves during a typical recoil cycle. Once this was accomplished, an electronically controlled servovalve, provided under contract by HR Textron, Valencia, CA, was adapted to the recoil mechanism and the process repeated.

The servovalve was designed to improve performance by adapting to error-detecting feedback sensors. Unlike conventional recoil systems that throttle oil in a predetermined fashion, the electronically controlled mechanism employs a microprocessor to control fluid throttling. An electronically controlled valve reduces recoil forces by responding to feedback sensors during the recoil cycle.

The Picatinny test demonstrated that recoil force could be consistently controlled during weapon firing, and represents a significant breakthrough in recoil mechanism technology. The development has potential spin-offs to all artillery systems and is directly applicable to lightweight artillery efforts. Weapon stability during firing continues to be a major concern in lightweight systems; by introducing electronic control, recoil force can be tailored to enhance overall stability.

Additional benefits of electronic control are built-in prognostics, and the potential for simplified design and manufacturing processes of future recoil mechanisms. To date, 20 percent reductions in peak recoil force were consistently obtained through optimization of the recoil process.

25MM Type Classified

Bradley Fighting Vehicle (BFV) 25mm gunner training will soon be available at some 35 military installations. This is the result of efforts by a Picatinny Arsenal type-classification team that streamlined testing and cut through paperwork to meet a Defense Department ordered production speedup of a new, inexpensive practice round.

The Bradley's standard armor piercing (AP) 25mm round, the M791, has been the only round available for performing AP gunnery practice, including qualification firing. It requires a downrange distance of 14,000 meters.

Although many Army posts have the required fire and maneuver space, stateside only Fort Hood, TX, has a range that can accommodate BFV 25mm firing without seriously affecting other training, according to the Picatinny team. These other posts would have to literally shut down most of their other ranges and maneuver training areas to conduct 25mm firing.

The new practice version, called the M910, has a trajectory identical to the armor piercing munition to 2,000 meters, and has a maximum range of less than 8,000 meters. This shorter maximum range means that no limits will have to be put on gun elevations, as would have been the case with the standard round. It also simulates the standard munition in linking and loading, and in storage of rounds in the vehicle.

Fielding of the M910 will allow the bulk of 25mm live fire training exercises to be conducted on existing maneuver and gunnery ranges, opening up some 35 posts in the U.S. and the Federal Republic of Germany for both M2 and M3 BFV firing.

The M910 concept was initiated in 1985 as a full scale development program. A prime development contract was awarded to Ford Aerospace in August 1985, and similar contracts were awarded to Aerojet Ordnance and Honeywell Corp. in August 1986 to foster competition for the first scheduled production in 1989.

Mainly because of an urgent need for the M910 to support European BFV training, a request was made to produce a limited number of rounds in FY88. As a result, last March the Army Materiel Command added $15 million to its FY88 budget request for M910 limited production.

The following month, Picatinny accelerated its efforts to type classify the round because of the long lead time needed to prepare program documentation and the coordination necessary with other government agencies. The necessary testing, data reduction, data validation and independent evaluation reports were prepared in time to support a December 1987 in-process review.

Congress approved the funding for the program that month. The $15 million appropriation will purchase some 556,000 rounds. The first shipments are expected in the second quarter of fiscal year 1989.

The M910 development program is funded by the Army's program manager for the BFV system. The 25mm team of Picatinny's Close Combat Armaments Center has spearheaded this project. As a result of its efforts, the 25mm team has been nominated for the prestigious Army research and development achievement award.

Improved 81mm Mortar System Completed

The product manager for mortars has announced that the U.S. Army's airborne, air assault and mountain battalions and the U.S. Marine Corps' fighting forces will be strengthened considerably by the recent type classification of two new cartridges for an improved 81 millimeter mortar, which has been designated by the Army as the M152. Type classification means that an item or system is ready to be procured and fielded by the Army.

By type classifying the munitions — the M819, Red Phosphorus, Smoke and the M853A1, Illumination Cartridge — the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Picatinny Arsenal, NJ, completed its development for the totally new 81mm Mortar System. This innovative array is intended to replace the current M29A1 Mortar System.

Work on the pair of rounds at ARDEC's Fire Support Armaments Center (FSAC) finalizes a system capable of firing new cartridges at longer ranges and at higher rates of fire. This family of ammunition also includes two high explosive (HE) cartridges and two practice rounds.

John Feneck, system engineer for the improved 81mm system in FSAC's Mortar Systems Office, traced the 181's history to a co-development effort with the United Kingdom's Ministry of Defence that led to an improvement in their 81mm smooth bore, muzzle-loaded mortar and their HE cartridge. The mortar was later designated the M252 when it was type classified for use by the U.S. armed forces.

"This new weapon has a stronger tube than the old mortar and also uses a blast attenuation device," Feneck said. "The device was designed to improve crew safety by reducing

noice levels and blast effects at the gun site. This was accomplished by diverting the muzzle blast and noise up and away from the gun crew."

The British HE cartridge's performance was improved by replacing the point detonating fuze with the U.S. multi-option fuze. That fuze has multiple-setting capability for either proximity (3-13 feet above the target), near surface burst (0-3 feet above the target), point detonating (function on impact), or delay (for penetration of bunkers, roofs, etc.) after impact.

The fuze provided the mortar crew with a significant increase in flexibility and greatly enhanced performance for each fire mission. The setting may be changed numerous times without affecting operability.

"The other improvement to the British HE cartridge was the replacement of the propelling charges with a charge system that is waterproof and more durable under severe handling and transportation conditions," said Feneck.

The improved British HE cartridge was type classified for use by U.S. armed forces and designated the M821 High Explosive Cartridge. A companion HE round to this cartridge is the M889, which is identical except that it uses a less expensive point detonating fuze, the M935.

"The M889 cartridge with the M935 Fuze provides reversible selection between the point detonating and delay modes," Feneck added. He went on to explain how the next significant accomplishment in the ammunition family was the development of the M819 Smoke Screening Cartridge. This round has the unique distinction of being the only mortar smoke screening cartridge in the world that utilizes red phosphorus wedges.

These wedges are ignited, ejected from the cartridge over the target by the use of a mechanical time fuze, and dispersed on the target to quickly produce an obscuring smoke screen. The cartridge provides an increase in range of 400 meters over the standard bulk-filled, white phosphorus cartridge it will replace, while producing a smoke screen that is five times more effective.

The round which completes the family of tactical ammunition — the Illumination Cartridge — provides a 200 percent boost in the area of illumination and an increase in effective range of 2,300 meters over the current illumination cartridge it will replace. This provides sufficient illumination to adjust fire to the maximum range of the HE cartridges (5,700 meters).

Complementing the family of tactical ammunition was the development of a full range practice cartridge, and the acceptance of a short range practice cartridge, which was evaluated as a nondevelopmental item under an International Materiel Evaluation Program.

The full range practice cartridge is ballistically similar to the HE cartridge and operates in the same manner. The cartridge has an inert projectile and a fuze facsimile which can be set in the same manner as the HE cartridge fuze.

The impact produces a signature of flash, "bang," and smoke that can be seen and heard at a distance of 2,500 meters from point of impact. This cartridge provides realistic training for the gun crew by simulating the HE fuze settings of proximity, near surface burst, impact and delay. The propelling charge adjustments and noise levels are the same as the HE cartridge. The impact signature produced by the fuze facsimile provides excellent training of forward observers.

A cost savings of approximately 69 percent per cartridge is realized when using the new cartridge as compared to crew training exercise costs associated with firing live ammunition. The short range practice cartridge is used in areas where the firing ranges are space limited. This cartridge has a maximum range of approximately one-tenth the range and a similarity in size and weight to the HE cartridge.

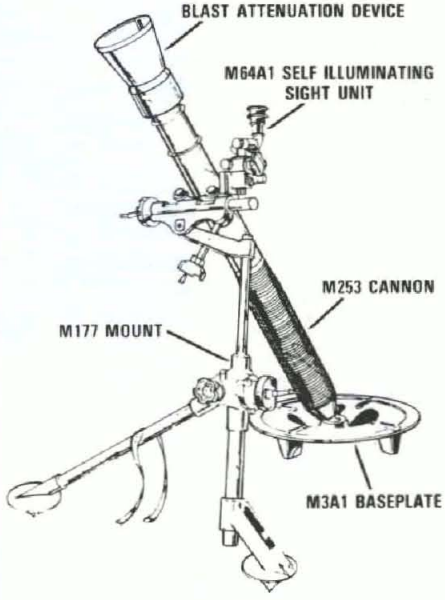
The fuze facsimile has the same impact signature and simulated setting positions as the full range practice cartridge's fuze. This new practice cartridge has a charge adjusting feature which governs ranges. The fuze impact signature of flash, "bang," and smoke can be seen to the maximum range of this cartridge.

A unique feature of the short range cartridge is that it can be recovered, brought back to the gun site, rebuilt, and refired up to 10 times. This provides a significant cost savings up to 93 percent per cartridge when compared against firing with live ammunition.

The current stockpile of 81mm ammunition is interoperable with the new system. The improved ammunition is also interoperable with the old system at reduced ranges. All the fire control data for the improved family of ammunition will be incorporated into the recently fielded Mortar Ballistic Computer (MBC). The MBC is a powerful, hand-held computer that is designed to automate the Mortar Fire Direction Center functions of ballistic computation, data management and communications.

The night placement of the mortar is enhanced through the use of a lightweight Self-Illuminating Sight Unit and Self-Illuminating Aiming Post Lights. The new system upgrades the NATO-standard M3 Series Baseplate, currently used on the old system, to the stronger M3A1 Baseplate.

Thus, through the combined efforts of both the U.K. and U.S., American and other NATO infantry forces will have the most sophisticated, reliable and effective 81mm mortar weapon system in the world today.



M252 Improved 81mm Mortar

CRDEC Scientists Cited

Three Army scientists have been recognized for the scientific advancements they made as part of an innovative research program at the U.S. Army Chemical Research, Development and Engineering Center (CRDEC).

Dr A. Peter Snyder, Dr. William M. Lagna and Dr. Ronny C. Robbins received CRDEC's 1987 Outstanding In-House Laboratory Research (ILIR) award. The ILIR program provides funding for challenging programs suggested by CRDEC scientists and engineers.

The scientists headed two research projects dealing with new technology in the mass spectrometry field. Snyder's work, in the development of a portable mass spectrometer that could be used in the field by the Army, resulted in unprecedented advancements in the instrument's design.

The spectrometer apparatus breaks down very large molecules so the compounds can be analyzed and identified. It has traditionally been confined to the laboratory. The goal of the program is to create a portable new addition to the mass spectrometry field.

"This instrument has the greatest potential to do this type of work outside the laboratory," said Snyder, a research chemist in CRDEC's Research Directorate. "We're using a much smaller, lighter instrument, and less power is required to operate it."

The research effort was a collaboration between CRDEC, Dr. Henk L.C. Meuzelaar, University of Utah, and Dr. Rick Yost, University of Florida.

Lagna and Robbins, chemists in CRDEC's Detection Directorate, headed a project to develop a pyrolysis mass spectrometer, which uses chemical "fingerprints" to identify biological agents, and could be used in the field.

"The detection of biological threat agents is elusive because of the wide range of forms in which they could be disseminated," said Lagna, who works with Robbins in the Detection Technology Division. "The most commonly used methods of biological identification are laboratory based and time consuming. Mass spectrometers are fast, reliable and extremely sensitive detectors of chemical agents."

The spectrometer is interfaced with an aerosol collection system, which automatically takes an air sample. The sample is heated, broken down into a pattern by which it can be identified, and compared to a large data base of known chemical signatures to determine a match.

By expanding the spectrometer's capability into the biological field, they hope to create a rugged, dependable instrument that could provide early detection and warning for soldiers in the field.

The Army *Does* Change Its Spots

. . . With New Camouflage Patterns

Countersurveillance experts at the Belvoir Research, Development and Engineering Center have just completed designing new three-color camouflage patterns for all tactical equipment in the Army's inventory. The three-year program required 413 drawing packages to meet camouflage needs for 834 different items of equipment. All told, 225,000 drawings are being distributed to Army units worldwide, including Germany, Korea and Japan.

A drawing package consists of six pages: a drawing for each major view of the item — the four sides and top — and an inspection sheet to ensure the pattern is applied correctly. To minimize the number of drawings,

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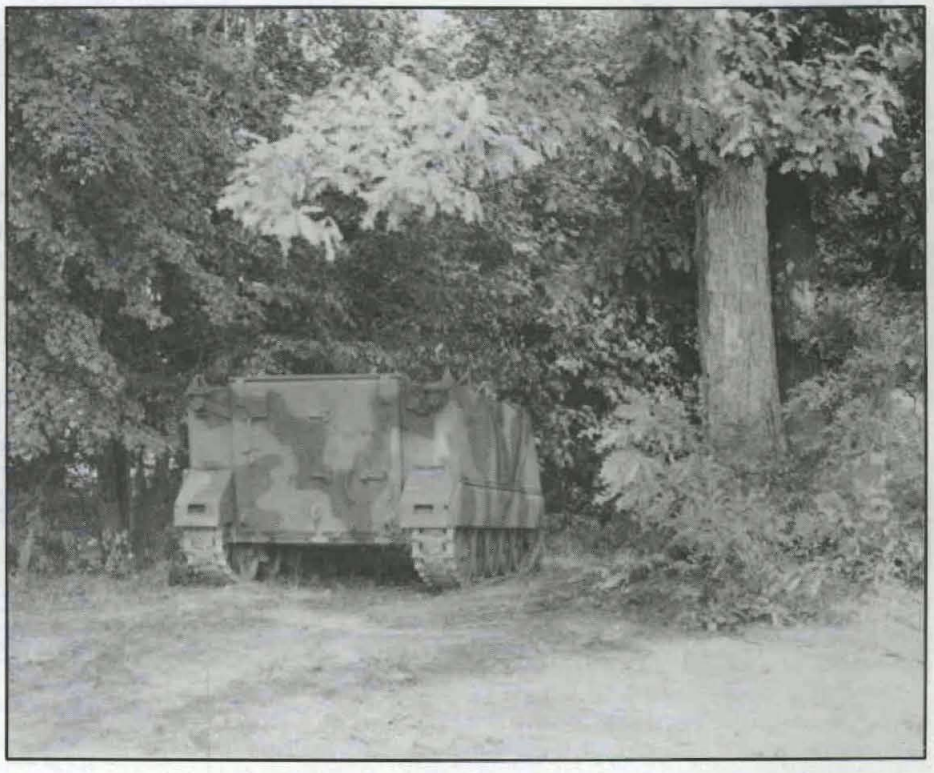

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Center engineers consolidated similar items. For example, nine drawing packages provided camouflage patterns for 132 shelter-mounted communications systems. This saved nearly $1.6 million.

Center engineers and technicians used several methods to meet the program's tight schedule. They used computer-aided-design technology to draw patterns on a computer image and print out a finished design. Also, a team developed a photogrammetric technique and went to the field to take pictures of more than 177 different vehicles. These photos were digitized by computer to develop technical drawings when none were available.

The three-color pattern, which is more effective than the four-color pattern the Army had been using since the early 1970s, was developed in cooperation with the Federal Republic of Germany. The Germans have completed their pattern-design program and are now repainting their equipment. Other NATO countries are also considering the three-color pattern. As the U.S. conversion is completed, the designs will be applied using a Center-developed chemical-agent-resistant coating that will allow soldiers to decontaminate equipment in the field.

Patterns for new equipment will be developed as the items are fielded. As the leading agency for camouflage, the Center is also working on patterns for Navy, Air Force and Marine Corps ground-support equipment.

HISTORICAL HIGHLIGHTS

The First Project Managers!

During the War of 1812, the small, outnumbered U.S. Navy was able to achieve a string of single ship victories over the British. These victories were the product of cover and deception in the development of arms and equipment to achieve a kind of qualitative technological surprise.

In 1812, the Royal Navy ruled the waves. Its total naval power consisted of 584 ships at sea in full commission, of which 102 were line-of-battle ships and 124 were frigates, with an immediate reserve of 18 battleships and 15 frigates. This force was deployed world wide but mainly against the French.

The whole U.S. Navy consisted of just 20 ships, of which eight were frigates and 12 sloops and only 17 of the 20 were available for sea service. To meet the U.S. Navy, the British decided to rely upon their frigate force deployed to Halifax and West Indies stations to handle the situation. Thus, the major ship actions of the war between the two countries would be a series of frigate battles.

The British were in for a surprise. What they did not know was that the American frigates were superior to any frigate afloat in two essentials, the ships themselves and their crews. The U.S. ships could out-gun any ship fast enough to catch them and out-sail any ship that could out-gun them.

The U.S. ships were far bigger and more powerful than any other frigates in the world. Instead of the British standard 44-guns (which the U.S. were all rated or designated) they mounted a main battery of 30 long 24-pounders, 18 42-pounder carronades on the quarter-deck and on the forecastle six 42-pounder carronades and two long 24-pounders, a total of 56 guns.

The U.S. ships were also 17 feet longer than the British standard. Below decks, the American ships were built like the British 74-gun ships of the line and their masts were 7 inches thicker, allowing them to carry more sail. Each American ship had had an experienced ships captain standing by her during the whole course of her construction, from keel laying to outfitting — a revolutionary concept subsequently adopted by all navies; the obvious beginnings of the project manager concept.

While the British had to scrape the bottom of the barrel for its manpower, the U.S. ships rejected all but the most skilled seamen of first class physique. The U.S. manpower came from the hardy seamen of the northeast with merchant marine and similar experience. Also, a large number were Royal Navy deserters.

It has been stated that every American frigate probably had at least 100 ex-British seamen aboard. Lastly, the Americans paid greater attention to discipline, gun drill and aiming practice, even in port, and they had learned the British methods of close action and hulling fire.

The first of the frigate actions was that between USS President and HMS Belvidere (June 23, 1812) which ended in a draw. The second action was between HMS Guerriere and USS Constitution (Aug. 19, 1812). The results of this victory stunned the British. When it was followed by USS United States over HMS Macedonian (Oct. 25, 1812), and USS Constitution over HMS Java (Dec. 29, 1812), the British were "horror-struck." The times of London remarked "the spell of victory had been broken."

British fortunes were slightly reversed when HMS Shannon bested USS Chesapeake off of Boston harbor (June 1, 1813). In this action, the British Captain Philip Broke, using those very skills the Americans had heretofore possessed, discipline and drill, overcame the noble Captain James (Don't give up the ship!) Lawrence who had sailed with an ill-prepared crew but in every other aspect was evenly matched.

Misrepresenting one's capabilities is a time honored deception practice which can lead to an immediate tactical advantage for the deceiver and can continue until such time as the opponent overcomes his surprise and takes tactical, materiel or doctrinal countermeasures.

The preceding was submitted by James W. Conlin, a senior analyst in the Threat Evaluation Division, Office, Assistant Deputy Chief of Staff for Foreign Intelligence, HQ, Army Materiel Command.

Training Systems Conference Announced

The 10th Interservice/Industry Training Systems Conference (I/ITSC) will highlight the armed services' continual long range objective of increasing and maintaining the combat readiness of all forces, when it convenes in Orlando, FL, Nov. 29 - Dec. 1, 1988. The conference theme is "Combat Readiness Through Training — The Next Decade."

The conference is the premier event of the year for the simulation and training technology communities of government and industry. This year's conference is sponsored by the National Security Industrial Association in conjunction with an interservice team. That team is headed in 1988 by the Navy, represented by the Naval Training Systems Center at Orlando, FL.

Serving as conference chairman for this year is Dr. Thomas E. Sitterley, The Boeing, Seattle, WA. Under his direction a committee of representatives from industry and government will work out the details for the conference.

In looking to the future, conference officials say the readiness mentioned in the conference theme can be improved by sustaining the current momentum in training system advances while continually searching for better solutions to complex training systems. In the next decade, they conclude, the services and industry must provide a sustained effort to look for new, innovative, unique advances in all aspects of training systems. The combined result of all such improvements must be to improve combat capability — the ultimate challenge.

Questions regarding the 1988 conference may be directed to the Conference Publicity Office, NTSC, Orlando, FL 32813-7100 or telephone 305-646-4500.

CORRECTION

Due to a printing error on page 30 of the March-April 1988 issue of *Army RD&A Bulletin,* the words "MANPRINT in the Procurement and Source Selection Process" were omitted as a sub-headline above the beginning of the next to last paragraph. We regret any confusion that this error may have caused.

Rotorcraft Structures Meeting

The Southeast Region and the Hampton Roads, VA, Chapter of the American Helicopter Society will sponsor a national conference on Advanced Rotorcraft Structures in Williamsburg, VA, Oct. 25-27, 1988.

The theme of the conference, which will be held at the Fort Magruder Inn and Conference Center, is the role of structures in the trade between requirements and opportunities. Operational requirements for rotorcraft are changing rapidly, both in military and civilian applications. Increased requirements in speed, maneuverability, vehicle maintenance and durability demand new solutions. At the same time, developments in the areas of high-strength composites, super-computers, and automated fabrication are providing new opportunities to satisfy or exceed some of these new requirements.

Close Combat Vehicle Symposium

The Close Combat Vehicle (CCV) 1988 European Symposium will be held Nov. 14-18, 1988 at the Armed Forces Recreation Center, Berchtesgaden, West Germany. Sponsored by the CCV Materiel Fielding Team-Europe, the symposium will include such topics as force modernization and fielding issues associated with new tracked vehicle systems in Europe. Additional information is available from: CPT Mike Simpson, CCV MFT-E, APO NY 09112, PH 011-49-9662-9018 (in Germany: 476-2757/2612). Message Address: Chief, CCV MFT-E, AMCPEO-CCV-MFE, VILSECK, GE.

Natick Hosts Science Symposium

The U.S. Army Natick Research, Development and Engineering Center, Natick, MA, will hold a science symposium on "Science and Technology for the Soldier," June 1-3, 1988 at the Natick Conference Center. Additional symposium information is available from Thomas Sklarsky on AV 256-4687 or commercial (617) 651-4687.

ATTENTION AUTHORS

Do you have an article you would like to submit for publication in the *Army RD&A Bulletin*? If so, we would like to hear from you. We will consider all articles based on importance of the subject matter, factual content, timeliness, and relevance to the bulletin's mission. The following are general guidelines for submissions:

- *Length.* Articles should be about 1,500-1,800 words (8 double-spaced typed pages). Shorter or longer articles are acceptable, depending on what is required to adequately tell the story.
- *Photos.* Include any photographs or illustrations which complement the article. Black and white or color are acceptable. We cannot promise to use all photos or illustrations and they are normally not returned unless requested.
- *Biographical Information.* Include a short biographical sketch of the author.
- *Clearance.* All articles must receive appropriate clearances and be approved for open publication. This may require reviews by the author's security/OPSEC and public affairs offices. A cover letter stating that these clearances have been performed must accompany the article.

Articles should be sent on 5-1/4-inch floppy disk in ASCII format. Articles should also be sent in regular mail. OPSEC clearances and photographs must be sent by regular mail even if articles are sent on floppy disks.

Letters. If you have a comment or view about an article we have published in a recent issue of *Army RD&A Bulletin,* feel free to submit letters to the editor explaining your views on the subject.

Mailing Address: HQ, AMC, Army RD&A Bulletin (ATTN: AMCDE-XM), 5001 Eisenhower Avenue, Alexandria, VA 22333-0001.

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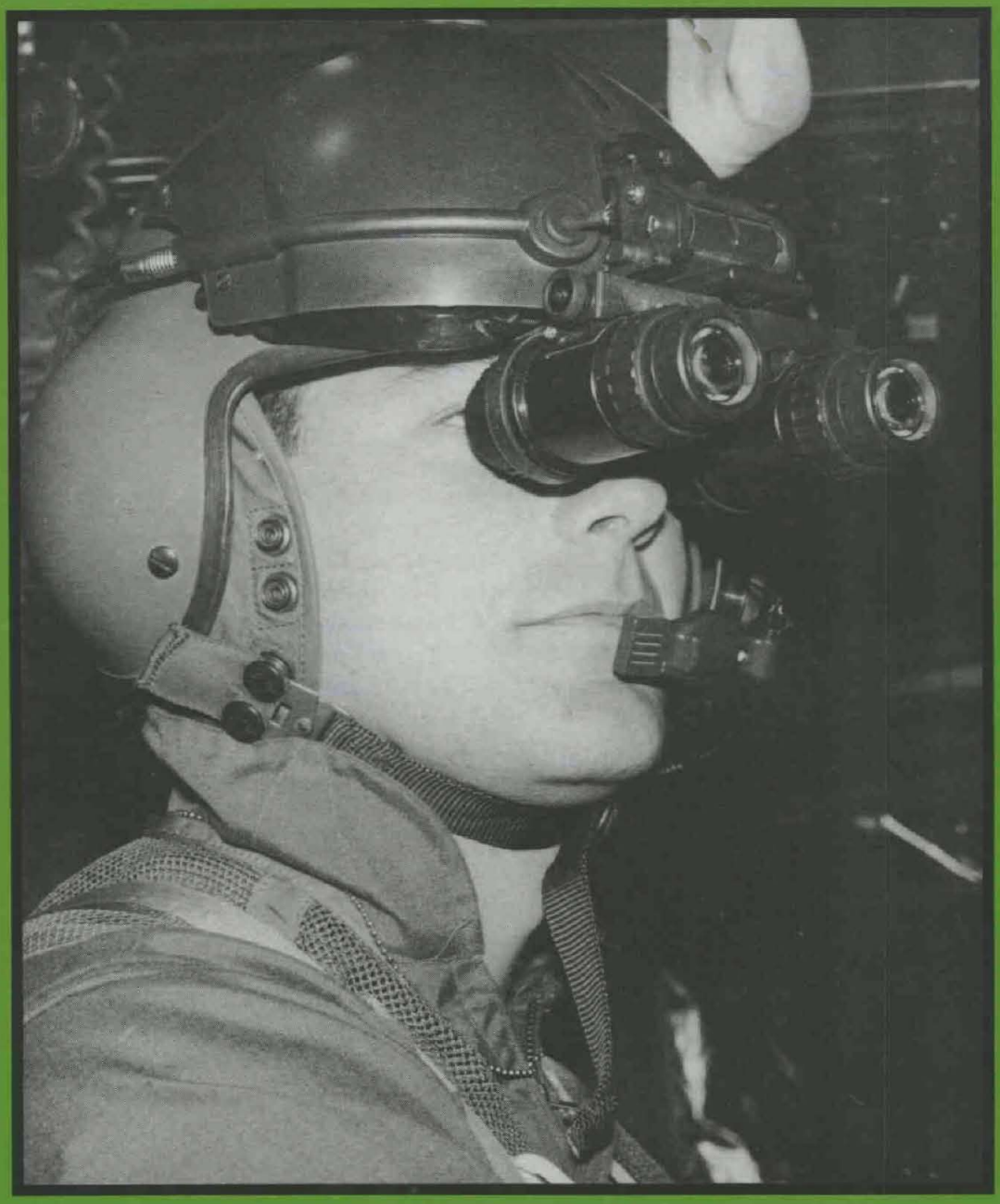

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