RESERVE COMPONENT TRAINING

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ABSTRACT

The relative costs of Active forces and Reserve forces make Guard and Reserve units increasingly important in defense planning. With the inception of the Total Force policy, the training objectives of Guard and Reserve units became the same as those of Active units with similar missions. The other side of the economic coin that favors Reserve forces is less time and equipment for training, fewer training areas, and poorer training facilities. These factors plus geographic dispersion of Guard and Reserve units make the training environment for Reserve forces much different from that for Active forces. This paper is a progress report on Phase 1, Army Reserve Components, of a study of technology and procedures to improve training programs of the Reserve components of the Services. The study methodology for Phase 1 is expected to be used for subsequent phases that examine the Navy and the Air Force.

A. GENERAL

Under the Total Force Concept, performance standards and training objectives for Guard and Reserve units *are the same* as those of Active units with similar missions. However, the differences in economics of full-time and part-time forces and in learning reinforcement associated with training timetables for these forces make it necessary for the Services to use different training strategies for Active components and Reserve components (Guard and Reserve). There is general agreement that strategies for training the Reserve components (RCs) have not, in many cases, provided units with personnel trained well enough to meet their service performance standards (for example, see Ref. 1, a recent Defense Science Board report). Thus, the Office of the Assistant Secretary of Defense (Reserve Affairs) and the Institute for Defense Analyses have undertaken, in late 1985, a study of major elements of those strategies, viz., training technology and training procedures.

Purpose

The objectives of the OASD(RA)/IDA study are to (1) identify significant shortcomings (if any) in the use of technology, training devices, and procedures to train the RCs of all Services, and (2) make proposals for the development and acquisition of cost-effective training devices and procedures needed to train the RCs.

Scope

The study focuses on sustainment and unit training, vis-a-vis institutional training, and on enlisted personnel only.

Approach

Inasmuch as identifying technology and procedures to meet training needs of the Service RCs means finding the most promising training investments, our study involves evaluating the effectiveness and costs of training media.*

B. ARMY RESERVE COMPONENTS

Because of recent congressional interest in nonsystem training devices** for the Army Guard and Reserve, the first phase of the study is concerned only with the Army RCs. The paper describes our methodology, which is outlined in Fig. 1,

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*Selection of a "medium," or equivalently a "training device," implies selection of an encompassing "instructional system," in which courseware (which is the substance to be learned) and software (which calls up the courseware as needed and controls the medium according to an instructional strategy) are arranged to advantageously use capabilities of the medium (e.g., printed material, audio-visual equipment, videodisc, etc.).

**A "nonsystem" device supports general military training, or more than one system or item, or several different types of equipment (an example: MILES, multiple integrated laser engagement system). A "system" device is designed for use only with a specific system or item (an example: M48 tank Turret Trainer). This study will consider both types of training devices, as appropriate.

and our progress in the Phase 1 effort.* Follow-on phases of our study will address Navy and Air Force RCs. As you will see, that progress is uneven. While we are well along in our effort to collect generic cost data, our efforts to estimate the costs and the effectiveness of media for specific applications involve collection, evaluation, and analysis tasks, many of which are still to be performed.

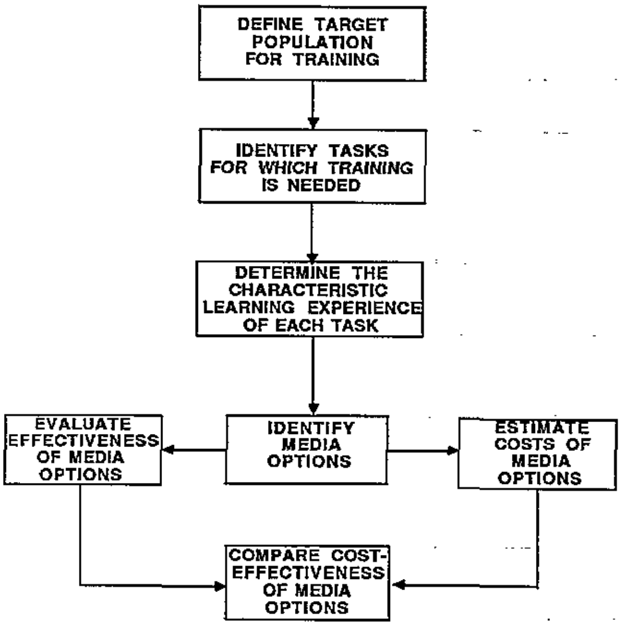

FIGURE 1. Media Selection Procedure

1. Training Environment

Our initial study effort examined how RC training needs are shaped by the RC environment. We want to describe the principal characteristics of that environment--viz., training time, geographic dispersion, and facility suitability--statistically so that their impact on the utility and cost of training devices and procedures can be measured.

A general idea of the overall problem of sustainment and unit training in the Army RCs is conveyed by some aggregate statistics: More than 600,000 soldiers with over 400 MOSs (military occupational specialties) in approximately 6,900 units at nearly 4,000 stations. Specifically, the Army National Guard (ARNG) has 3,457 units and 2,858 armories; the average armory accommodates 148 enlisted personnel. The Army Reserve (USAR) has 3,438 units and 1,098 reserve centers; the average population per center is 202 enlisted personnel. In both the ARNG and the USAR, many armory/center populations reflect a variety of MOSs, few billets of any single MOS, and few experienced instructor NCOs (non-commissioned officers). And in both the ARNG and the USAR during 11 months of the year, the RC soldier availability for training (2 days/month) is 10 percent of the (20 days/month) availability of his Active Army counterpart; it is 50 percent for the month in which the Reservist/Guardsman is on 2-week active duty.

In order to determine the effect of environmental factors on Army RC training, a sample of MOSs was selected in a two-step process. First, from the system of 32 Career Management Fields (CMFs), which the Army has established to administer clusters of related MOSs, 13 CMFs were found to have combined ARNG and USAR populations greater than the corresponding Active Army populations; Table 1 shows the current authorized strengths of the CMFs by component. Second, after replacing CMF 97, Band, by CMF 31, Communications-Electronic Operations, the largest population MOS in each of the 13 large-population CMFs was selected for the study sample; Table 2 indicates that these 13 MOSs account for between one-third and one-half of the populations of each Army component.

TABLE 1. CURRENT AUTHORIZED STRENGTH BY CAREER MANAGEMENT FIELD

	CMF	ACTIVE	GUARD	RESERVE
11	INFANTRY	67,178	66,401	18,311
12	COMBAT ENGINEERING	16,898	23,265	10,754
13	FIELD ARTILLERY	38,735	34,285	5,846
16	AIR DEFENSE ARTILLERY	13,577	4,737	24
18	SPECIAL OPERATIONS	3,145	1,145	1,406
19	ARMOR	28,493	23,324	5,078
23	AIR DEFENSE SYSTEMS MAINTENANCE	2,865	66	7
27	LAND COMBAT AND AIR DEF INTERMED MAINT	4,589	833	83
28	AVIATION COMM-ELEC SYSTEM MAINTENANCE	1,927	692	258
29	COMM-ELEC MAINTENANCE	11,879	3,536	1,748
31	COMM-ELEC OPERATIONS	80,714	32,349	10,878
33	EW/INTELL SYSTEMS MAINTENANCE	1,493	33	167
51	GENERAL ENGINEERING	12,018	12,833	12,579
54	CHEMICAL	7,672	4,406	5,308
55	AMMUNITION	5,409	1,912	2,768
63	MECHANICAL MAINTENANCE	62,204	50,765	20,430
64	TRANSPORTATION	23,018	18,237	14,668
67	AIRCRAFT MAINTENANCE	16,754	8,484	2,326
71	ADMINISTRATION	44,870	20,050	33,838
74	AUTOMATIC DATA PROCESSING	4,623	1,183	923
76	SUPPLY AND SERVICE	49,741	26,616	24,434
79	RECRUITMENT AND REENLISTMENT	8,078	586	651
81	TOPOGRAPHIC ENGINEERING	1,297	433	879
84	PUBLIC AFFAIRS AND AUDIO-VISUAL	2,458	1,025	1,386
91	MEDICAL	38,774	18,272	30,267
92	PETROLEUM	7,397	4,286	2,796
93	AVIATION OPERATION	2,843	836	278
94	FOOD SERVICE	17,736	16,184	8,632
95	LAW ENFORCEMENT	22,818	13,074	7,599
96	MILITARY INTELLIGENCE	6,947	1,849	3,117
97	BAND	2,510	2,178	687
98	ELECTRONIC WARFARE/CRYPTOLOGIC OPERATIONS.	8,311	33	1,070
	TOTAL	575,561	393,723	223,818

Source: PERSACS (Ref. 2)

TABLE 2. LARGE POPULATION MOSs

			COMPONENT POPULATION		
MOS	CMF	TITLE	ACTIVE	GUARD	RESERVE
11B	11	INFANTRYMAN	47,684	42,814	16,718
12B	12	COMBAT ENGINEER	12,573	20,096	6,566
13B	13	CANNON CREWMEMBER	20,700	22,758	3,004
19E	19	M48-M60 ARMOR CREWMEMBER	12,617	13,132	2,996
31K	31	COMBAT SIGNALLER	8,017	9,221	2,568
54E	54	NBC SPECIALIST	6,881	4,368	2,566
62E	51	HEAVY CONSTRUCTION EQUIP. OPERATOR	2,802	3,707	2,313
63B	63	LIGHT WHEEL VEHICLE MECHANIC	17,700	15,884	6,687
64C	64	MOTOR TRANSPORT OPERATOR	18,012	18,303	9,267
71L	71	ADMINISTRATIVE SPECIALIST	19,805	7,736	18,284
76Y	76	UNIT SUPPLY SPECIALIST	17,833	12,153	7,941
91A	91	MEDICAL SPECIALIST	12,269	9,303	6,550
94B	94	FOOD SERVICE SPECIALIST	17,874	17,792	9,346
		TOTAL	214,267	204,257	97,772
		PERCENTAGE OF COMPONENT	38	48	44

*Besides the presenters of this paper, the following IDA analysts contributed to the Phase 1 effort: Bruce Angier, Joseph Domin, and Mark Knapp.

C. MEDIA SELECTION

1. Training Target Populations

Three bases are used for selecting target populations for training. First, the large-population MOSs used to develop density distributions also provide target populations for gauging the cost-effectiveness of alternative training devices and procedures. Second, since some important technologies available for training might not be appropriate for the large-population MOSs, other MOSs that are associated with topical training devices that reflect advanced technologies may be selected. And third, special attention will be given to maintenance MOSs inasmuch as many RC soldiers work on trucks, armored vehicles, helicopters, electrical and electronic equipment, and weapons of all kinds; Table 3 shows that the strength of combat service support, which includes maintenance personnel, is especially heavy in the Reserve. For our sample set of 13 MOSs, 23 percent (MOSs 11B, 13B, and 19E) are in combat arms, 31 percent (MOSs 12B, 31K, 54E, and 62E) are in combat support, and 46 percent (MOSs 63B, 64C, 71L, 76Y, and 94B) are in combat service support.

TABLE 3. CURRENT ARMY AUTHORIZED STRENGTH--POPULATION FRACTIONS BY FUNCTION[a]

FUNCTION \ COMPONENT	ACTIVE	GUARD	RESERVE
COMBAT ARMS[b]	0.31	0.34	0.15
COMBAT SUPPORT[c]	0.25	0.24	0.23
COMBAT SERVICE SUPPORT[d]	0.44	0.42	0.62
TOTALS	1.00	1.00	1.00

[a] Source: PERSACS (Ref. 2)

[b] Includes CMFs 11, 13, 16, 18, 19, 23, 27, 67, and 93.

[c] Includes CMFs 12, 28, 29, 31, 33, 51, 54, 81, 95, 96, 98, and part of CMF 74 (MOSs 34C, -F, -H, -K, -L, -T, -Y, and -Z).

[d] Includes CMFs 55, 63, 64, 71, 76, 79, 84, 91, 92, 94, 97, and part of CMF 74 (MOSs 74D, -F, and -Z).

2. Required Training

An MOS designation implies that a soldier has certain skills, each of which implies abilities to perform a set of tasks. Each MOS typically encompasses several dozen tasks, which are identified in a "Soldier's Manual." For the 13-MOS sample, the average number of tasks per MOS is 71. Tables 4 and 5 illustrate common tasks and M101A1 (105mm towed howitzer) tasks, respectively, for a MOS 13B Skill Level 1 Cannon crewmember.(3)

TABLE 4. COMMON TASKS FOR MOS 13B SKILL LEVEL 1

CANNONEER
- PREPARE A POSITION TO RECEIVE/EMPLACE A HOWITZER
- RECORD/MAINTAIN FIRE MISSION DATA ON DA FORM 4513
- EMPLACE/RECOVER COLLIMATOR
- EMPLACE/RECOVER AIMING POSTS

AMMUNITION
- LOAD HOWITZER AMMUNITION ON VEHICLES
- STORE AMMUNITION IN PREPARATION FOR FIRING

CREW-SERVED WEAPONS
- PERFORM OPERATOR MAINTENANCE ON A M60 MACHINE GUN AND AMMUNITION
- PREPARE A RANGE CARD FOR A M60 MACHINE GUN
- PERFORM OPERATOR MAINTENANCE ON A CALIBER .50 MACHINE GUN AND AMMUNITION
- LOAD, REDUCE A STOPPAGE, UNLOAD, AND CLEAR A CALIBER .50 MACHINE GUN
- ENGAGE TARGETS WITH A CALIBER .50 MACHINE GUN
- SET HEADSPACE AND TIMING ON A CALIBER .50 MACHINE GUN
- MOUNT/DISMOUNT A CALIBER .50 MACHINE GUN

COMBAT TACTICS
- INSTALL AND OPERATE FIELD TELEPHONE

NAVIGATION
- DETERMINE THE ELEVATION OF A POINT ON THE GROUND USING A MAP
- DETERMINE AN AZIMUTH USING A M2 COMPASS

COMMUNICATIONS
- USE VISUAL SIGNALS TO CONTROL MOVEMENT

CANNON MAINTENANCE
- PREPARE DA FORM 2404 (EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET)

TABLE 5. M101A1 TASKS FOR MOS 13B SKILL LEVEL 1

CANNONEER
- PREPARE SEMIFIXED AMMUNITION FOR FIRING
- BORESIGHT THE DIRECT FIRE TELESCOPE USING A DISTANT AIMING POINT
- BORESIGHT THE DIRECT FIRE TELESCOPE USING A TESTING TARGET
- SET/LAY THE CANNON FOR QUADRANT WITH THE RANGE QUADRANT
- MEASURE THE QUADRANT WITH THE RANGE QUADRANT
- SIGHT ON A TARGET WITH THE DIRECT FIRE TELESCOPE
- DISASSEMBLE/ASSEMBLE BREECH AND FIRING MECHANISM
- LOAD AND FIRE A PREPARED ROUND

CANNON MAINTENANCE
- PERFORM PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3. Characteristic Learning Experiences

Learning is generally categorized as cognitive or psychomotor. Cognitive learning includes memorization, rule learning, rule using, identification and classification, and making decisions. Psychomotor learning includes skill mastery and positioning movements.

Experiments and experience in learning indicate that, to provide equal training effectiveness, increased complexity and length of the cognitive or psychomotor aspects of subject tasks require increased training and practice.

In order to estimate the effectiveness of alternative media in learning MOS tasks, the cognitive and psychomotor aspects of these tasks have to be identified. Whatever measured results of learning experiments and experience are available will then provide a basis for estimating media effectiveness on the common denominators, viz., cognitive learning and psychomotor learning, of the MOS tasks.

Of the average 71 tasks per MOS in the 13-MOS sample, 68 tasks involve both cognitive and psychomotor learning; two involve only cognitive learning; and one involves psychomotor learning only.

4. Media Options

Two groups of media are being examined: (1) media currently used by the Army and (2) new training devices that embody advanced technology.

a. Current Training Devices. The Army Training and Doctrine Command (TRADOC) lists approximately 2,400 items among nine categories* of extension training materials** for our 13 sample MOSs. A catalog relating those materials to tasks has been completed by TRADOC.

While the cost and effectiveness of all extension training materials are of interest, the focus of this investigation is primarily on training devices.

b. Examples of New Technology. Embedded trainers, artificial intelligence, computer-based instruction, interactive television, interactive videodisc, and telecommunications are only a partial list of new technology opportunities for Army training.

While other hardware and software examples of new technology might also be mentioned, it seems most logical for this study to investigate in depth a set of topical training devices that incorporate some types of new technology that appear particularly relevant to the RC training environment. Table 6 lists several candidates for cost-effectiveness investigation.

TABLE 6. SOME NEW TECHNOLOGY DEVICES

- MAINTENANCE TRAINERS
- INTERACTIVE VIDEODISC DEVICES - ELECTRONIC INFORMATION DELIVERY SYSTEM (EIDS)
- INTERACTIVE TELEVISION TRAINER VIA SATELLITE - SCHOOL OF THE AIR
- LASER ENGAGEMENT SYSTEM (MILES)
- INTERACTIVE SIMULATOR NETWORKING - SIMNET
- INTERACTIVE SIMULATION TRAINERS - GUARD FIST I (ARMOR) AND GUARD FIST II (ARTILLERY)
- COMPUTER-BASED VISUAL GUNNERY SIMULATOR - CONDUCT OF FIRE TRAINER (COFT)
- VIDEODISC GUNNERY SIMULATOR (VIGS)
- TANK GUNNERY AND MISSILE TRACKING SYSTEM (TGMTS)

5. Media Effectiveness

Analyses of effectiveness and costs will use Army analyses wherever possible. As a prerequisite for development of a training device, the Army conducts a Cost and Training Effectiveness Analysis (CTEA) to support a system training device requirement or a Training Development Study (TDS) to support a nonsystem training device requirement (this prerequisite is sometimes waived.)

*(1) Training literature products, (2) training extension courses, (3) audio-visual materials, (4) graphic training aids, (5) devices, (6) skill performance aids, (7) correspondence courses, (8) resident exportable material, and (9) RC school material.

**"Extension" implies application for sustainment and unit training.

A CTEA or a TDS contains a training device cost-effectiveness analysis and analyses of other factors as well: (1) new skills and knowledge needed to operate and maintain the device, (2) suitability of the device to train the target population, (3) changes to the current training programs to make best use of the device, (4) development of a new training program, (5) changes to training facilities, and (6) compatibility of the proposed device with existing systems.

Reviews of CTEAs and TDSs will provide opportunities to examine information used by the Army in its training investment analyses. Where necessary, we expect to perform independent effectiveness analyses.

6. Media Costs

a. Generic Costs. Our cost structure includes these major elements: Instructional System Development (ISD) costs, investment costs, and operating costs. Costs for these elements are being collected from three source categories: (1) hardware and software costs of similar types of training equipment; (2) forecast costs related to advanced technology equipment; and (3) costs of similar items that are now, or will soon be, available commercially. Because of expected technology transfer from the private sector, hardware RDT&E costs are not emphasized.

(1) ISD. Man-hour and cost estimates of courseware development are shown in Table 7 (from Ref. 4). The estimates are based on a courseware development cost of $100,000, in FY 1986 dollars, per person per year of 2,000 work hours. Some estimates (e.g., those for interactive computer-aided instruction) are based on advances in other related fields. However, they are particularly valuable as indicators of the relative costs of various advanced technology devices.

TABLE 7. TRAINING DELIVERY SYSTEM, COURSEWARE DEVELOPMENT COST ESTIMATES

MEDIA	DEVELOPMENT HOURS PER HOUR OF INSTRUCTION	DEVELOPMENT COST PER HOUR OF INSTRUCTION (IN 1000's OF $)
ADVANCED TECHNOLOGY		
COMPUTER-AIDED INSTRUCTION	100-400	5-20
INTERACTIVE COMPUTER-AIDED INSTRUCTION	500-1000	25-50
INTERACTIVE VIDEODISC	400-800	20-40
SIMULATORS	800-2000	40-100
EMBEDDED TRAINING	200-300	10-15
ADVANCED JOB PERFORMANCE AIDS	40-300	2-15
EXISTING TECHNOLOGY		
EXISTING MEDIA, CIRCA 1980	50-500 (MEAN=170)	3-15 (MEAN=$6)

To compare advanced technology systems to current systems, man-hour and cost data from a Navy study[5] are also presented as "existing technology" in Table 7. These latter data, which have been modified to separate design costs and development costs and to reflect organizational overhead, indicate the costs (in FY 1986 dollars) incurred in the ISD process by the Navy in in the late 1970s. While the comparison of two sets of estimates developed separately must be undertaken with care, a ratio of 5:1 for course development using advanced technology training devices rather than existing technology appears reasonable.

(2) Investment. General statements about the procurement costs of advanced technology training systems can be misleading for two reasons. First, there are a wide variety of different systems with different equipment requirements. Second, some of these systems are just becoming operational (e.g., videodisc) or are still in development (e.g., intelligent computer-aided instruction). However, some insight is available both from the general literature and from specific programs under development.

While simulators usually range in cost from 20-65 percent of actual equipment costs([6],[7]), a similar rule of thumb for the cost of computer-based instruction is more elusive([8]).

Table 8 shows some investment estimates that are based on costs of commercially available equipment. Many of the computer-based training delivery systems postulated are direct spin-offs of commercially available, or soon-to-be available, equipment. The main point here is that technology transfer from the commercial sector can occur.

TABLE 8. INVESTMENT COSTS--COMMERCIALLY AVAILABLE EQUIPMENT

- COMPUTER HARDWARE MORE THAN CAPABLE OF PERFORMING THE FUNCTIONS OF AN EIDS[1] (WITHOUT VIDEODISC) IS AVAILABLE COMMERCIALLY FOR $5,000-10,000[2]
- CD-ROM (COMPACT DISK - READ ONLY MEMORY) VIDEODISC WILL BE AVAILABLE IN 1986 FOR $500[3]
- MASTERING CD-ROM DISCS CURRENTLY COSTS $5000 [4] TO $8000 [5], AND COPIES ARE $5[4] OR LESS
- HISTORICALLY, HARDWARE PRICES HAVE FALLEN BETWEEN 20%[6] AND 50%[7] ANNUALLY FOR GIVEN CAPACITY (WITH 25% A COMMONLY-USED AVERAGE)

1 EIDS = ELECTRONIC INFORMATION DELIVERY SYSTEM
2 FULLY-CONFIGURED, HIGH-END COMPUTER
3 REF. 10.
4 REF. 11.
5 REF. 12.
6 REF. 13.
7 REF. 14.

The last item in Table 8 is a key to understanding the possibilities for obtaining inexpensive hardware, and for gaining insight on future hardware, software, and courseware trade-offs. Simply stated, the price of a given level of computing power has fallen 20-25 percent a year every year for the last 30 years. But software and courseware productivity increases have not kept pace with these price declines; software productivity growth is reported at 4 percent per year([9]). This means that, for a fixed fixed system, software will become the primary cost-driver. To achieve lower cost systems, future designs may see trade-offs of software for hardware.

(3) Operating. Operating costs are a key component of the total life-cycle cost of a training system. Much of the overall savings expected for advanced technology training devices is based on decreases in course length or instructor requirements and consequently less total pay for students and instructors.

Table 9 shows some operating cost estimates that are available from the literature. For training systems still under development, these costs are not known with certainty. For earlier versions of CAI and simulators, estimates of cost savings are about 30 percent in comparison with conventional instruction ([7],[14]). The majority of these savings come from the introduction of individualized instruction embodied in the delivery system and not from the existence of the computerized instruction alone ([14]).

TABLE 9. OPERATING COSTS

- CHANGES IN STUDENT PAY AND ALLOWANCES DUE TO SHORTER COURSE LENGTHS
  - Not available for many advanced technology systems
  - Previous comparisons of computer-aided and computer-managed instruction show 30% time savings; similar savings for maintenance simulators
  - Further analysis suggests 90% of savings come from individualized instruction, not CAI, and possibly not simulators
- CHANGES IN INSTRUCTOR PAY AND ALLOWANCES DUE TO CHANGING REQUIREMENTS AND PREPARATION TIME
  - Total requirements vary with course length
- OTHER OPERATING AND SUPPORT COSTS
  - For flight simulators, O&S costs are 8-10% of O&S for the aircraft being simulated

Total instructor requirements fall with decreased course length, all other things being equal. The incorporation of subject matter expertise into computers and/or simulators should also result in less instructor time per student hour, but the evidence is fragmentary and not conclusive.

Savings on other operating and support costs may result in significant life-cycle cost differences between training options. For example, the O&S costs of flight simulators are 8-10 percent of the cost of operating the aircraft being simulated ([15]).

b. Costs of Specific Devices. Some of the costs that are being developed for specific training devices are contained in Tables 10 and 11, where cost per unit, cost per trainee, and life-cycle cost are shown for the Mobile Conduct of Fire Trainer (M-COFT) and the Guard Unit Army Device (GUARD) Full Crew Interactive Simulation Trainer (FIST) for Artillery (GUARD FIST II). M-COFT cost estimates were adjusted to FY 1986 constant dollars using OSD-Comptroller inflation indices. The M-COFT is a derivative version of the COFT, whose R&D cost of $28M is sunk, to meet special needs of the ARNG. Operating and support costs are based on an equipment life of 20 years.

TABLE 10. LIFE-CYCLE COSTS FOR MOBILE CONDUCT OF FIRE TRAINER (CONSTANT FY 86 DOLLARS IN THOUSANDS)

	UNIT COSTS M-COFT VARIANT		
	MAIN BATTLE TANK, M-1	FIGHTING VEHICLES, M-2/M-3	MAIN BATTLE TANK, M60
RESEARCH & DEVELOPMENT	-		-
INVESTMENT	$2,600	$1,810	$2,660
OPERATING & SUPPORT*	$4,760	$4,760	$4,760
LIFE-CYCLE COSTS (LCC)*	$7,360	$6,570	$7,420
MOS TRAINED	19K	11M/19D	19E
BASIS OF ISSUE	ONE PER ARNG ARMOR BATTALION	ONE PER ARNG MECHANIZED INFANTRY BATTALION	ONE PER ARNG AND USAR ARMOR BATTALION AND USAR TRAINING DIVISION
NUMBER FUNDED BY FY 1986/AFTER FY 86	7/0	6/0	11/37
LCC PER TRAINEE	$32.3	$15.0	$31.4

* BASED ON A 20 YEAR EQUIPMENT OPERATIONAL LIFE

TABLE 11. LIFE-CYCLE COST FOR GUARD FIST II (CONSTANT FY 86 DOLLARS IN THOUSANDS)

	TOTAL COST	UNIT COST
RESEARCH & DEVELOPMENT	$ 9,240	$ 26
INVESTMENT	$11,700	$ 32
OPERATING & SUPPORT*	$33,730	$ 93
LIFE-CYCLE COSTS (LCC)*	$54,670	$151
MOS TRAINED	13B,E,F	
BASIS OF ISSUE	ONE PER FIELD ARTILLERY (FA) BATTALION, FA BRIGADE, DIVARTY, CORPS, AND INFANTRY/ARMOR BATTALION IN THE RESERVE COMPONENTS.	
NUMBER FUNDED AFTER FY 1986	406 (INCLUDES 362 OPERATIONAL UNITS AND 43 SUPPLY/ MAINTENANCE UNITS FOR TRAINING SUPPORT)	
LCC PER TRAINEE		$0.36

* BASED ON A 20 YEAR EQUIPMENT OPERATIONAL LIFE

Cost-per-trainee figures are based on the number of personnel in these specific battalions: (1) Tank Battalion equipped with M-1s, TOE* 17235J420, 228 personnel with MOS 19K; (2) Tank Battalion equipped with M60s, TOE 17235J410, 236 personnel with MOS 19E; (3) Mechanized Infantry Battalion equipped with Bradley fighting vehicles, TOE 072435J410, 438 personnel with 11M or 19D MOSs; and (4) Field Artillery Battalion, 155mm Towed Howitzer, TOE 06125H000, 419 personnel with MOSs 13B, 13E, and 13F.

The M-COFT (M-1 or M60) will be assigned to a battalion whose typical composition is four companies located at different and separate stations. Army utilization factors indicate that each company will require two weekends to provide M-COFT training sessions for all its personnel, after which the trainer will be towed to another company-station. Thus, each 19K soldier (M-1) or 19E soldier (M60) would get six M-COFT training sessions per year. The $31,000-$32,000 cost over 20 years for a M-1 M-COFT or a M60 M-COFT means the total cost per trainee is about $1,500 per year, or $250 per training session.

*TOE = Table of Organization and Equipment

D. CONTINUING PHASE 1 EFFORT

Our ongoing and near-term work involves evaluating the cost-effectiveness of these media/training device groups, which are not mutually exclusive: (a) media options for training the large-population MOSs; (b) GUARD FIST I and GUARD FIST II, which are ARNG-sponsored training device initiatives for tank gunnery training and artillery crew exercises, respectively; (c) new training devices that incorporate advanced technology; and (d) maintenance trainers.

Another part of our near-term effort is concerned with evaluating the state of the physical plant--in terms of space, heat, power, and storage--at Guard armories and Reserve centers. Early investigation indicates that the state of many RC facilities may preclude the use of desirable training devices. For such cases, we expect installation improvements, alternative facilities such as public schools or Holiday Inns, and stand-alone trainers (e.g., M-COFT) will be examined.

E. SUMMARY OBSERVATIONS

The density distributions of the sample MOSs illustrate quantitatively a dominant characteristic of the Army RC environment. The dispersion of many small training target populations combined with low expected utilizations of equipment (by soldiers with limited availability for training) make low-cost-per-trainee a design imperative for RC training devices.

Although we have a methodology for identifying promising devices, it is too early to make training investment recommendations. However, our preliminary analysis of the capabilities and costs of interactive video and telecommunications indicates that these technologies would be especially well suited for Army RC training. To illustrate, let's consider some new devices that we have discussed.

Example: The heart of GUARD FIST II, the artillery trainer, is expected to be a videodisc system that provides high-resolution scene imagery for the artillery forward observer. The design of GUARD FIST I, a full-crew tank gunnery trainer, has not yet been defined; however, GUARD FIST I will likely include three videodisc systems--one each for the tank commander, the gunner, and the driver.

The M-COFT is also a tank gunnery trainer, whose development and procurement imply Army satisfaction with its cost-benefit specifics. The cost and effectiveness of GUARD FIST I have not been estimated; nor has the similarity of M-COFT and GUARD FIST I, in terms of task-training capability, been analyzed. While many tasks may be common to both trainers, we expect that other tasks can be trained on one device but not the other.

Let's set aside for a moment the fact that we have not yet analyzed GUARD FIST I and M-COFT. If the 3:1 ratio of videodisc systems for GUARD FIST I and GUARD FIST II is used as a first-order indicator of the relative life-cycle costs of these trainers, the life-cycle cost of GUARD FIST I would be about $1,000 per trainee. The 30:1 advantage in life-cycle cost per trainee for GUARD FIST I over M-COFT (see Tables 10 and 11) make the former an especially attractive device for detailed cost-effectiveness analysis.

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