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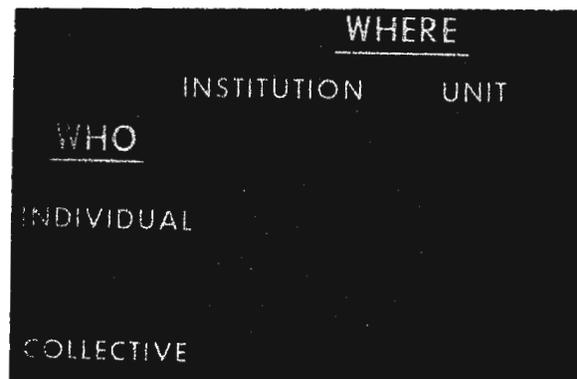
THE CHALLENGE OF ARMY TRAINING
MAJOR GENERAL PAUL F. GORMAN

I am confident you will agree with me that General Talbott has adequately described the challenge for US Army training. It's a tall order: to win outnumbered, to win in the first battle. It's very appropriate that this particular quorum meet over the next couple of days to talk about how it is that we're going to go about doing that. It goes without saying that we're going to have to develop, in the present and future generation of American soldiers, a craft, a cunning, a proficiency, a professionalism beyond that which we have been able to develop in the past. Many of you here today in civilian clothes once wore the Army uniform, or the uniform of another service and are aware that for all of our shortcomings we have done an adequate job of preparing Americans for the exigencies of past battlefields. It is important for you to realize, however, that the methods, the approaches that the Army has used in the past-as good as they have been-are quite inadequate for the task before us today. We're going to have to find new and better ways of doing the job.

As a matter of fact, I have to tell you that a year ago we could not even have adequately talked about the problem before us, and the opportunities that lie before us, because our vocabulary was inept. It was inadequate for the purpose of describing the full range of jobs that are accomplished within the Army training system.

So I'm going to start this morning by laying before you the language that is presently embodied in the Army's basic regulation on training. For those of you who are interested, that's Army Regulation 350-1. It's a new regulation, just published, but it includes a number of terms with which even the soldiers in this room may not be familiar.

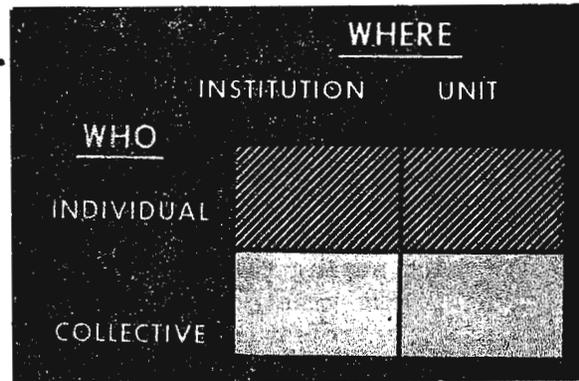
This terminology talks first of all to who it is that is being trained in any given training undertaking, and it draws the distinction between individual and collective training, a distinction that recognizes that training a single individual, imparting to him skills and knowledge, is intrinsically different from building in a group of individuals that interdependence which makes up collective proficiency.



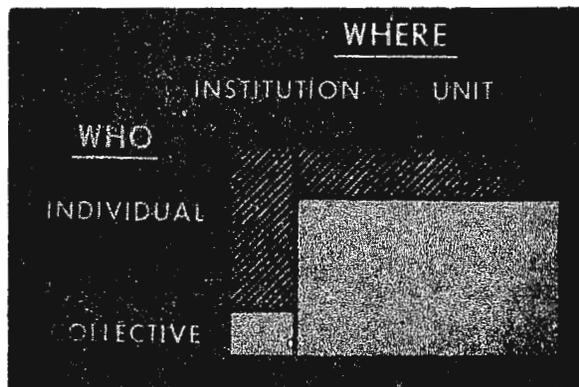
Now these terms are pretty important to coming to grips with how the Army training system works. It's important to make a distinction between the who of training and the where of training. There are two locations in which Army training takes place. The regulation says that there is a

distinction between institutional training and unit training, and that each of these locales posits its own training strategies and its own particular approaches, poses its own problems, opens its own opportunities. It is crucial for the Army to understand those differences.

One could describe the universe of Army training, then, in these terms. There is individual training, described by the hatched area of this slide, which takes place both in the location of the institution and in the tactical unit; and there is collective training that occurs in both locations.



If one were to describe, however, the reality of the Army system you would find probably that this slide is a better depiction geometrically of what actually occurs. Most Army training takes place in the unit; that's where soldiers spend most of their career. Perhaps 90%, on the average, of the soldier's time is spent in a tactical unit and properly so, and it is there that he acquires most of his Army experiences. Whether those are sound training experiences, whether they add up to progression in skill and knowledge, whether they amount to the acquiring of competencies day by day, that depends pretty much on how efficient this unit training is. And as the diagram suggests, most training in units is collective training aimed at developing proficient crews, squads, platoons, companies, battalions; aggregations of men doing their job as a team.



There still remains, however, an important job to be done in individual training out in the unit. And of course, as this diagram suggests, our institutions, are aimed fundamentally at producing trained individuals.

Now, in drawing the distinction between institutional training and unit training these generalizations are worthwhile. General Myer can establish here at Ft Gordon a fixed learning experience with each of the many MOS's, or Military Occupation Specialties, that he trains, and we can bring, to this fixed experience, students and process them through here, factory-like. Keeping these marvelous facilities occupied something like 100% of the time, honing from cycle to cycle the training experience so

that it gets more and more efficient as we proceed. That sort of circumstance is very different from that faced by the unit commander who by and large has the same group of fellows in hand from one day to the next, but faces the very difficult problem of confronting them each day with a new learning experience. A very much more difficult kind of an undertaking for him particularly because, whereas General Myer can develop in his faculty real expertise, in-depth expertise, the sergeants and lieutenants out in the troop units have got to be generalists capable of teaching a subject each day different from what they taught the day before, and ranging across the whole span of competencies that the unit embraces.

Moreover, obviously General Myer has an advantage here in this school in terms of facilities, over what signal commanders face out in Army units. This refers to methods of instruction. Here in an institution it is relatively easy to access advanced educational technology. One can make changes far more readily, and one can take advantage of educational technology. By and large, what the units have to work with is the operational equipment that we issue them. Now, that's not a judgment on whether it's right or wrong; that's simply a description of the way it is.

The most important point that I'd have you take from this slide is the last line. In the institutional training of the Army, the critical outcome is minimum time and that is so because time is a shorthand for resource. Time means manpower to the Army. Time means resources in terms of the variable costs of conducting training. The operating dollar appropriated by the Congress for the purpose of training is metered in the amount of time it takes us to process students through our institutional training programs. As we'll see in a moment, most of our attacks on efficiency in institutional training aim at reducing time, whereas in the unit it is proficiency that is the outcome. We are interested, in the unit, in driving proficiency up to whatever level we can, and maintaining it there.



Here are some further distinctions that you should note. There are numerous advantages beyond proficiency in institutional training. The schools, the service schools of the US Army, are by and large its heart and its soul. We learned this very painfully in this country, for we didn't have a service school system until the turn of the century. It was after the military disasters of the War of 1898 and the Philippine Insurrection that Elihu Root brought

into being the system of service schools that now extends across some 23 separate institutions. We have in addition to the service schools, as part of our institutional training, some 7 training centers; and these taken together, these 30 locations, form the means through which the Army explains to its own what it's all about. It is the safeguarder, the guardian of the ethics that go into making up what it is that distinguishes the soldier from anyone else in the society. It's the way we communicate standards, for both individual and collective training, and, of course, it is the way that we communicate doctrine throughout the force.

The word doctrine as it is used by the military is an important one. General Talbott by and large was discussing concepts with you this morning. He was suggesting to you that we must bring to the future battlefields a different set of ideas than we have brought to past battlefields. Now, those ideas are the stuff of doctrine. Doctrine is what more than half the Army believes and is prepared to act on. It is the ideas that form the basis for common action on the battlefield. If combined arms is important, then that thought, that concept properly expanded and explained must be communicated to the force and just how one brings about combined arms action on the battlefield has got to be as clear, explicit, as well understood in a Kaserne in Germany as it is in Ft Hood, TX, or on the hills in Korea. Doctrine is what is taught, whether it be taught in the service schools, on that hill in Korea, at Ft Hodd, or in the Kaserne in Germany.

Doctrine, then, is one of the principal products of the service school system. They are the authors of doctrine, the font of doctrine, they produce concepts and ideas and are responsible for communicating them to the force. Whether through the medium of the students in their classrooms that go forth to carry the concepts to the men that they train in the units, or through field manuals, or other communicative devices, the schools originate the doctrine and transmit it to the force, thereby bringing the US Army forward from year to year at a pace abreast of developments abroad. They bring it into a position better to meet the challenges of the modern battlefield.



Now all of these advantages, however, are not without price. About 12 1/2% of the Army's FY 76 budget for operation and maintenance of the Army go into operating our institutions throughout the Training and Doctrine Command. About 15% of Army manpower is invested annually in maintaining our schools and training centers, and providing the students for these. That is a very sizeable investment in institutional training. But we feel that it's worth it.

| INSTITUTIONAL TRAINING | |
|------------------------|----------------------------|
| SCHOOL-TRAINING CENTER | |
| ADVANTAGES | DISADVANTAGES |
| PROFESSIONALISM | TAIL VS TEETH: 113,000 MY |
| DOCTRINE | BASE OPNS: 60% \$ |
| STANDARDS | TRAVEL COSTS: \$18 MILLION |
| EFFICIENCY | |

The Training and Doctrine Command operates some 31 installations, 23 of which primarily for institutional training. \$6.00 out of every \$10.00 that the TRADOC spends on its mission go into operating those posts, paying for the buildings, the fuel to heat the building, and paying for the civilian help that maintains the post and keeps it going. There is a very sizeable cost for just keeping these institutions open.

Simply to cite the amount of money that the Army lays out to bring students from the field into the institution, and to send them from the institution back to the field strikes some measure of the high cost of institutional training. Some \$18 million dollars annually is required to provide student travel into and out of the institutions. All of that is by way of argument for getting maximum efficiency from institutional training. We've got to preserve, improve, and advance the advantages of institutional training. At the same time, we have got to insure that we give the people of the US and the Congress the maximum return on every dollar that they invest in this undertaking.

Now let's look at unit training for a moment. There are obvious advantages in conducting training in the operating units. The first is of course that the soldiers will be there should their unit be called upon to go into battle. It is part of this readiness to win the first battle of the next war that General Talbott referred to earlier. No longer can the US Army have most of its soldiers tied up in schooling operations. That was the case during the late twenties and thirties. It is a posture entirely inappropriate for the world today. Most of our soldiers have got to be in the units, and they have got to be there gainfully employed in learning their trade.

| UNIT TRAINING |
|-----------------------------------|
| BATTALION COMPANY |
| ADVANTAGES |
| READINESS |
| COHESION |
| OPERATIONAL WEAPONS AND EQUIPMENT |

In the process of learning, there are human relationships built which go a long way toward developing the teamwork, the proper subordination, that should exist between leaders and followers in a tactical unit. The process of training goes a long way towards building the tactical cohesion, the common confidence, the esprit that arms the unit for what lies ahead on the battlefield.

And finally of course in the units are the full range of operating weapons and equipment with which the soldier must work. It is very difficult for General Myer to conduct combined arms training in the truest sense here at Fort Gordon because he does not have readily available to him the full panoply of weapons that one would find on the modern battlefield. That is not his mission, of course, but it would be impossible for him to do that here in an institutional training environment.

In operating divisions, such as at Fort Carson or at Fort Hood, there are available to the commanders, the anti-aircraft weaponry, the artillery, the anti-tank weapons, the tanks, the communications equipment, the tactical forward air parties, all of the where-with-all to train in the combined arms.

There are disadvantages. When one builds on an operating post, a training facility, and makes a substantial investment in an elaborate range, it is unlikely that an operating unit can use that facility at anything like 100% of the time. Lucky, indeed, if we get 50% utilization in some of our posts. So if one talks about making available to an operating unit an expensive simulator one has to examine

| UNIT TRAINING | |
|-----------------------------------|----------------------|
| BATTALION COMPANY | |
| ADVANTAGES | DISADVANTAGES |
| READINESS | INEFFICIENCY/EXPENSE |
| COHESION | PARTICULARISM |
| OPERATIONAL WEAPONS AND EQUIPMENT | STANDARDS |

carefully the density of potential users for such a simulator to insure that something like reasonable utilization will ensue. The simple fact of the numbers of such units guarantees that any approach one makes to providing materials, and modern advanced educational technology to units, is going to be expensive. You just multiply the number of units of a given type by the number of devices that one needs, or the various locations where you want to talk about delivering training, and automatically you find yourself in six figures or more.

If the US Army were to allow all of its thousands of unit commanders each to train their soldiers as they saw fit we would be prone to particularism. We would not have a doctrine. It would be impossible or at least difficult for a battalion trained in Germany easily to mesh with a battalion trained in Fort Hood, or elsewhere in the US, for the purpose of operating somewhere in the world, in any kind of an emergency.

And finally if we allowed unit commanders to establish their own standards throughout the world I think you could see automatically we would face chaos. Standards in training are one of the most important undertakings of the institutions of the Army, and those standards that are established in the schools for the training of soldiers in this setting must be those which unit commanders achieve at least minimally. They can go beyond, but we insist and should insist that those standards be Army wide at the minimum.

Now I have described the vocabulary that we will use in talking about training over the next couple of days. I tell you that that is now the vocabulary that is in our Army regulation. It is not, I must admit, in general use in the Army. One of the purposes that this forum will serve, I hope, is to acquaint a number of the soldiers who are attending here or who will be reading these proceedings, with some of these basic notions.

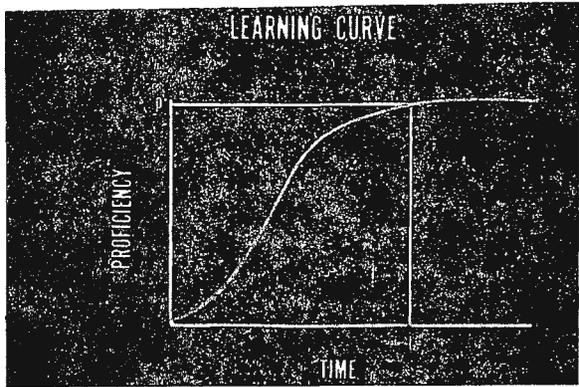
We would propose to you that over the next two days that we talk about four potential areas in which Army training can be substantially improved. They are listed here. Obviously, there are going to be numerous areas of overlap. It is difficult to talk about institutional efficiency without addressing the subject of proficiency. And if we can find a way of increasing the proficiency in units, obviously we need to apply those same ideas to the institution and vice versa. And the notion of communication can be as useful in discussing unit proficiency as it is in the abstract. Nonetheless this is the rubric that we have adopted for our proceedings here, and it is probably as useful a construct as any in trying to organize our thinking about how to improve Army training.

POTENTIAL WIN AREAS

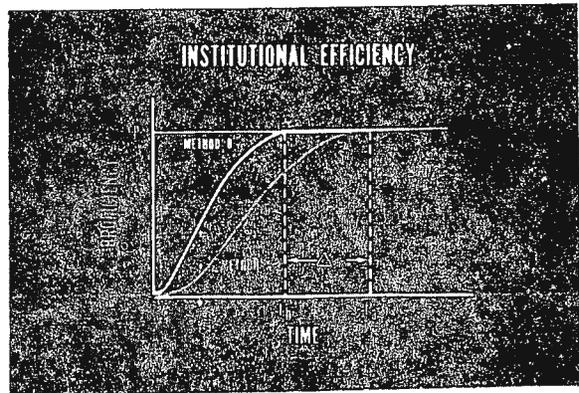
- INSTITUTIONAL EFFICIENCY
- UNIT PROFICIENCY
- INSTITUTION-UNIT COMMUNICATION
- EFFECTIVE SIMULATION

Now let me talk a little bit about each one of these and illustrate to you how we in the Army are approaching the solution of these problems, expecting the panelists to develop for you approaches that are being taken in industry and academia that parallel or indeed in some instances surpass what we are doing to attack the issue.

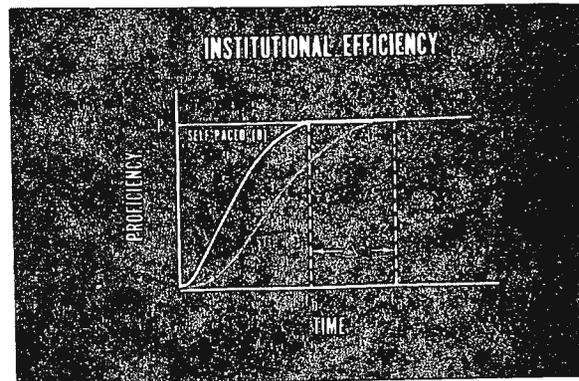
First of all looking at the general notion of increased efficiency. This I offer as a useful construct, a kind of classic learning curve where we are talking about increased proficiency over time and suggesting that there is a point in time where the marginal return on additional investments of resource, again using time as the shorthand for resource, does not produce increases in proficiency. And obviously in institutional training that is the point where theoretically we should stop training. We have achieved all the proficiency that can be reasonably expected and the man should be sent to the field. For every method of training there is bound to be another method which will produce in the same period of time additional proficiency or which will produce in less time the same proficiency.



So the difference between time a and time b is what we refer to as a Delta T. Time, of course, can be translated readily into manpower and dollar savings and I will do that for you here.



Basically as we have been analyzing institutional training over the past year or so, we have turned time and time again to the notion that if we could self-pace our institutional training we could make substantial gain in proficiency. That is, we can conserve institutional training time over proceeding as we do in most courses throughout our institutional training via the Lock-Step Method, where the



soldier enters, is put into his class, and the class proceeds through a fixed program of instruction to the graduation date which is predetermined from the moment that he enters. Self-pacing can produce these savings, and we have demonstrated in a number of experiments with HUMMRO, the Army Research Institute, and civilian contractors as well as a number of in house experiments within our institutions that these efficiencies can take place.

The order of magnitude is shown here. Now this chart is a trifle misleading. I used the terminology self-paced. I think that you can appreciate that in not all instances were these genuinely self-paced, individualized programs of instruction in the ideal sense. The Armor advanced individual training, for example, still depends pretty much upon groups progressing through training. Some of the training, in fact, was collective in here because we have to get at the notion of crew membership. But these were for the most part individualized and self-paced programs. These Delta T's are real. That is to say they were demonstrated. They tell us that the average soldier can finish one of these courses of instruction if allowed to proceed at his own pace, in something like a quarter less time than we have been able to achieve using the traditional approaches to the system.

| SELF-PACED TRAINING MORE EFFICIENT | |
|------------------------------------|-----------|
| PROGRAM | Δ T IN MY |
| SUPPLY CLERK AIT | 25% |
| ARMOR AIT | 25% |
| ENGINEER AIT | 32% |
| HELICOPTER MECHANIC AIT | 25% |

Now let's try to apply this method across the board to the courses that we are conducting. CSAIT refers to Combat Support Advanced Individual Training. There are some 240 of these courses and, unfortunately for my story, the number of man years per course is the same as the number of courses but this is a statistical accident. There are about 240 man years on the average involved in these courses. The total savings, if we could self-

| CS AIT IMPLICATIONS (Δ T) | |
|-------------------------------------|--|
| 240 COURSES | |
| X 240 MAN-YEARS PER COURSE AVERAGE | |
| X 25% SAVINGS THRU SELF PACING | |
| 14,400 MAN-YEAR THEORETICAL SAVINGS | |

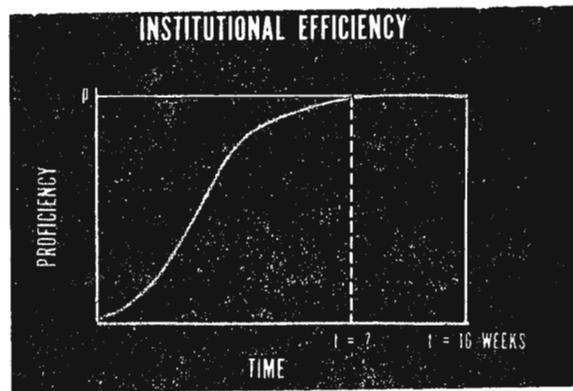
pace and individualize the whole range of Combat Support Advanced Individual Training conducted by the Training and Doctrine Command, would amount to about a division's worth of manpower. One US Army division could be manned out of the manpower savings proceeding from self-pacing and individualizations. Well, you might say then, Why don't you get on with it?

The fact of the matter is that in most of our Advanced Individual Training, these are entry level courses for the soldier when he first comes in the Army.

This state of affairs obtains. We bring the man to the level of proficiency that he could reasonably reach and we keep him in the training program beyond the point where it is economic to train him.

Every other soldier could, we believe, be sent to the field in

25% less time. But we are constrained to keep him in the training base for the full 16 weeks by public law.



In 1951 during the Korean War the Congress passed a law which stipulated that a soldier going to an overseas area would receive a minimum of four months of training, 16 weeks. That law is still on the books, and the Army is still training soldiers to a minimum of 16 weeks. Active or reserve, we have got to keep the soldier in training for the full 16 weeks. Now, obviously in a Lock-Step Program which this legislation

THE LAWS IN QUESTION

- PUBLIC LAW 82-51
- PUBLIC LAW 88-110

REQUIRE 16 WEEKS FOR INITIAL TRAINING

pretty well dictates for a Commandant like General Myers, this means that half of the fellows reach the point that they know everything that the course has got to teach them, and for the last couple of weeks they are bored. Or if we graduate them early we still have to keep them around Fort Gordon or Fort wherever and the problem comes up how to keep them gainfully occupied.

We feel that the law can and should be changed, We are telling the Congress that we have, at the moment, proficiency tests which will enable us to ascertain when the man has reached the proficiency that he needs to perform his duties in the Army and we are asking for permission to send him to his operating unit as soon as he can pass those proficiency tests. And we are estimating that we can get that 25%.

If we could get that law changed one other option comes open to us. We refer to it as one station unit training (OSUT). This is a proposal to undertake collective training in our institutions. It is proposed

to bring a soldier in, right at the outset and put him in a pro-tem unit in which we would be able to establish very early in his career, virtually from the first day, an identity with the branch in which he would be serving and a relationship with a group of drill sergeants and a company commander over a continuous period of time. This would carry that man from his very primary experiences, his very basic experiences, through the completion of his advanced individual training in that one unit.

We don't do it that way now. For a variety of reasons we divided that period of entry level training of 16 weeks into two 8-week increments. Basic combat training followed by an advanced individual training period. For the majority of soldiers that second period of training, advanced individual training, is received at a different place, in a different unit. A different post in the US. This proposal would accomplish significant efficiencies, and we are confident that we can better train a soldier using one station unit training than we are able to achieve with the present bi-furcated system.

The order of magnitude of the Delta T's of this training in institutions is illustrated here. Again, these amount to very substantial amounts of manpower. This is one brigade worth of soldiers for the US Army. It means a brigade that we don't have to reenlist. It means a brigade we don't have to train. Or it means an additional brigade in the force structure. More teeth in the Army, less tail.

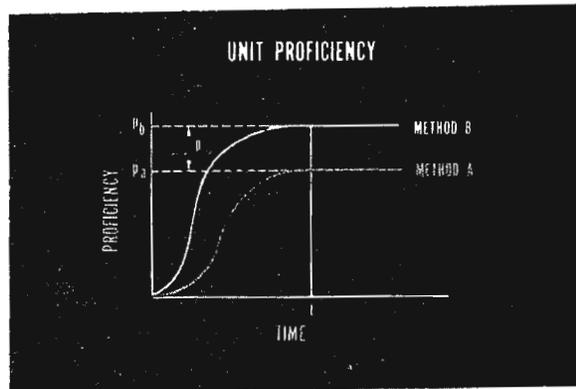
The variable costs are shown here and they are not inconsiderable. Now we will have an opportunity with Dr. Joe Kanner and his panel to examine institutional training in greater detail. Hopefully in the course of those discussions we will see other opportunities that are open to us by way of achieving efficiencies. If I can get those efficiencies in hand and multiply them by the number of courses and the density of students that we have in the US Army we can produce a stronger Army for less money. We can give the Congress and you, the people, their moneys

| OSUT SAVINGS | |
|-----------------|-------|
| TYPE TNG | ΔI |
| INFANTRY | 4 WKS |
| ARMOR | 3 WKS |
| FIELD ARTY | 2 WKS |
| ENGINEER | 2 WKS |
| AIR DEFENSE | 2 WKS |
| SIGNAL | 2 WKS |
| MILITARY POLICE | 2 WKS |

| OSUT SAVINGS | |
|------------------------|----------|
| TRAINING BASE FUNDS | \$4.7 M |
| TRAINING BASE MANPOWER | 409 MY |
| ACTIVE ARMY TRAINEES | 3127 MY |
| RESERVE TRAINEES | 759 MY |
| RESERVE PAY | \$3.6 M |
| ACTIVE ARMY PAY | \$19.3 M |

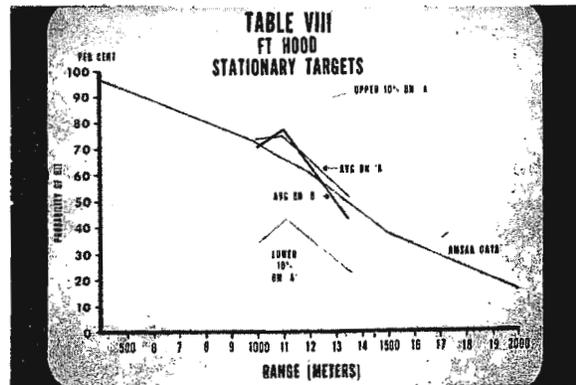
worth for every dollar invested in the Army.

Turning to the second topic, we talk about proficiency. We are interested specifically in proficiency in the units. Again if we could get proficiency anywhere in the training system we are interested. But it is here that proficiency gives maximum pay off in terms of battle capability. Here is the construct on which we are operating. We are looking for ways with a given investment in resource, time, manpower, or whatever, in which we can find methods that will yield higher proficiencies. My representation to you is that this is a real search. It is an undertaking that the Training and Doctrine Command, through the service schools, performs for the Army wherever it is serving.



General Talbott mentioned combat developments referring to that process by which we survey foreign battlefields and technology, trying to find the ideas and the materiel with which to arm the Army for the future. In the Training and Doctrine Command we talk about a correlative program called training developments, where we look assiduously at how to train so as to find these Delta T's.

Here is a actual example from Training Developments in the Training and Doctrine Command to illustrate the point. The long line from upper left to lower right is one of those AMSAA curve, Army Materiel Systems Analysis Agency curve, which represents the capability of a tank cannon, this is the M60A1 tank again, in terms of probability of hit over range. This is the benchmark. This is what the ammunition, the training ammunition, and the cannon should be capable of. And what we have done here is to display the actual performance of two battalions, labeled Battalion A and Battalion B, at Fort Hood, Texas in some actual range firing on a specific test of their ability to hit combat-like targets under combat-like circumstances.

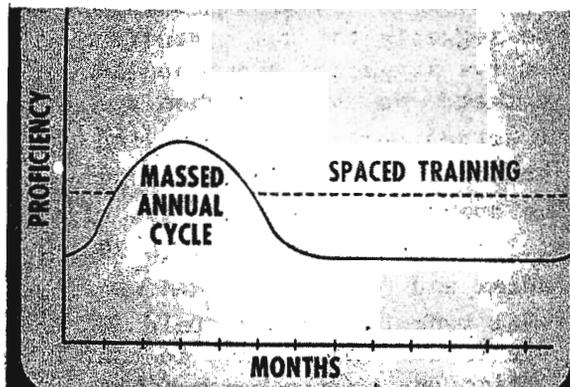


As you can see the test involved targets from about 850 meters to about 1350 meters. That is not the full range of the tank cannon but as the line suggests the two battalions performed pretty much the way the AMSAA curve suggested they should perform. Well, can we take comfort in that? No, because when you stratify the crews in Battalion A by their actual performance you find a spread that ranges from this lower region on the chart to this upper region on the chart. The bottom line is the average of the lower 10% of the crews in Battalion A. The differential between these crews is 70% probability of hit. There is no way, ladies and gentlemen, that we could build product improvement for the M60A1 tank that would yield 70% increase in the probability of hit. There is no ammunition, no range finder, no better turret, no gadget, no gimmick, no black box, that we could stick on that tank that would give us a 70% increase in the probability of hit. But it is very obvious that is possible to get performance like that upper 10% of the crews. So it is incumbent upon us in the training developments process to find out what it is that makes those upper 10% of the performers.

For example, General Talbott mentioned that we had changed the standards for opening or firing time. One conclusion from our study of the Mid-East is that he who shoots first has a much greater chance of surviving on the modern battlefield. Two years ago the standard opening time in this exercise, that is to say the amount of time allowable for the tank to get off the round, was 15 seconds. We now give a weighted score; to earn maximum points you must shoot in 5 seconds. We wish as a standard to get the median here at about 7. In actuality these crews were shooting at about 9 seconds on the median. That was not bad, given the fact that this was the first training that these particular crews had had with these new standards. What is interesting is that the crews which shot fastest are the crews in the upper 10%. The crews which shot slowest are those crews in the lower 10%. There is no conflict between accuracy and speed provided that the training is conducted properly.

Well how does one approach that. One of the things that we learned in this study, one of the points which emerged from our analysis here, this bit of training development, is that the Army has simply got to change its mind about how it goes about conducting training. The Army is 200 years old this week. And I guess from year 1 of its existence through the present we have annualized our training cycles. I suppose it had something to do with letting the troops go home to harvest the crops or letting the militia go back to get paid or something like that. But virtually everything we do, once a year is enough. There is an annual rifle season. There is an annual tank gunnery season. There is an annual artillery shoot.

Of course, what conceptually is flawed in that approach is that for every learning curve that the collective takes, there is a forgetting curve, a real, quantifiable forgetting curve on the back side of that learning curve and what you do is settle for mediocrity for most of the year with an annual training cycle. For a skill like tank gunnery we can demonstrate that once a year is simply not enough to provide the proficiency that



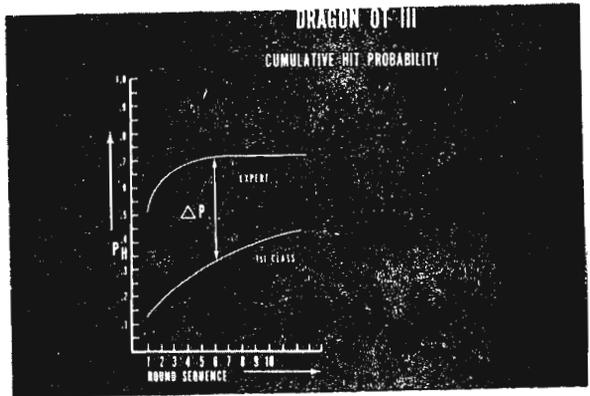
is required for the modern battlefield. It is far better to space the training throughout the year. Moreover, we can demonstrate that it is less expensive to do it this way because you don't have to pay the very high price in training ammunition that one has to pay in order to climb all the way to the top of the learning curve.

We think that much of this spaced training can be maintained through simulation. Miniaturization with the tank gun, the use of lasers in lieu of firing around down range and a variety of other approaches which we won't discuss in detail. But I think you will be able to see in the displays outside, some of the technical approaches that are open to us. I would like to discuss these notions in little greater detail using the weapons system that General Talbott referred to in his presentation.

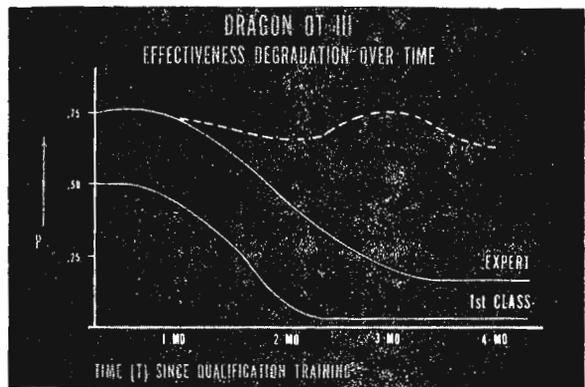
This again is the Dragon Weapons System, an anti-tank system, 32 lbs, held on the shoulder of the soldier. Above the tube is the tracking head that follows the missile down range. All the soldier has to do is to keep the cross hairs focused on his target and the machine will automatically fly the missile to where the cross hairs are laid. The machine is very accurate out to 1000 meters. But the weapon's accuracy is modified by the fact that it is on a human shoulder, and that human flinches when this thing makes noise and when people are shooting at him. When the target is moving and dodging, weaving and disappearing behind bushes it becomes hard to keep that cross hair in the right place. All the normal human errors obtrude.



Here again is the point that General Talbott made about the distinction between first class gunners and expert gunners. If we can deal with the expert class, we can get almost immediately into the realm of probabilities of hits of .7 on the average and it is easy to maintain it. The point that I would like to make is that the soldier got to his initial point through simulation, through the use of this launch effect trainer. So one could talk about the role of simulation in achieving proficiency. One needs to also talk about the role of simulation in maintaining proficiency.



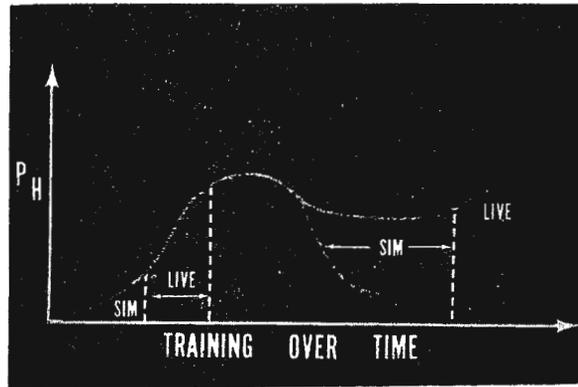
This is a depiction of that degradation of training over time and the chart here suggests that the soldier needs the simulator in order to maintain his proficiency over time.



What the Dragon lesson shows us is that if we will use a simulator as a discriminator to pick the soldiers who should be given the system, and combine that with the proper use of simulation and training, and constant practice, we can get this kind of differential. Again we are looking at a product improvement through training that is far beyond anything that we could build into the weapons system through material.



And finally, then, a kind of a generalization or a construct built around these ideas which could be supplied as satisfactorily to the TOW system or to any other weapons system like the Shillelagh system that General Talbott referred to for the M60A2. If the measure of effectiveness is probability of hit, the proficiency that we are looking for, and time is on the horizontal axis, there is a period of time early in the acquisition of proficiency in which simulation can play a significant role. We believe that for these kinds of missile systems, one of the important roles of the simulator is to discriminate among those soldiers who can handle weapons system. Separate those who have the hand/eye coordination, the steadiness, etc., from those who do not.



Then one has to invest in a certain amount of live firing. For all of the systems we have been looking at, this is true. One cannot completely substitute for live firing, at least with the simulators that are presently available to us. We are looking for better simulators. We would be delighted if anybody in NSIA could come forward and show us a better simulator. But at the moment we are saying that we need to invest a certain amount in the live firing. Then we must maintain proficiency and here again we believe that the simulator can do that and periodically we have to go back to live firing in order to refresh and refurbish those skills. Of course, we would want to do this in any period of heightened tension when we are preparing the unit to go into battle.

I offer this as kind of a model that we would bring to the analysis of any particular weapons system when we were examining that weapons system in order to find how to bring about improvements in proficiency. Dr. Charlie Jackson and his panel will discuss with you approaches to gaining and maintaining proficiency as seen from the reserach community and from the point of view of industry.

Out in the lobbies around the area you will see demonstrations of ways and means that are available to us today for these purposes. For example, the moving target screen across the way is a simulator that we believe gives us some effective approaches to training soldiers to shoot at moving, dodging targets. Also out here in the lobby are other devices that take us in the same direction.

Now let's turn our attention to this matter of institute to unit communication. I want to be clear that the usage I have put on the word communication here is probably a lot broader than is common. But, I think for the purposes of our discussions over the next couple of days it is

important to keep that word just as broad as we can possibly get it.

The US Army can make a lot of money in addressing these kinds of problems if we could bring about a better linkage, or tie, between the unit commander who faces all of these very difficult problems, and the service schools where we have the putative experts in our weapons systems, the font of our doctrine, etc. This particular problem was with us throughout the years of the Vietnam war and is still with us. We still

have soldiers in service on two year enlistments. They will be disappearing, the minimum enlistment now is three years, but there is a substantial amount of turnover occasioned by the Army's effort to keep the forces in Germany at full strength and supplied with well trained individuals.

To look again at the importance of this communication link I offer these generalizations about the institution and the unit. The institution is the font of knowledge. In the unit are the fellows who have got to do most of the training job and who have the least wherewithall to do that job. Anything that we do to operate on that equation is going to pay handsome dividends.

Here are some possible interventions that the US Army could use to build communication from the service school into the units. I am not going to develop these in any great length because COL Frank Hart and his panel will discuss many of them in extenso. Extension courses refers generically to nonresident instruction, if you will, prepared in the service school, packaged for delivery in the units or by self-study by the

UNIT TRAINING ENVIRONMENT

- ANNUAL TRAINING CYCLE (PROGRAMS)
- PERSONNEL TURNOVER
- INEXPERT CADRE
- OVERCOMMITMENT
- LIMITED RESOURCES

| | <u>INSTITUTION</u> | <u>UNIT</u> |
|--------------|--------------------|--------------|
| DOCTRINE | SOURCE | USER |
| CBT DEV | SOURCE | USER |
| TNG DEV | SOURCE | USER |
| INSTRUCTOR | EXPERT | GENERALIST |
| TIME | LIMITED | LESS LIMITED |
| FACILITIES | ELABORATE | PRIMITIVE |
| SIMULATORS | EXTENSIVE | PRIMITIVE |
| INST. DESIGN | ADVANCED | PRIMITIVE |

POSSIBLE INTERVENTION

- EXTENSION COURSES
- JOB PERFORMANCE AIDS
- STRUCTURED OJT
- SIMULATION

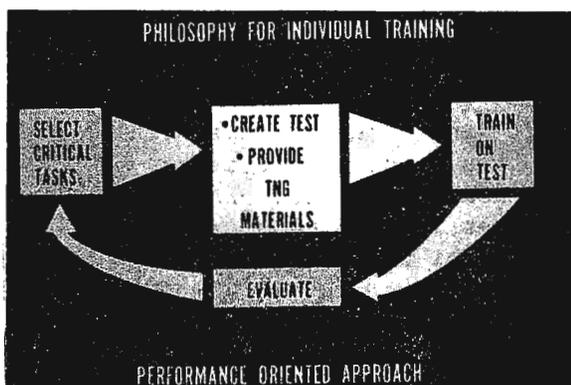
individual. Job performance aids refer to procedural guides, particularly for the conduct of technical training. Structured on-the-job training is an attempt in the service school to build courses of instruction which are deliberately designed to be administered in the unit and which involve the supervisor of the trainee in the training process from day to day. There should be a measurable, perceptible growth in skill and competence, recognized by both the trainee and his immediate supervisor, so that the OJT program builds that cohesion to which I alluded earlier. And finally, of course, the area of simulation which we have already discussed and will come back to, in our final discussion.

It is important when talking about communication to recognize that there are three broad classes of jobs in the US Army. The percentage of job holders are broken out as on this slide. The distinction between these is important because for the bulk of the soldiers in the Army, those whose jobs are concerned fundamentally with maintaining or operating materiel, and those whose jobs are related to administration or the providing of services;

| TYPES OF JOBS | |
|---------------|-----------|
| CATEGORY | % OF ARMY |
| COMBAT | 28% |
| TECHNICAL | 29% |
| SERVICES | 43% |

for these soldiers in those two categories (technical and services) what they do in peacetime is what they do in war time. Therefore, training strategies built around on-the-job training are far more readily available to us than comparable strategies which we attempt to apply to the combat arms soldiers. The combat arms soldier in many ways poses for us the most difficult of our training problems. He must be trained fundamentally through simulation. We have got to simulate battle in order to create for him a learning environment within which he can progress in skill and knowledge. Now we will come back to talking about him in a moment.

Let me focus a little more definitively, however, on the general proposition of communications for all of these people. We bring to our attack on the problem of communication, the kind of general strategy shown here, whether we're talking about the combat arms soldier, the technician or the fellow in the service trades. The fundamental step is to identify what is genuinely critical to him in the

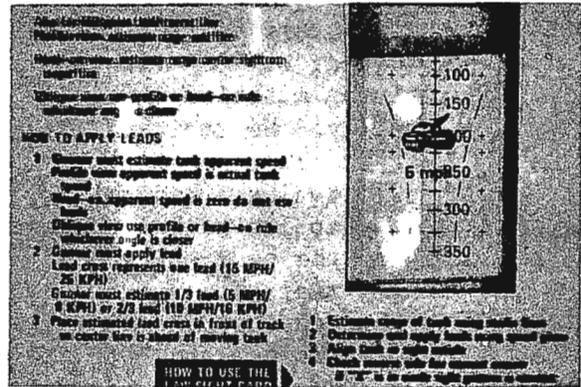


course of doing his job. What job performances or tasks are genuinely critical to his success or failure on the job? We then build a test to ascertain whether or not he can perform that task satisfactorily. We provide training material to develop the competence to pass that test satisfactorily. We train on the test, we tell them what the test is going to be, we ask them to train to the point where he can pass that test, and then we evaluate his ability to pass the test and then show the feedback loop to let us know whether in fact we have adequately defined the task or built the test correctly. The words "performance orientation" here simply imply that the name of the game is not to demonstrate skill at reading, not to demonstrate the ability to cope with multiple choice questions, but to demonstrate competence with an actual military undertaking.

General Talbott described the light anti-tank weapon M72A2 or the LAW. It's issued to any soldier who might have to fight a tank, whether he's a soldier of the Signal Corps or the Artillery or the Infantry. Across most of our MOS's, soldiers must be able to fire this weapon. General Talbott alluded to the fact that we had conducted training development tests to find out what the critical tasks were in mastering this weapon. The improved training program which the Army came up with involved the use of a simulator. The simulator in this instance included a subcaliber round of ammunition. I've a lot of trouble explaining to people that that's a simulator because there's a lot of folks in Washington and elsewhere who think of a simulator in terms of something shaped like a cement mixer that you put the soldier inside of and shake, rattle, and roll him in the process of the learning experience.

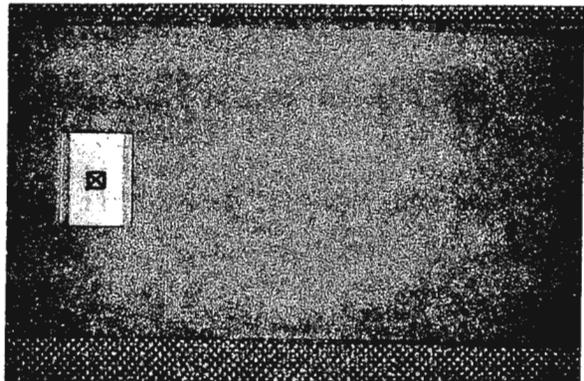
This small rocket performs ballistically like the actual 66mm rocket that the LAW fires and you can shoot it at an actual tank. So it's possible with this simulator to allow the soldier to experience all that he would have to face short of the outright terror that will, no doubt, accompany the actual event. He gets an opportunity to handle the sighting and aiming process and measure his ability against an actual tank on actual terrain. This simulator, incidentally costs about one-tenth of the service round and of course, it is rather difficult for us to fire the service round against the actual tank.

Now we use another simulator and here again I have difficulty talking about simulators to some people. We found that one of the critical tasks with which soldiers had the greatest difficulty was in setting up the correct sight picture and we devised a simple slide rule affair which has a bunch of tanks on it, a window with a slide, the reticle of the sight, (the actual device that's on the front leaf of the LAW) displayed on there and the soldier simply raises the tank on the sight leaf so that it is correctly positioned. The reticle that he has to learn how to master, is graduated in meters from 50 to 350. This is what is hard to learn, this is a stadia-metric feature. It's designed to assist the soldier in ascertaining what the correct range is. This again goes to the critical task that General Talbott mentioned. If you can determine the range, your probability of hit goes up dramatically. So we put these stadia-lines on here and what the soldier has to do is to fix the lines onto the width of the tank as it appears to him and that will give him an indication of the range. If the tank were in full side profile, it would just fit between the vertical curved lines and he would slide that up to fit it to the tank and he would at that point and time have the correct range to fire.



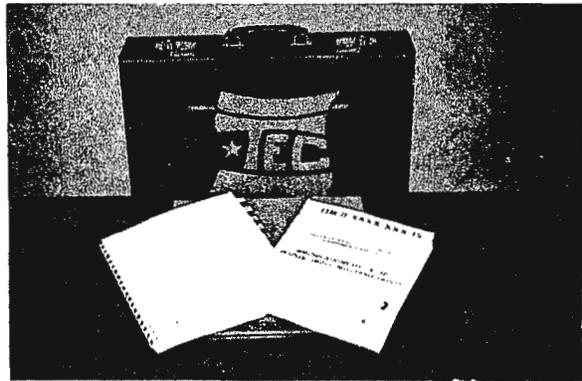
Now, when the tank is as shown here, in sort of a semi-side view, he has to make an approximation. He has to know how to make that approximation and that's what this little simulator enabled us to get at.

Moreover it is not only a teaching device but an evaluator. Over on the back there's a box with an X in it and the Sgt can watch the soldier from the rear as he slides the slide back and forth, and he can ascertain, when the X is in the box, the soldier has the correct sight picture set up and he can put him on to the next one.

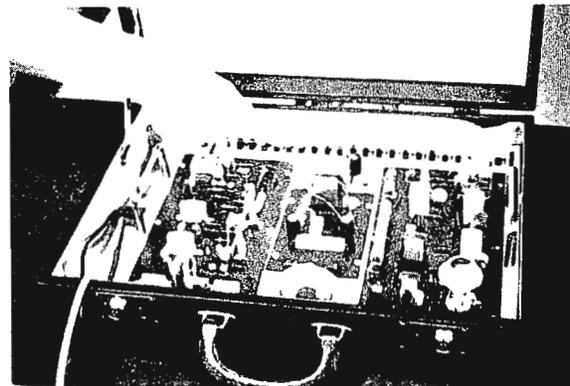


Now this was developed at a service school, the United States Army Infantry School. It was developed to assist unit commanders to conduct training wherever it might occur anywhere in the world. It's a communication mechanism. I may be stretching a point in referring to it as a simulator and as a communications mechanism, but I think it makes a point about the breadth that I would hope that we could use that term.

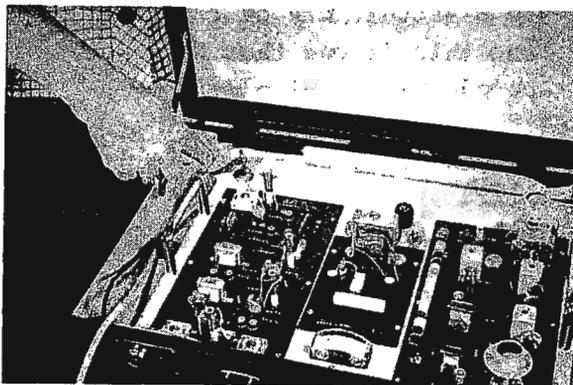
Here's another way of communicating and this is one that General Myer's people here devised at Fort Gordon. This is a programmed text (it's in draft here) and in it's present form will walk soldiers through the process of trouble shooting a piece of electronic equipment. Now that programmed text proceeded from an analysis of five military occupation specialties by the Signal School in which the school ascertained that trouble shooting procedures in those five MOS, across all the 64 various kinds of equipments, radios, and radars that those technicians in those five military occupational specialties were expected to maintain, that the trouble shooting procedures had a great deal in common. In fact, so much in common, that it was possible to build a simulator which would permit the soldier to apply his test equipment and trouble shoot the simulator just like he would the radar or the radio that he would be expected to handle in the field. The simulator is in a suitcase or briefcase, and there are manuals that explain how to use the simulator and the program text together.



Here's a view inside the simulator. As you can see there's all kinds of resistors and capacitors but what's interesting is that there is a row of switches and the soldier, in his self study, can program into this circuitry faults by setting up a certain coding on the switches. He induces certain kinds of errors or problems into the circuitry. He can then take his test sets and see if he can find that difficulty and properly write it up for maintenance, removal, replacement, or repair. So with this simulator we can train. We've ascertained that trouble shooting is a critical task in five MOS. We've provided a test in this form and we've provided training materials in the form of the program text and the simulator.



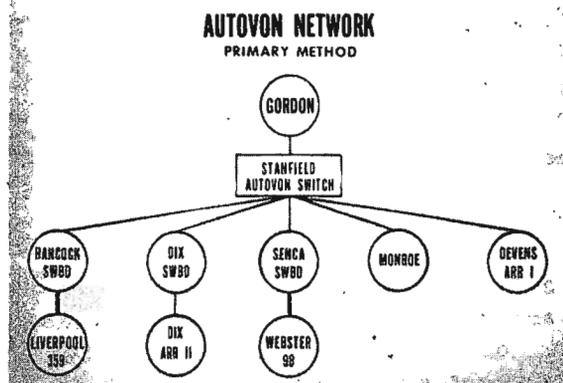
We can now administer that test and we do that by simply putting a metal bar over the switches, locking the switches, and the test officer or the NCO can induce an error, lock the simulator up, hand it to the man and say "Here, trouble shoot this and write up the maintenance form." The outcome of the test is his ability to correctly fill out the maintenance form.



I think that this is a superb illustration of good training developments in a service school that will be of inestimable value to reserve component commanders, all over the United States who have very low densities of these soldiers in these particular military occupation specialties. They come only one or two to the unit or detachment, but they all need to be trained and those commanders don't have the expertise to train these fellows. General Myer is going to have to do that and he's going to have to do that from here through this mechanism. So again, all of this paraphernalia is a communications medium, as I use the word.

Now we understand that the printed word is still the cheapest way of communication, but we've got problems and we know that we are going to have to supplement the printed word with other communication mechanisms.

Again I want to cite an experiment conducted here just within the past month by the Signal School in which we made available to a group of 45 reservists, on one weekend, 16 successive hours of instruction in radio teletype procedures. Not a very exciting training undertaking, but a very necessary one. Again we were talking to a problem that occurs in relatively low densities in a wide variety of units all over the United



States. What we did was to set-up the network shown here on our automatic voice dial telephone network. During the weekends those networks sit by and large unused. We put them to use in this particular instance by connecting a classroom here at Fort Gordon, where we had some of General Myer's instructors giving a class in radio teletype procedures using slides just exactly like I'm using them here and talking the soldiers through

their paces in this subject just as they would if they had them here at Fort Gordon. They were connected by AUTOVON to five locations. By way of interest, Liverpool is outside of Syracuse, New York, Webster is just outside of Rochester, New York, Fort Dix is in lower New Jersey and Fort Devens is in Massachusetts. I took the 16 hours of instruction. I now know more about radio teletype procedure than I ever wanted to know.

But this fellow here at Fort Gordon as he changed his slides, we had mechanisms at all of these locations that would simultaneously change our slides. We had microphones on the tables at all of the locations so that any time a soldier had a question he could break in and ask what the fellow meant by that. It was a very interesting experiment to me because I noted that first of all the field manual, the document that these reservists had in hand with which to do the job, was out of date. Time and time again the soldier would say "Oh, but it says right here on page so and so, Sergeant, that what you said ain't true." And the Sergeant would have to say yes but that was up-dated by such and such change published three months ago and hadn't filtered out down the system.

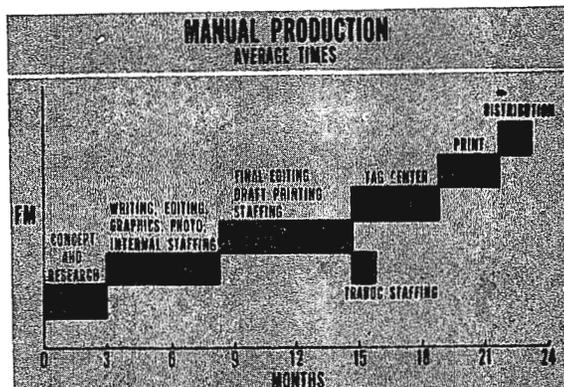
It is also interesting for me to note the language, the terminology, the vocabulary that the Sergeant at Fort Gordon used was different from the language and the vocabulary that the reservists were accustomed to. Most of them had gone through Fort Gordon 4, 5, or 10 years ago and we change in the Army as do most other institutions from year to year. The way we talk about our job changes and these people had a little communication problem just in terms of vocabulary, that they had to get straightened out. In these and other significant ways I was struck with the fact that bringing these 45 reservists at those locations into contact with Fort Gordon, even by means of the telephone, using the slides mechanisms for visual support, was a very useful extension of institutional training down into the units and a very direct attack on the key problem of reserve component training.

We expect to take this sort of approach considerably further with experiments next fall when the reservists complete their annual training period of two weeks at active Army installations and are back at home station.

I'd like to mention in connection with this particular experiment that the linkage to Webster outside of Rochester, New York was accomplished under what is probably the worst possible sort of conditions. The class met in the basement of a grocery store, the local telephone company was on strike, the management had to come in and hook the telephones that these reservists were using as their terminus to a pay phone up in the grocery store and because people kept breaking in and trying to get a call out, they hung an 'out of order' sign on the pay

phone so we could talk through continuously during the exercise. If we can work through that kind of interference and get 16 hours of useful institutional training done, I think that we have a worthwhile undertaking.

Now this chart illustrates the difficulty with the printed word to which I earlier alluded. On the average the United States Army takes two years from the idea to the reality in a military publication. Obviously, that is altogether too long, and one of the major efforts in the Training and Doctrine Command is directed at improving our track record with this form of communications; we've got to, if we are going to keep pace with the sweep of technology.



To make that point, refer if you will, in your mind to the plight of the State of Israel, victorious in 1967, but faced with determined enemies and constant threat of war, and yet over the five years between the 1967 war and October of 1973 their doctrine proved insufficient. They didn't get the word out rapidly enough and diffused enough to prepare them for the October War when it broke.

One of the more signal failures was in coming to grips with the missile that General Talbott alluded to earlier, a model of which we have on display out in the lobby. It's called the "Sagger". These pictures are extracted from a publication that we provided you, not because we thought you all needed to know about the Sagger, but simply to illustrate the kinds of publications to which we are resorting in an effort to meet

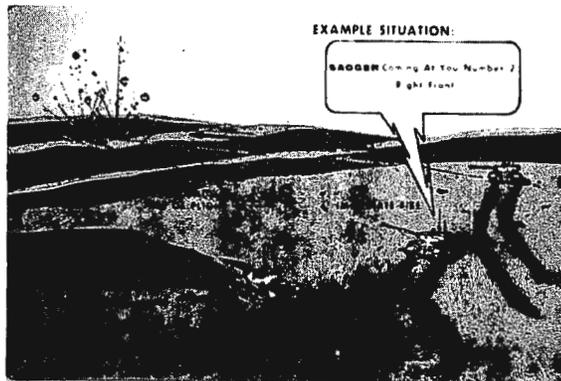


the challenge posed by General Talbott. Our soldiers, the soldiers of the United States Army must know what they are going to encounter in terms of enemy weaponry on the battlefield and this is a mechanism for informing them about those weapons. This book was produced in three months from the idea to the reality. Within three months from the day we said that we were going to do it we had these down to battalion level throughout the world, and it's a very useful publication.

To illustrate the point a little bit more. When the Egyptians crossed the Suez Canal attacking the defenders of the Barlev line, the Israeli defense line, those defenders saw the Egyptian soldiers carrying on their backs this suitcase-like package and there were some good natured reports over the radio to the effect that the Egyptian infantry has come to stay. That jocular report went back on up through channels, but at no echelon did anyone in the Israeli defense force apparently alert to the fact that the Egyptians were deploying the Soviet Sagger missile which could be so packaged. When the Israeli division, armor division, was sent into counter attack against the Egyptians that had made a lodgment on the East bank of the Suez Canal, the lead tanks reported that as they advanced across the desert they saw what appeared to be a line of trees; out 3000, 5000 meters to their front, about every 30 or 40 meters there was what appeared to be a tree. It turned out that that line of stakes were Egyptian soldiers each armed with this device, and as the Israelis approached the 3000 meter line the Egyptian soldiers laid down behind their weapons and delivered a barrage -literally- of these guided missiles at the advancing Israeli tanks, and devastated the lead battalion creating a shock which very nearly paralyzed the Israeli Armed Forces for several days. Tactical surprise.

Now with this publication and with those kinds of plastic models of the Sagger and other weapons that you see outside, we hope to communicate to our soldiers enough information so that that same kind of surprise will not take place. Moreover we would hope, through these publications and through other doctrinal publications, through stipulating standards to be met in training, we hope to show him what to do about those missiles in combat.

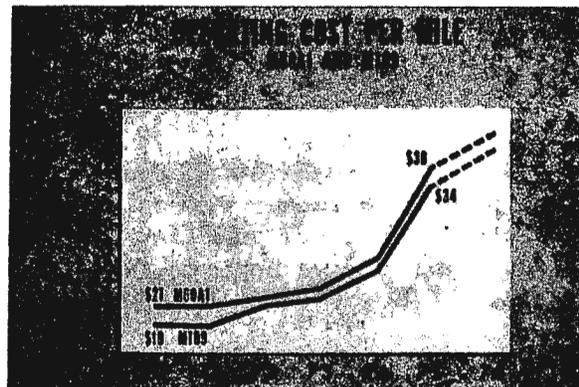
Here, for example again from the TRADOC Bulletin #2, is a prescription for handling a tank platoon in the presence of the Sagger. This simply talks about the techniques called Sagger watch in which one tanker is assigned the job of keeping an eye on a particular sector and when he sees the Sagger fired he immediately calls the warning to the others so that they can take advantage of the 21 seconds time of flight of the missile to take evasive action. If they can do that, seek cover in the terrain, as you can see here, they can defeat that missile system. As I mentioned earlier, Colonel Frank Hart and his panel will examine in some detail for you the other options that are



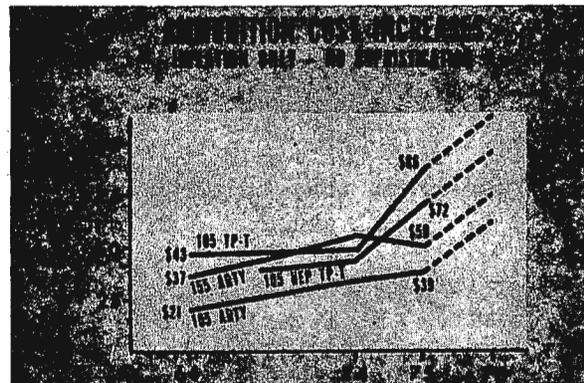
open to the Army and to others confronting comparable training problems in bridging the gap between a source of expertise and doers in the field. Again you will see many of these devices illustrated in our displays and tours.

Now finally, and perhaps most importantly, I would like to turn our attention to the general question of simulation. I made the point earlier that one cannot train combat soldiers in peacetime except through the use of simulation. We have indicated that simulation plays an important role in the achievement of proficiency. But probably nowhere is simulation as important as developing the teamwork and the prowess of the battle captain to which General Talbott alluded in his remarks. In training the individual tank commander, the man who must make those choices on what terrain to use, where to drive, what kind of evasive action to take, split second decisions; in training him to make the proper decisions, time is one of the more difficult undertakings that we face and we see no way of doing that without some kind of an approach to simulation.

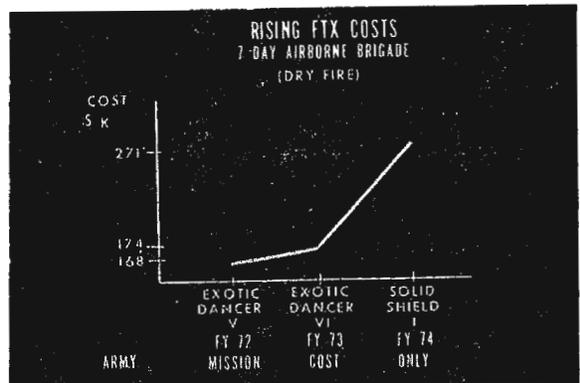
Not the least of our concerns in finding more effective simulation is the fact that we are facing very stringent cost constraints in conducting our training in the traditional fashions. I show you here some cost curves for two of the vehicles, combat vehicles, that we have in largest numbers in the US Army. One is the M60A1 tank that we have been discussing all morning, and the other is the 155mm self-propelled Howitzer, the basic artillery piece of the US Army. As you can see, just over the past five years the costs of operating these vehicles per mile have increased by a factor of two-thirds.



Here are some ammunition costs to show you that using ammunition for training purposes is increasingly an expensive proposition for the Army. The slopes, which we are looking at here, reflect, of course, the higher costs of manufacturing replacement ammunition. The same rounds, over time, are just more costly all the way.

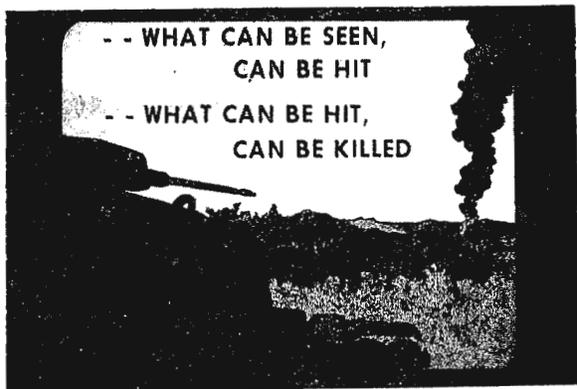


Here are some cost figures on a traditional field exercise. No live firing involved in here, there are not any ammunition costs, and this is an outfit, an airborne brigade, that does not have many tanks, does not have self-propelled Howitzers. It is not incurring those high costs per mile for track vehicles that I referred to in my earlier slides. Just the simple expenses of taking the unit to the field and maintaining it for a period of seven days have gone up dramatically in this timeframe. I could show you figures for the past year which indicate the slope shown here has again been verified, born out by recent events.



Now, General Talbott made this point. This is pretty critical to all of our approaches to simulation in tactical training. Indeed, as we shall see in a minute this is the very basis for most of our simulations.

Let me, before I talk about those, take you back, some of you can remember this, to the Louisiana maneuvers of 1942. You remember reading about how the US Army staged these great mock war games across the southern US to simulate the conditions that the Army would face in North Africa and subsequently on the European continent. The US Army has not advanced the art of such a simulation much beyond where it was in 1942. Our present field manual for the conduct of maneuver training contains basically maneuver control mechanisms identical to those that were used in 1942. Fundamentally, we train by putting out on the ground a tactical unit and putting it through the paces that it would have to move through in battle. We provide controllers, umpires, who go out on the ground and watch this unit while it is going through those paces and make a judgment whether it was doing right or wrong. They critique the commanders and the soldiers as to whether or not they were properly doing it and hope thereby to teach them well enough to insure that in battle they will not make similar mistakes. Now, I think that you can infer that it is exquisitely difficult for an umpire to do that today.

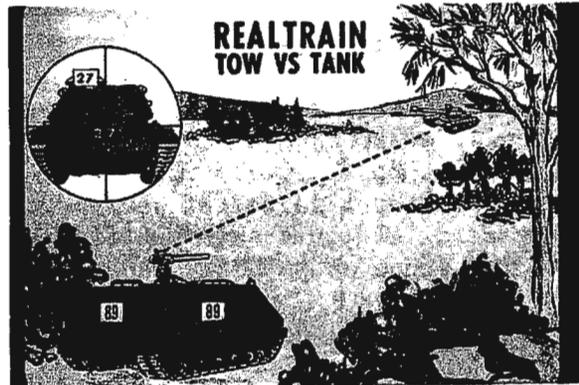


I take you back to General Talbott's slide which illustrated that the reach of a tank cannon today is at least 20 times what it was in WWII. So the umpire has that much more ground to watch. The reach of the anti-tank guided missile is 3000 meters, a couple of miles, and it's very difficult indeed to see the target with the naked eye. The optics the gunner is using are ten power and he

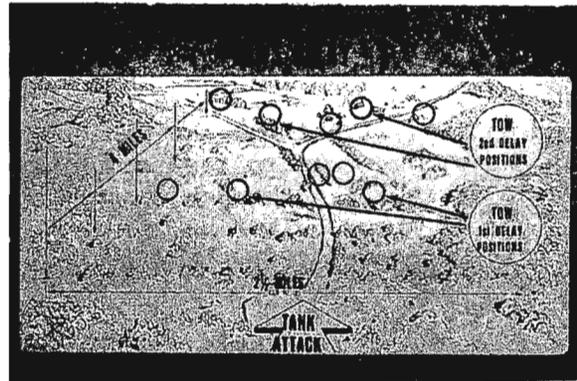
see his target far more clearly than the umpire can in many instances. But it is very difficult to get across to the participants in field exercises today what is involved in this lethality and proliferation of weapons that obtains in the modern battlefield. Hence the importance of simulations such as General Talbott discussed in the Wildflicker experiment.

I would like to develop that a little bit for you so that you understand what we are doing. All we do is build an optical replica of the transaction between a gunner and his target. We do it with a telescope mounted on top of the firing weapon and numbers mounted on the target vehicle. All participants have numbers on them, all are equipped with these telescopes. The geometry of the numbers and the power of the telescope is the simulation.

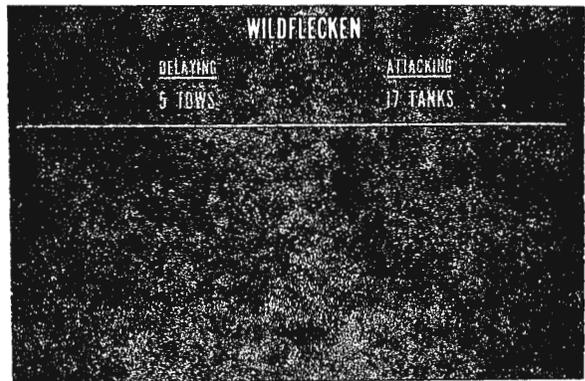
If the gunner can see the tank well enough to read the number, to announce the number, he is assumed to have killed the tank. What can be seen can be hit, what can be hit can be killed. In this particular case the TOW gunner has to keep the target tank in his sights for a period of time that would equate to the time of flight of his missile and an umpire here using this auxiliary telescope verifies that in fact he did that and at the moment of impact he had his cross hairs properly aligned. If at that moment he can call off that number he is awarded a kill. Now here is the tank with the numbers painted on the side of it. There is a number on the front as well. This is the sort of a problem that we can solve with simulations of this sort.



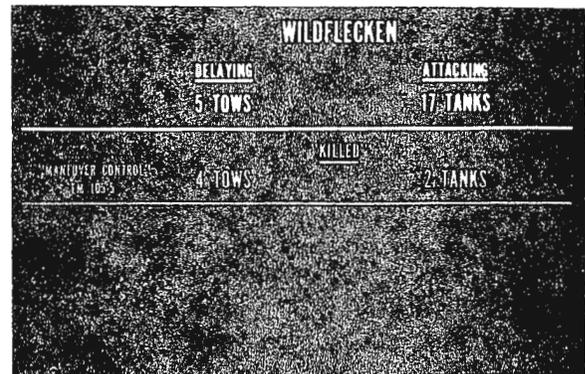
This slide shows a two and 1/2 mile front about four miles in depth to set up a simple exercise involving five TOW and 17 tanks. This is a delay exercise in which these five anti-tank guided missiles will take up certain initial positions, will fire at the advancing tank company and then will fall back to other delaying positions to the rear and then again take the tanks under fire.



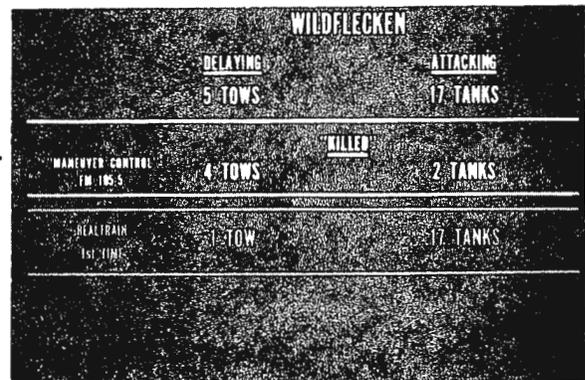
We ran such an exercise, this is another such iteration in the Wildflicker tests. We had five TOW in this instance delaying against 17 tanks attacking.



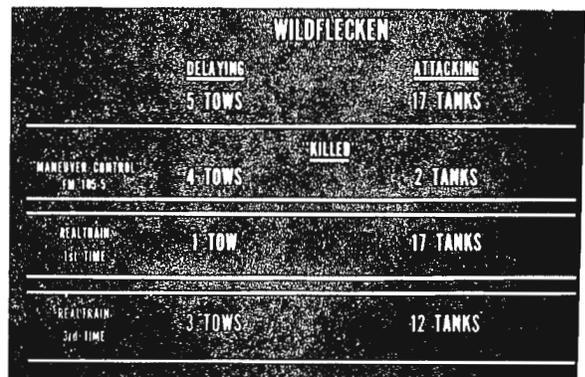
Now if one turns to our field manual on maneuver control, FM 105-5, published in December of 1973, one month after the conclusion of the October War in Israel, and applied the formulae that are found therein, for adjudicating this attack, the umpire would have had to eliminate four of the delaying TOW and two of the attacking tanks. That is the way we have been training.



It turned out in the actual event that the first time through, the first iteration, in this exercise at Wildflicker, only one TOW was destroyed and all of the attacking tanks were eliminated. That is pretty real. Because this is of course virtually the experience that the Israeli armor division underwent in its first exposure to the Sagger that I just described. The second time through, just as in the tests described by General Talbott, the performance of the tank company improved.



The final run through, the third time, they only had twelve tanks destroyed and there were five tanks left.



Now a couple of points about this sort of simulation. First of all the costs of running this exercise no matter how it were umpired, would be substantial. If that unit had gone out onto the ranges at Wildflicker and conducted their training as the Army has traditionally conducted training, the bulk of the expense would have been incurred. Simply the operating costs per mile to take the outfit out on the range and run it around cross country would consume POL (petroleum, oil and lubricants), it would consume spare parts, and the time and the pay of the soldiers would have to be taken into account. The differential between conducting training per this field manual and conducting training with the simulators that we described, \$1600 for those telescopes and the numbers, is substantial.

SAVINGS - 1000:1
REALTRAIN EQUIPMENT (\$1,600.00)
SAVED
1 TANK PLATOON (5 TANKS) (\$1,600,000.00)

Now I have to, from time to time, appear before people in Washington who are not prepared to believe that a simulation that would enable us to get forward with teaching the proper use of the terrain and due regard for the lethality of enemy weapons, would be worth its weight in gold. There are a lot of folks in the Congress and elsewhere who are not prepared to accept that on face value. I have to submit cost figures. So the way I have been trying to attack this is to make a point that that \$1600 investment is demonstrably, in this case, worth five tanks. By the third time through that company, that tank company, knew how to use the terrain and to cope with TOW-like weapons systems in delay positions well enough to have come out with a tank platoon that it wouldn't have had if it went in without this training. Obviously you can buy a lot with what it would cost to buy a tank platoon. The return on investment in this instance, one way of looking at it in any event, is 1000 to 1.

Now Colonel Jim Madden will lead a discussion of simulation as it is applied to this very problem and to other comparable problems. What we are trying to teach here are the lessons that General Talbott cited as being important; lethality, use of terrain, use of suppressive fire, combined arms; all of these can be taught, we think, far more effectively than the Army has done so in the past. Must be taught, must be taught, if we are going to win the first battle of the next war.

To summarize, we are going to talk ladies and gentlemen in these four areas, four separate panels; Dr. Kanner's, Dr. Charlie Jackson's, COL Hart's, and COL Madden's panels.

POTENTIAL WIN AREAS

- INSTITUTIONAL EFFICIENCY
- UNIT PROFICIENCY
- INSTITUTION-UNIT COMMUNICATION
- EFFECTIVE SIMULATION

All of this is taking us toward the end of developing an Army with the battle effectiveness to fight outnumbered and win. Win the first time out.

HOW TO WIN OUTNUMBERED

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