monolithic systems, bi-polar systems, partitioning, and small, medium and large scale integrations; all problems that are gradually invading the field of training devices.

As you know, we have to become still more cost effective. We have to reduce government spending without reducing our military potential, but rather increasing it at the same time.

We are expected to do our utmost within the state-of-the-art, not only to be cost effective as far as lifetime ownership of our equipment is concerned, but, as I mentioned before, also manpower effective as far as operation and maintenance is concerned. I realize that this last demand is extremely difficult to fulfill, but unless all of us, NTDC and the training device industry, pick up this challenge and do our utmost to further new training concepts in new training devices, training device technology will fall behind other technological areas.

I want to specifically refer to the area of unsolicited proposals. We receive many unsolicited proposals during a year but only very few of these show progressive thinking or show an understanding for the problems I have outlined to you or even address the age-old training device problem of nonprogrammed visual simulation.

Your attention is directed to the eight papers in our program which are related to the subject of visual simulation. I want to close these brief remarks on the theme of this conference with the hope that industry will answer our call for innovation in training device technology, in general, and in visual simulation, in particular.

TRAINING DEVICES IN TODAY'S ARMY

COLONEL ROBERT E. PHELPS
Acting Commander
U. S. Army Participation Group

Colonel Lester H. LeVine Commanding Officer of the U. S. Army Participation Group at the Naval Training Device Center, addressed the Conference last year and was scheduled to speak to you this morning. Unfortunately, he has been hospitalized for almost a month and is unable to be here today.

In behalf of Colonel LeVine and all members of the U. S. Army Participation Group, I, too, would like to extend to you a warm welcome to our Third NTDC/Industry Conference. We have noted that more than one-half of you are with us for the first time. It is also gratifying to note the broader representation in this year's Conference. More than one-third of the companies represented here this year are participating for the first time. Together with our Navy colleagues, we sincerely hope that this Conference will be rewarding for all of us from a professional viewpoint and that it will stimulate increased efforts by your companies to help us solve the increasingly complex training requirements of our respective services.

I welcome the opportunity to speak to you today. I will talk to you briefly about the U. S. Army Participation Group and how we interface with the Navy here at the Center, a few of our current training-device projects, and some that will be coming along in the near future. Also, I will present our candid estimate of the potential for use of training devices in the Army.

The Army Participation Group was established as a result of an agreement in 1950 between

the Secretary of the Army and the Secretary of the Navy. The primary mission of our group is to arrange for the research, development, and procurement of training devices responsive to qualitative materiel requirements and small development requirements approved by the Department of the Army. While our group is collocated with the Naval Training Device Center, it is a subordinate activity of the U. S. Army Materiel Command which, as you know, is responsible for the research, development, procurement, and logistical support of most Army materiel.

Since our group is authorized only eight officers and twenty civilian personnel, we utilize the technical and administrative services of the Naval Training Device Center in carrying out our mission. For this support, the Army pays approximately one-seventh of the cost of operation and maintenance of the Center.

As a newcomer in the Army Participation Group, I am impressed with the outstanding relationship we have with Captain Miller and the many talented people who make the Naval Training Device Center such a unique organization. Our participation in this joint venture makes available to the Army a wealth of experience and technical expertise in the field of simulation which the Army need not attempt to duplicate, even if that were possible.

As mentioned previously, all Army training-device requirements must be approved by the Department of the Army before development is undertaken. While such requirements may originate at any level in the Army, most of them are initiated by the Army service schools and Army Materiel Command project managers. The Army Participation Group works closely with these agencies from the outset in an effort to assure that wholly-satisfactory, cost-effective training devices are delivered to users at the times they are required.

Next, I will discuss briefly a few of our current training-device projects and some which may be approved for development in the near future. My purpose is to give you an indication of the broad range of devices in which the Army is interested and areas in which we believe the Army will focus its attention in the years ahead.

We are deeply involved at present in a variety of projects to support Army aviation training. The dollars we are spending in this area exceed by far those going into any other category. This is not difficult to understand when we consider two facts: first, the use of sophisticated, high-cost, operational aircraft for training purposes is an extremely costly proposition and; second, under the present military force structure, the Army is authorized more cockpit spaces than all of the rest of the U. S. armed services combined. Our helicopter pilot training requirements are enormous now and are likely to remain relatively high in the future, regardless of what happens with respect to the war in Vietnam.

The Synthetic Flight Training System (Figure 1) currently is our largest developmental project. It is a multisystem trainer designed to provide efficient, economical training in instrument flying in both our utility and cargo helicopters. Several contractor proposals are being evaluated at present. Barring unforeseen developments, we expect to award a contract early in 1969. This is the most sophisticated and expensive trainer-development project ever undertaken by the Army. If the development model is successful, we anticipate a procurement potential of 20 to 25 million dollars over the next five years.

The Cheyenne Combat Operations Simulator System (Figure 2) is another large trainer development and procurement program now under consideration. We have been working closely with the Army Aviation School in the preparation of the qualitative materiel requirement, which, according to present plans, will be submitted soon to the Department of the Army for approval. The total cost of this program, including production, is estimated at 25 to 30 million dollars over a five-year period.

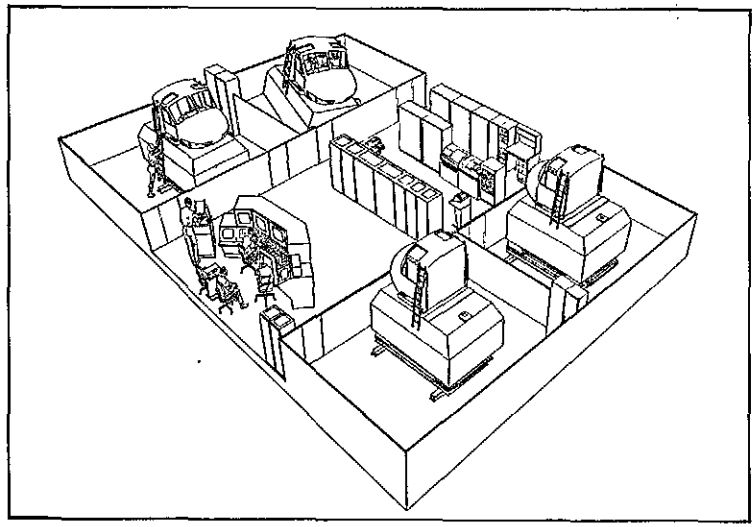

Figure 1. Schematic of Synthetic Flight Training System, Device 2B24.

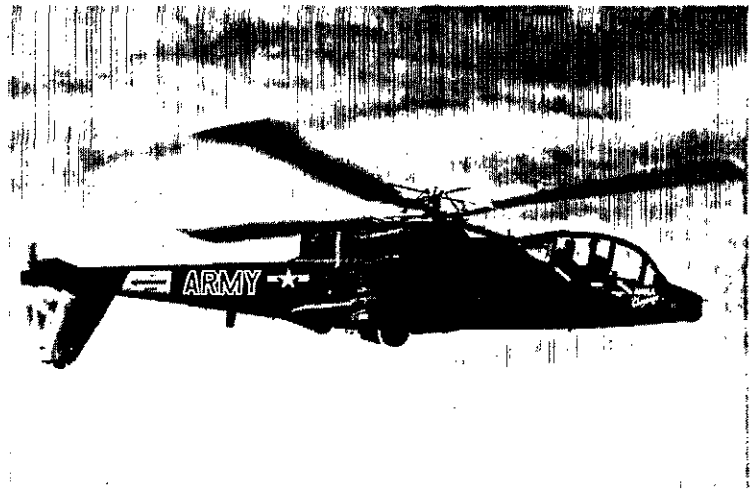

Figure 2. AH56A Cheyenne Helicopter.

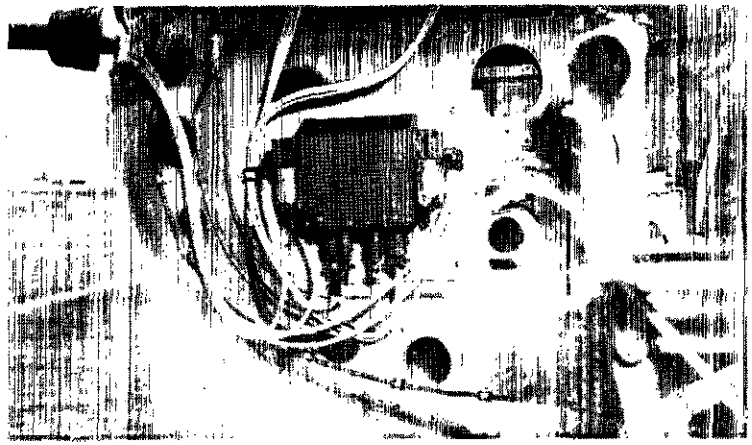

Figure 3. Part of Relative Airflow Indicator Device (Air Intake and Signal Conditioning Unit Only) Mounted Externally on Helicopter Gunship.

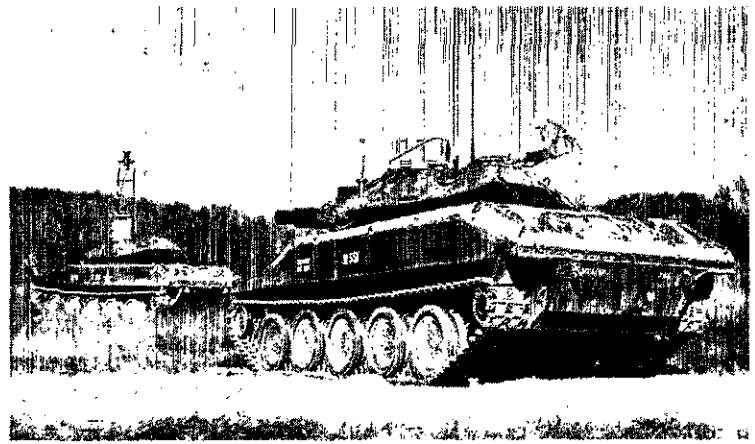

Figure 4. XM35A Conduct of Fire Trainer Mounted on Two Sheridan Vehicles (Device X3A101)

The Relative Airflow Indicator Device (Figure 3) is another aviation trainer that deserves mention. Conceived by an Army aviator at Fort Rucker, this device permits a helicopter pilot to determine the relative airflow and compensate therefor in firing 2.75-inch rockets. Use of this device in training improved the accuracy of rocket firing by 900 per cent. It is so successful that installation of the device on all helicopter gunships in Vietnam is under consideration.

Armor training, particularly tank gunnery, is another high-cost area in which the use of training devices not only saves money but provides increased effectiveness and flexibility. Our second highest dollar outlay at this time is for armor trainers.

Our three largest projects in this area are nearing completion. (Figure 4). They include a Conduct of Fire Trainer for the Sheridan vehicle, a similar device for the M60A1E2 medium tank, and a Sheridan weapons systems trainer for classroom use. The Conduct of Fire Trainers simulate the flight of a shillelagh missile to an infra-red source target. Since each Conduct of Fire Trainer costs about the same as firing 10 to 15 live missiles, potential dollar savings are in the millions.

Tank gunnery trainers utilizing laser technology appear to have a great potential. We are continuing our research in this field in which there is great interest at high levels. The procurement potential is high once we determine which system best satisfies our requirements. Also, the armor people are still looking for a satisfactory hit indicator device for large caliber weapons. Perhaps laser technology may provide a solution to this problem.

Training-device requirements for the Main Battle Tank-70 (Figure 5) have not been finalized; however, it is certain that a family of devices will be required. Ultimate procurement potential is considered high.

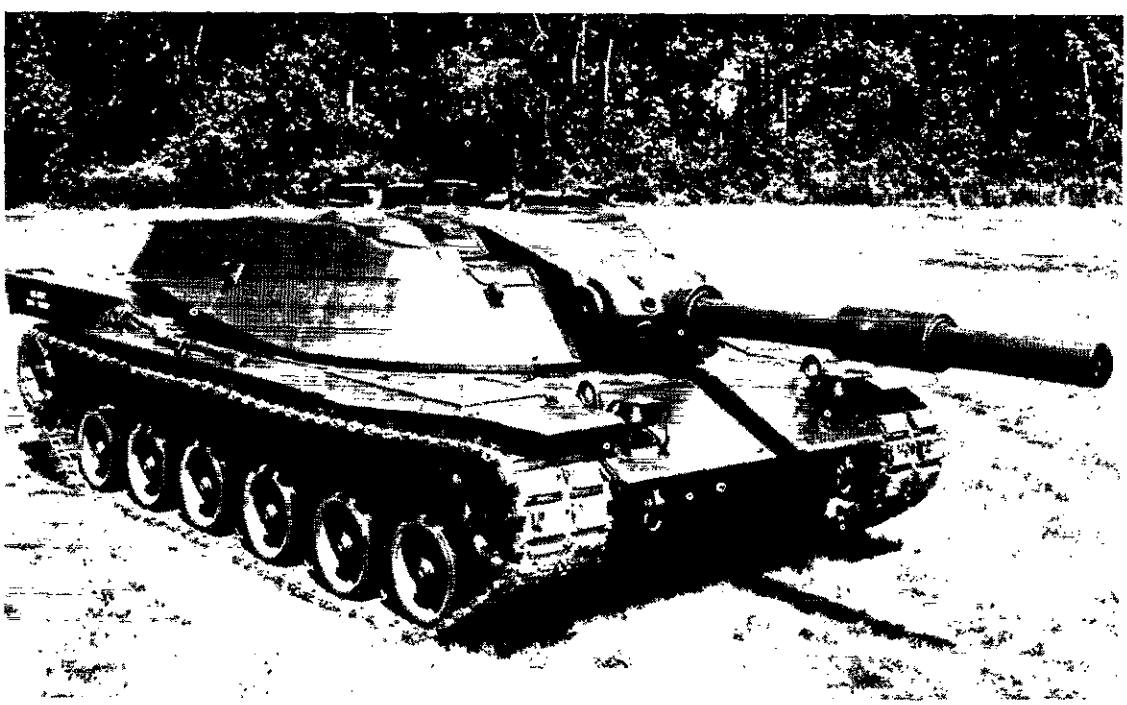

Figure 5. Main Battle Tank-70

Another area of continuing interest is targets and target systems to parallel new weapon development. Technologically, this field is extremely broad. Mr. Long will speak to you this afternoon on small arms targets; however, I want to show you a polyethylene target for small arms (Figure 6) which was developed here at the Center earlier this year. Initial tests results were favorable, so we procured 200,000 of these targets for use at all Army training centers in the United States. This target lasts about ten times as long as the paper target it replaces and is much more effective in hit registration. We anticipate that it will be adopted for Army-wide use and procured in substantial quantities on a continuing basis.

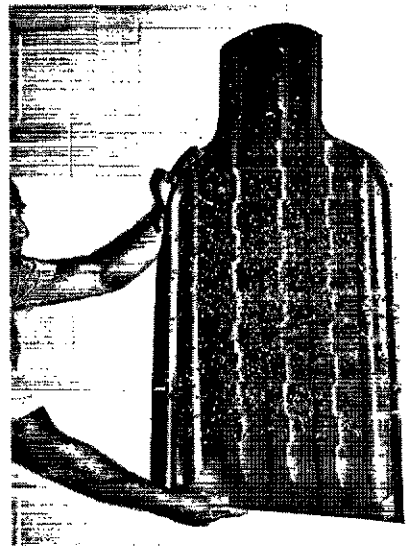

Figure 6. Polyethylene Type E Silhouette Target After 3,000 Hits by M16 Ammunition

In the missile field, we are nearing completion of the first moving target simulator for Redeye (Figure 7). Service test of this trainer should begin early in 1969. Procurement should follow in FY 70 and FY 71. The Department of the Army has approved the requirement to adapt the moving target simulator to the Chapparal and Vulcan Weapon systems.

Requirements for trainers to support the Sentinel system have not been finalized; however, it is certain that some training devices will be required. We have provided some recommendations and are attempting to keep informed of the status of this program. At this time, however, we think it is unlikely that we will be involved in Sentinel trainer development.

An air defense program we are watching is the Sam-D system. It has a significant trainer potential but specific requirements have not been finalized.

In the electronics field, we have under development a Large Area Radiac Trainer (Figure 8). We expect to begin service test of this device in April 1969. Procurement will be initiated soon thereafter.

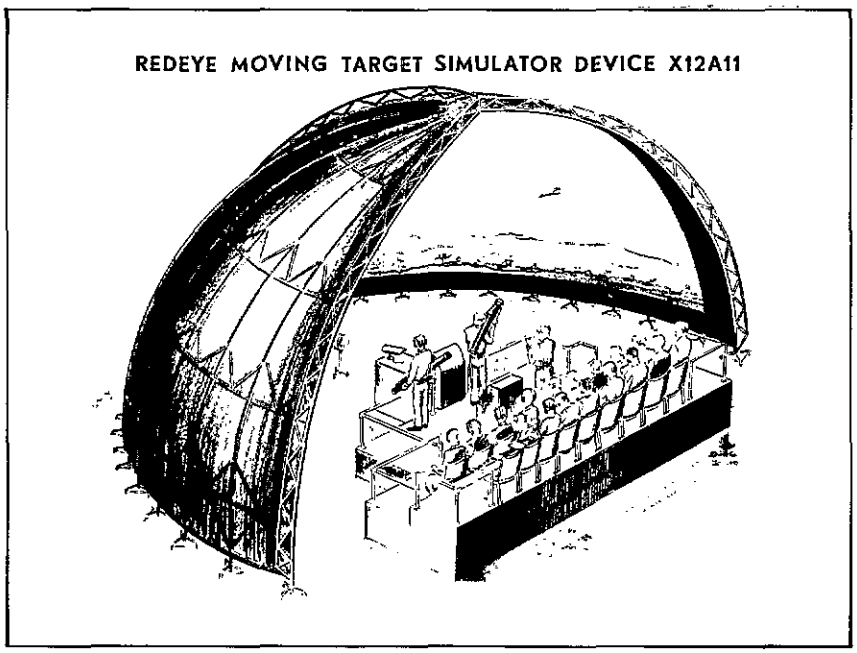

Figure 7.

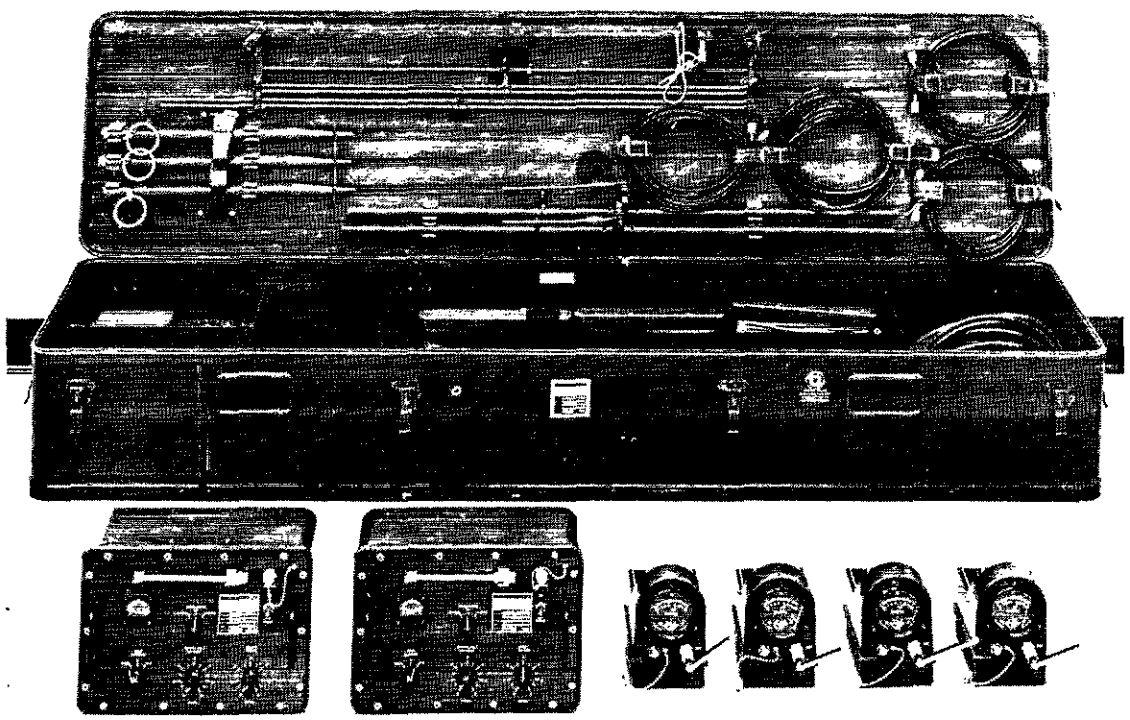

Figure 8. Large Area Radiac Trainer (Device 11F6).

Gentlemen, the Army today is using a great many training devices ranging in complexity from simple to highly sophisticated. Many were developed through our participation with the Naval Training Device Center. Others were developed and procured through Army channels; for example, as part of total package procurements by Army project managers from prime contractors on major systems and equipments.

Even though the Army now makes extensive use of training devices, it is my strong belief that we have barely scratched the surface in this field and that the potential in the years ahead is almost unlimited. My colleagues in the Army Participation Group share these views.

Why do we feel so optimistic about the future for training devices? There are several reasons, but the fundamental answer lies in one expression with which all of us in Industry and the Armed Forces have become increasingly familiar during this decade:

COST EFFECTIVENESS

It appears certain that public pressure will continue to mount for ending the war in Vietnam, for increased expenditures on costly domestic programs, and for the reduction of taxes. Termination of hostilities undoubtedly would result in significant reductions in future defense budgets and major shifts in priorities for Government spending.

However, we should not view a reduction in defense spending as a bad omen for the future of training devices. We will have to maintain sizeable armed forces and a high degree of operational readiness to respond quickly to any future emergency.

Our weapons, aircraft, tanks, and other major items of equipment are becoming increasingly sophisticated, costly to procure, and costly to operate and maintain. When defense spending is reduced significantly, we must have more efficient and less costly ways of maintaining our combat readiness. We will no longer be able to afford the luxury of flying our operational aircraft as much as we do now. It may be necessary to restrict further use of high cost ammunition, missiles, rockets, and other items of equipment for training purposes.

Does this mean that we must accept a degradation of our operational readiness?

I say the answer is no, but those of us in this room and our colleagues with interest and capabilities in the field of training devices have a big job to do.

It has been established that significant savings in training costs are possible through the use of simulators instead of operational equipment. There is reason to believe that, in many cases, more effective training results can be achieved through use of simulators, for example, in tank gunnery. It is certain that safety in training can be enhanced in numerous training situations. The use of simulators can provide increased flexibility in training. I could go on.

This, gentlemen, is the challenge that confronts us. What are the problems we must overcome to achieve a real breakthrough in the use of training devices?

Four specific points come quickly to mind:

First, the reluctance of military personnel to train with anything other than basic items of equipment.

Second, the general lack of information throughout the Army regarding the capabilities and potential of training devices.

Third, the general lack of objective thinking throughout the military establishment about possible ways of increasing effectiveness in particular training situations.

Fourth, lack of specific data regarding the relative cost of training with operational equipment and simulation devices.

Undoubtedly others could be added to this list.

Now, what's our answer to these problems? I say all of these roadblocks can be overcome by a concerted effort in salesmanship. We must sell the Army on the necessity and desirability of making greater use of training devices. At higher levels of command conclusive proof of significant savings possible will go a long way, so long as we demonstrate that there will be no degradation of training effectiveness. The farther down the chain of command we go, the more difficult our selling task becomes.

We must keep in mind that approximately 75% of our Army personnel today has less than two years' service. The average age is between 19 and 20 years. These are the soldiers who use our training devices. We must prove to them and their junior leaders that our devices will provide effective training and are at least as simple, reliable, and easily maintained as the basic equipment they simulate.

We in the Army Participation Group are in the selling business now and intend to step up our efforts. We welcome any assistance you can give us.

A basic problem that has plagued us in the past has been lateness in determination of specific requirements for training devices. Too frequently, training-device requirements have been approved for developmental action too late to permit delivery of the device when it is required. We are overcoming this problem, but there is urgent need now for prompt determination of additional training-device requirements and early initiation of development so that we may prepare for the austere situations which may confront us soon.

Another serious problem we have faced in the past is the tendency to seek solutions to developmental problems that are beyond present technology. Invariably, these ventures proved costly in time and money and generated displeasure due to failure to deliver at the required time. In our business we must find solutions within the state-of-the art. We can't take time out for exploratory research on an approach that might not be productive while working on an urgently required training device.

Gentlemen, we solicit your assistance in selling the Army on greater use of training devices.

Perhaps as a result of analysis by your company of specific Army training requirements, you will discover a product on the shelf or a proved concept that provides a satisfactory solution to one of these requirements. We will be glad to review any proposal you consider worthwhile.

In closing, I want to bring to your attention by our former Army Chief of Staff, General Harold K. Johnson, in an address at the biennial Army Science Conference at the United States Military Academy on 20 June 1968. He had been expressing his personal concern about the extent to which the Army at least pursued items or phases which were very interesting but would not necessarily be very productive - in short, our tendency to introduce sophistication.

General Johnson said, "I would plead with you for simplicity and plead with you for reliability. I would take them at the expense of some degree of effectiveness. I would rather have something 80 per cent effective 100 per cent of the time than I would have something 100 per cent effective 50 per cent of the time."

We in the Army Participation Group concur whole-heartedly in General Johnson's remarks. We hope that you do, too. After all, the reputation of your company is at stake every time you deliver a training device to Army users. So is ours. We want to keep our customers happy and hope you do, too.

I've enjoyed talking to you and hope my remarks will prove helpful.

Again, a warm welcome and best wishes for a productive conference.