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however, the potential profit from training and human factors research and development is significant.

A planned, systematic, program of research and development in recruiting, retention, motivation and morale would benefit the RC. The RC would benefit from a plan that would apply currently available training and human factors technology to the RC's unique troop and individual ready reserve issues, while simultaneously providing for testing and applying high technology as it becomes available.

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Research Report -1427

**Recommendations for
"People Research and Development" Actions
to Improve Army Reserve Component Readiness.**

Prepared by

James A. Bynum

M. A. Fischl

for

Technical Director



U. S. Army

Research Institute for the Behavioral and Social Sciences •

February 1986

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U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the
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5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

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FOREWORD

Since 1970, when the Secretary of Defense articulated the concept of a Total Force, consisting of both active and reserve components of our military departments, the role of the Army's Reserve Components has changed from "an adopted child" to that of "joint heir," with significant responsibility for a major role in the Army's mission. Those responsibilities continue to increase. The level of readiness of the Reserve Component is therefore critical to the Army's ability to perform its mission.

This report is an expanded briefing, which describes some manpower, personnel, and human performance issues that affect the readiness of the Army Reserve Component; and it argues for the adoption of some soldier research and development actions that could and should be taken to improve the readiness of this component.



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RECOMMENDATIONS FOR "PEOPLE RESEARCH AND DEVELOPMENT"
ACTIONS TO IMPROVE ARMY RESERVE COMPONENT READINESS

EXECUTIVE SUMMARY

REQUIREMENT:

Review Reserve Component readiness, determine the manpower, personnel, and training issues which impede readiness, and recommend people-oriented research and development actions which would lessen the impediment and increase readiness.

PROCEDURE:

Data and documentation published by the US Army Forces Command (FORSCOM) Headquarters were reviewed, FORSCOM staff personnel were interviewed, and other Department of Defense documents and reports were reviewed and personnel interviewed.

FINDINGS:

In terms of Manpower, Personnel and Training issues, MOS qualification and personnel were cited as the most critical factors limiting Reserve Component readiness in FY83. Manpower strength appears to be more a function of policy and budget constraint, but there are indications that recruiting and retention are becoming problems. A planned, systematic program of research and development in recruiting, retention motivation and morale would benefit the RC. Training was not cited as a critical factor impeding readiness in the RC, however, the potential profit from training and human factors research and development is significant. The RC would benefit from a plan that would apply currently available training and human factors technology to the RC's unique troop and individual ready reserve issues while simultaneously providing for testing and applying high technology as it becomes available.

UTILIZATION OF FINDINGS:

These findings have been and will continue to be used by proponents of the Reserve Components to identify research requirements and to assign priorities to them. These findings can be used by the Army Research Institute to modify current research programs and to develop new research programs to meet Reserve Component needs and requirements.

RECOMMENDATIONS FOR "PEOPLE RESEARCH AND DEVELOPMENT" ACTIONS
TO IMPROVE ARMY RESERVE COMPONENT READINESS

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DEFINITION OF TERMS

- Selected Reserve: The Reserve Component manpower authorized in the annual authorization acts. The term includes all Guard or Reserve members in training categories or on full-time active duty, whether or not they are planned to mobilize with Reserve Component units. Selected Reserve accounting also includes those individuals waiting in the training pipeline. Those in the training pipeline cannot be mobilized until training is completed.
- Selected Reserve
Wartime Unit Requirement: The required trained personnel to fully man Reserve Component units upon mobilization.
- Programmed Unit Strength: The trained unit strength immediately available for mobilization. This includes:
- a. All members of Selected RC units.
 - b. All Active Component or Active Guard and Reserves scheduled or designated to mobilize with Selected Reserve units, excluding those members in the training pipeline.
- Programmed unit strength does not include:
- a. Individual mobilization augmentees.
 - b. Inactive National Guard manpower.

INTRODUCTION

In April 1984 a briefing citing the need for training research and development to support Army Reserve Component readiness was presented at an Army Research Institute planning conference. This briefing was based upon a cursory review of data available within the Headquarters, US Army Forces Command (FORSCOM). The limited information presented was sufficiently compelling that the scope of the data collection was expanded to include other areas in which soldier-related R&D might be developed to improve reserve component readiness. This report is the result of that effort.

The thesis of this report is that Reserve Component readiness can be increased by applying new developments in personnel performance and training research to current problems, and by planning a program of research and development for those issues and problems for which longer term budgeting or waiting on emerging technologies is required. This thesis is based upon data and documentation published by FORSCOM, the Office of the Secretary of Defense Reserve Forces Policy Board, and interviews with FORSCOM and OASD(RA) staff personnel.

This report is patterned after a briefing format rather than the standard research report format. The various tables, charts, and graphs were intended to be self-explanatory with minimal supporting discussion. The data upon which the tables, charts, and graphs are based, by their nature change frequently. Therefore, to have closure, we elected to present the data available through the end of Fiscal Year 1984. Further, the data and findings presented are sufficient to indicate, but are not an exhaustive analysis of, R&D opportunities. More data, and more up-to-date data, are available; and a more detailed analysis is required to construct a complete research and development program to improve reserve component readiness.

In this report a problem or issue which impedes readiness is discussed and one or more research and development actions is recommended. Recommendations run the gamut from adapting existing research products to planning research specifically for the Reserve Components. As is the case with the data, these recommendations are not exhaustive, merely suggestive. The report is not intended to be a research plan but rather is intended to convince the reader that a research and development plan could be prepared and executed to significantly improve reserve component readiness.

BACKGROUND

In 1970, then-Secretary of Defense Melvin Laird articulated a Total Force Concept, directing that the Secretaries of the Military Departments provide for the resources necessary to permit a balance in the development of Active, Guard, and Reserve Forces. In 1973, Secretary of Defense Schlesinger elevated that Concept by stating that the Concept would become Policy," ... integrating the Active, Guard and Reserve Forces into a homogeneous whole." Thus, the Army Reserve and the Army National Guard now comprise the Reserve Component of the Army's Total Force. Table 1 portrays the various categories and sub-categories of this Component. Table 2 shows the contribution of the Reserve Components to the Total Force in terms of the types and numbers of Major Elements.

TABLE 1

RESERVE COMPONENT CATEGORIES

RESERVE COMPONENT CATEGORY					
RESERVE CATEGORY	TRAINING PAY/ RET/CATEGORY	COMPRISED OF	MINIMUM NUMBER OF PERIODS OF IDT REQUIRED ANNUALLY WITH PAY	NUMBER OF DAYS OF ADT REQUIRED ANNUALLY WITH PAY	REMARKS
SELECTED RESERVE (Units and Individuals) CODES: S-Unit T-Nonunit U-Tng Pipeline M-Mil Tech F-PTSAGR	A	Units of the Selected Reserve	48	For Reserves: Not less than 14 exclusive of travel time. For Guard: 15 including travel time.	
		Individual members of the Selected Reserve	48	12 to 14 exclusive of travel time.	
	B	Unit and individual members of the Selected Reserve	24	12 to 14 exclusive of travel time.	
	C	Unit and individual members of the Selected Reserve	12	12 to 14 exclusive of travel time.	
	D	Unit and individual members of the Selected Reserve	0	12 to 14 exclusive of travel time.	
	T	ROTC Cadets who are members of Selected Reserve Units	48	For Reserves: Not less than 14 exclusive of travel time. For Guard: 15 including travel time. Not less than 4 months.	
	P	Nonprior service personnel currently on initial active duty for training	0		
	P	Nonprior service personnel awaiting IADT (with pay)	N/A	0	
	Q	Nonprior service personnel awaiting the second part of their Initial Active Duty for Training	N/A	0	
	U	Nonprior service personnel serving on the second part of their Initial Active Duty for Training	0	AS REQUIRED	
FULL-TIME SUPPORT (FTS) AC- TIVE GUARD AND RESERVE (AGR) PERSONNEL			N/A	N/A	
INDIVIDUAL READY RESERVE (IRR) CODE: R	E	Unit and individual members of the Selected Reserve	0	Not more than 30.	ADT may be performed with or without pay.
	H	Individual members of the Ready Reserve	0	0	
	I	Inactive Army National Guard	0	0	
	J	Members of the Ready Reserve participating in officer training programs	0	As required by the officer training program.	
	K	Members participating in the Armed Forces Health Scholar- ship program	0	45	
	L	Nonprior service personnel awaiting IADT (without pay)	0	0	Use Reserve category "U".
STANDBY STATUS CODE: N D B Y	1	Key employees in the Standby Reserve (Active Status List)	0	0	May perform voluntarily for retirement points and affiliate for this purpose with units of the Selected Reserve.
	2	Other members of the Standby Reserve on the Active Status List	0	0	
	3	Members of the Inactive Standby Reserve	0	0	No training or pay authorized.
RETIRED RESERVE CODE: V	1	Drawing Reserve Retired Pay under 10 USC 1331	N/A	N/A	
	2	Drawing Reserve Retired Pay under other than 10 USC 1331 or other than reasons of physical disability	N/A	N/A	
	3	Not drawing Reserve Retired Pay but eligible at age 60	N/A	N/A	
	4	Not drawing Reserve Retired Pay but eligible at age 60 (discharged from the Reserve forces)	N/A	N/A	
	5	Not drawing Reserve Retired Pay and not eligible at age 60 (Honorary Retirees) (DoD Di- rective 1200.15, Section II, paragraphs C.(3)(a) and C.(4)	N/A	N/A	
	6	Members of the Retired Reserve retired for reasons of physi- cal disability (Include mem- bers retiring under 10 USC 1209 in Code "3")	N/A	N/A	
	7	Reserve Officers and Enlisted members who have retired after 20 or more years of active duty.	N/A	N/A	

TABLE 2

ARMY RESERVE COMPONENT CONTRIBUTION TO THE TOTAL ARMY

MAJOR ELEMENT	ARNG		USAR		TOTAL PERCENT
	QUANTITY	% OF TOTAL	QUANTITY	% OF TOTAL	
Combat Divisions	9	35	0	0	35
Separate Brigades ¹	19	66	3	10	76
Special Forces Groups	2	25	2	25	50
Special Forces Bns	6	25	6	25	50
Infantry Battalions	71	74	7	7	81
TLAT ² Infantry Bns	4	100	0	0	100
Mech Inf Bns	41	47	2	2	49
Inf Scout Troops	5	100	0	0	100
Armored Battalions	43	43	2	2	45
Armored Cavalry Bns	4	57	0	0	57
Field Artillery Bns	105	47	18	8	55
Heavy Helicopter Co	6	100	0	0	100
Medium Helicopter Co	2	11	2	11	22
Pathfinder Units	5	46	5	46	92
Combat Engr Bns/Units	197	43	113	25	68
Conventional Ammo Cos	14	17	37	44	61
Truck Companies (all)	59	37	48	30	67
Maintenance Cos (all)	94	46	57	28	74
Army Hospitals (MTOE)	16	11	91	63	74
Medical Units (other)	135	24	220	40	64
S&S Capability	16	31	21	40	71
Civil Affairs Units	0	0	36	97	97
Training Divisions	0	0	12	100	100
Training Brigades	0	0	3	100	100
Psycho Opns Units	0	0	33	87	87
JAG Units	3	2	117	98	100
Corps Spt Groups HHC	4	17	15	62	79

TABLE 2 (continued)

ARMY RESERVE COMPONENT CONTRIBUTION TO THE TOTAL ARMY

MAJOR ELEMENT	ARNG		USAR		TOTAL PERCENT
	QUANTITY	% OF TOTAL	QUANTITY	% OF TOTAL	
Major Log Units (TAACOM and COSCOM HHC/MMC Commands)	10	22	12	26	48
Engr Bridge Co (non-Div)	15	48	6	19	67
QM POL Operating Co	0	0	5	45	45
Chemical Units-Smoke Gen	0	0	28	85	85
Corps Signal Bns	14	47	3	10	57
Public Affairs Units	53	65	25	30	95
MP Cos (non-Div)	91	46	40	20	66
Railroad Units	0	0	7	100	100
Watercraft Companies	1	7	7	50	57

¹Does not include 6th CBAC

²TLAT - Tow Light Anti-Tank

RESERVE COMPONENT READINESS

Army Regulation 220-1, Field Organizations Unit Status Reporting, establishes a system for reporting the current status of Selected Active and Reserve Component units. According to the Regulation, the Unit Status Report (USR) has two objectives. First it is to provide the current status of US Army units to National Command Authorities (NCA), the Joint Chiefs of Staff (JCS), Headquarters, Department of the Army (DA), and all chain of command levels. Second, it is to provide indicators to DA which: (a) identify factors which degrade unit status; (b) assist DA in resource allocation; (c) identify differences in current assets and wartime requirements; and (d) determine Army-wide trends and conditions.

While USR data are classified, the Reserve Forces Policy Board submits an unclassified annual Readiness Assessment of the Reserve Components to the Secretary of Defense which presents a comprehensive assessment of the status of Department of Defense reserve component readiness in terms of the USR categories: Personnel Readiness; MOS Qualification; Equipment-on-Hand; Equipment Readiness; and Training. Table 3, extracted from the Board's latest published report (Reserve Forces Policy Board, 1984) presents a comparison of critical factors reported in the USR in fiscal years 1982 and 1983 which have limited overall readiness of the Army Reserve Components.

TABLE 3

CRITICAL FACTORS LIMITING OVERALL READINESS IN THE RESERVE COMPONENTS, FY-1983 AND FY-1982

Component (type of Unit)	Most Critical		Second Most Critical	
	FY 1983	FY 1982	FY 1983	FY 1982
<u>Army National Guard</u>				
Overall	Equipment on-hand	Equipment on-hand	MOS Qualification	Personnel
Combat	Equipment on-hand	Equipment on-hand/ Training	MOS Qualification	MOS Qualification
Combat Support	Equipment on-hand	Equipment on-hand	MOS Qualification	Personnel
Combat Service Support	Equipment on-hand	Equipment on-hand	MOS Qualification	Personnel
<u>Army Reserve</u>				
Overall	Equipment on-hand	MOS Qualification	Personnel	Equipment on-hand
Combat	Equipment on-hand	Equipment on-hand	Personnel	Training
Combat Support	Personnel	MOS Qualification	MOS Qualification	Equipment on-hand
Combat Service Support	Equipment on-hand	MOS Qualification	Personnel	Equipment on-hand

The Policy Board reported that the Army National Guard (ARNG) overall readiness was down 3%^a for FY83 compared with FY82. However, substantial improvement was noted in ARNG Combat Units. This was attributed to the infusion of new equipment and an emphasis within the Army Directorate on improving ARNG combat unit readiness. The Board compared FY82 and FY83 readiness on each of the readiness elements and reported the following:

	Overall % Change (FY82-FY83)	Combat Unit % Increase (FY82-FY83)
o Personnel readiness	+7%	+30%
o MOS qualification	+4%	+12%
o Equipment on-hand	-4%	+26%
o Equipment readiness	-3%	+17%
o Training	+3%	+17%

^aActual USR data are classified but the Reserve Policy Board has developed a formula which permits portrayal of data in abstract percentages. The reader is directed to Table 3.2A (c) in the Classified Annex (Secret) to the Reserve Forces Policy Board's FY84 report for complete readiness data.

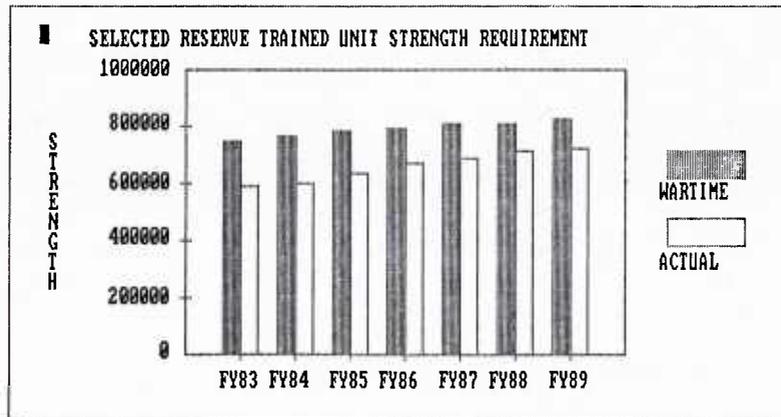
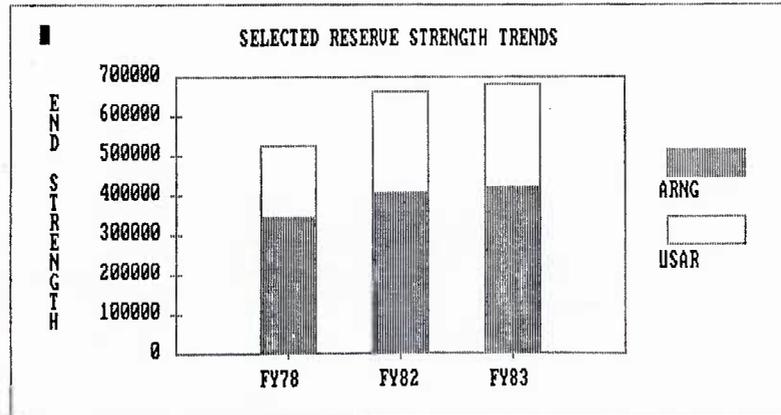
Overall readiness of the Army Reserve dropped by 4% from FY82 to FY83. Equipment on hand has replaced MOS qualification as the major limiting factor, according to the Board. Reported figures show the following:

	Overall % Change (FY82-FY83)
Personnel readiness:	No FY82 data available
MOS qualification:	+4
Equipment on-hand	-8%
Equipment readiness	-17%
Training:	+2%

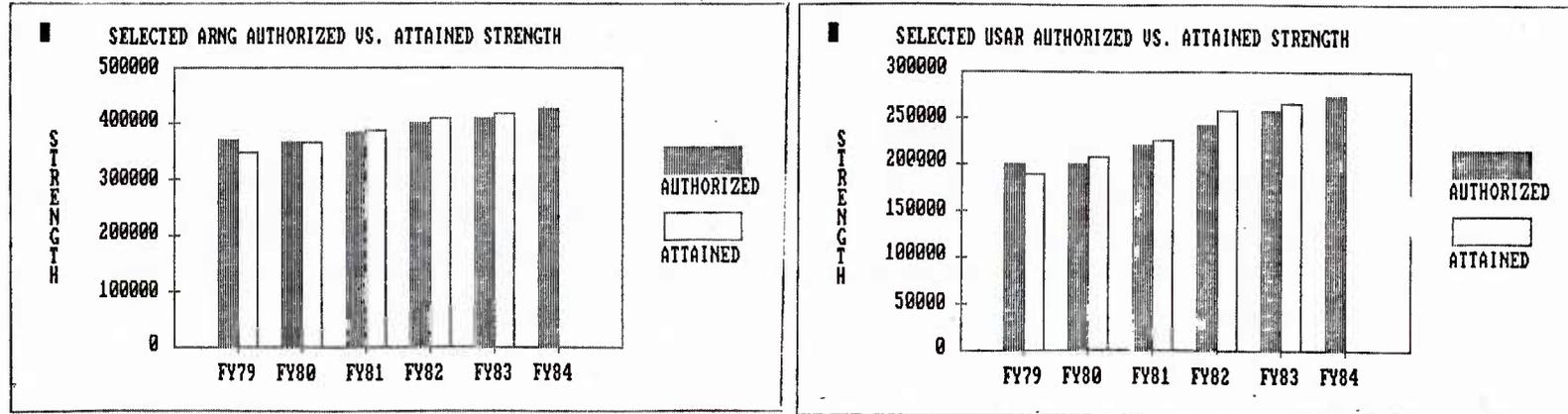
"The continued low state of readiness of Army Reserve combat units (17% C-3 or better) continues to be of major concern to the Board. In addition, the sharp and significant decline of the level of equipment readiness suggests an inability of the Army Reserve to maintain what equipment they have or, alternatively, an inability to provide an adequate maintenance support base."
(Reserve Forces Policy Board, 1984. p.26)

MANPOWER/PERSONNEL FACTORS AND READINESS

Current and Projected Strength. The graphs below show the growth trend from FY 78, the low point following the end of the draft and the start of the All Volunteer Force, and the difference between the wartime strength requirement and the authorized strength.

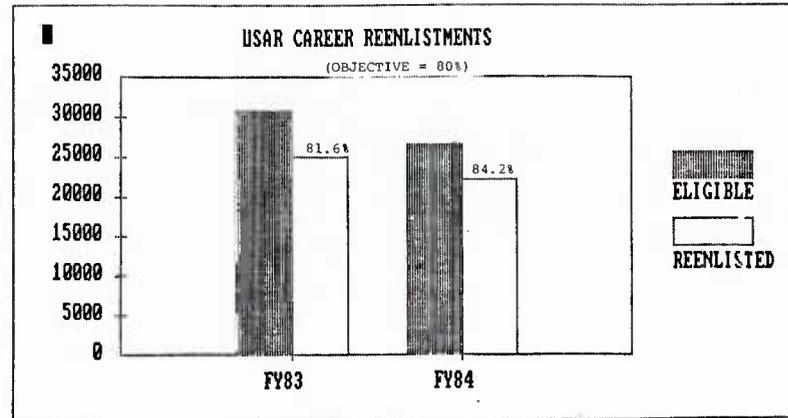
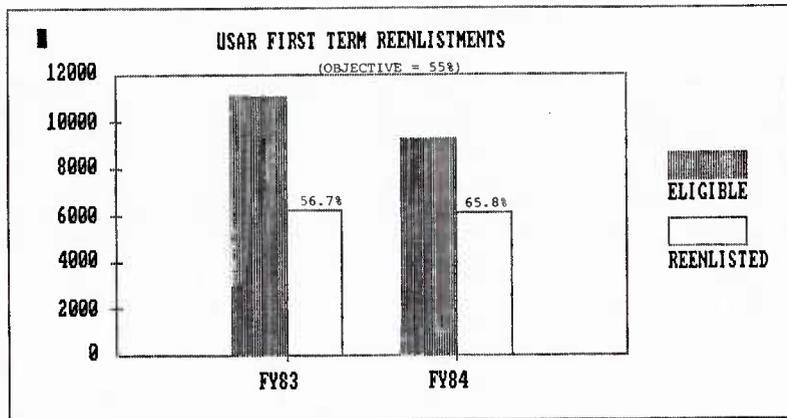
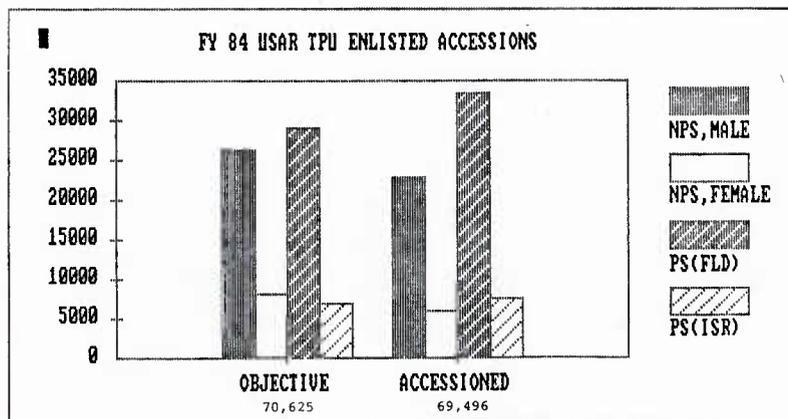


Although the data show a slight but steady growth, the difference between the wartime requirement and the imposed ceiling prompted the Reserve Forces Policy Board to express concern; and the board stated the difference is more pronounced in the Army than in the other Services. The Board stated that the difference was due to policy and budget constraints and that the Army could achieve higher numbers were it permitted to do so. To make this case they provided the data which are shown graphically below. Since 1980 the Army Guard and Reserve have been running at about 102% of authorized strength. ("Attained" data for FY 84 were not available for this paper.)

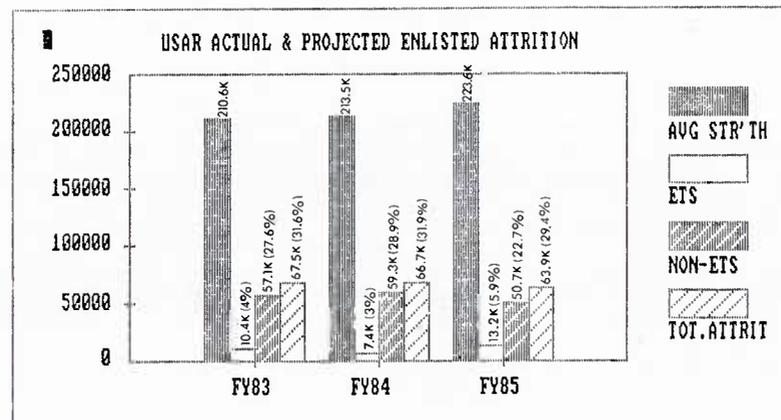
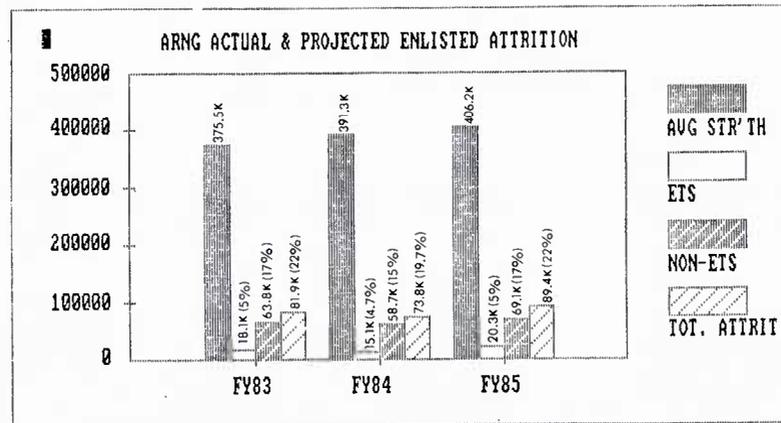


These figures do show a surplus in the Guard and the Reserve. However, there are indications that the Active Component is experiencing a shortfall in recruits. The RC is beginning to experience the same effects, attributed by many to the improvement in the economy.

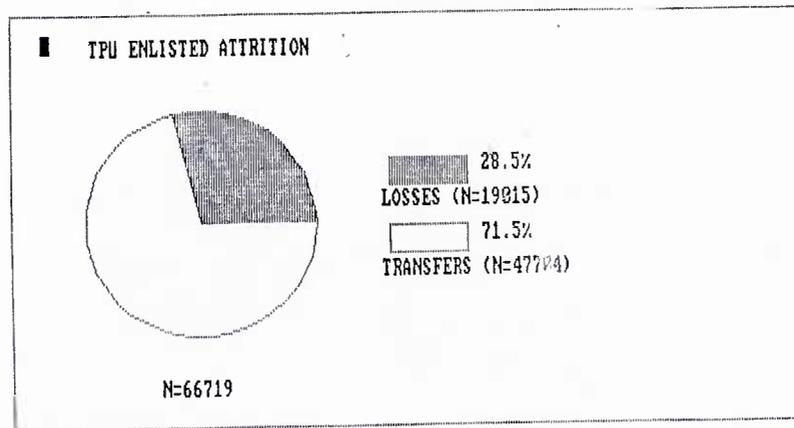
Recruitment and Retention in the Troop Program Unit (TPU). The TPU is used in the following cases to illustrate the types of problems in the RC. The FY84 recruiting goals were not met for the TPU in any category except recruitment of Prior Service (PS) members. On the other hand, reenlistment goals were exceeded in both FY83 and FY84. These results are portrayed in the following graphs.



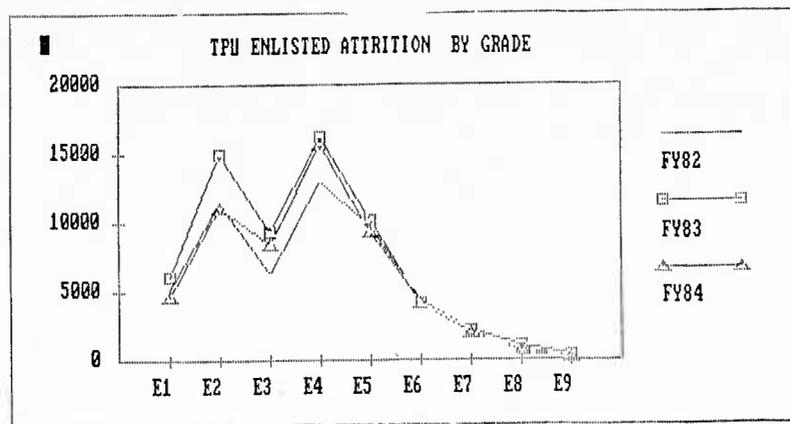
Attrition in the Reserve Component. The two bar graphs below show attrition, by number and percent of average strength, for both the Army National Guard and the Army Reserve for FY83 and FY84, with predicted attrition for FY85.



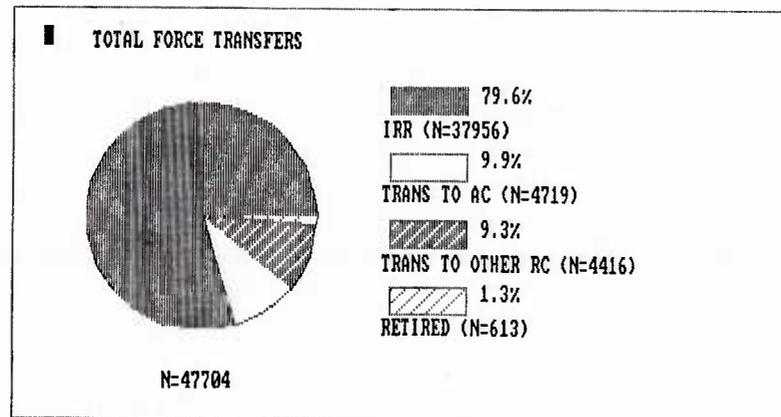
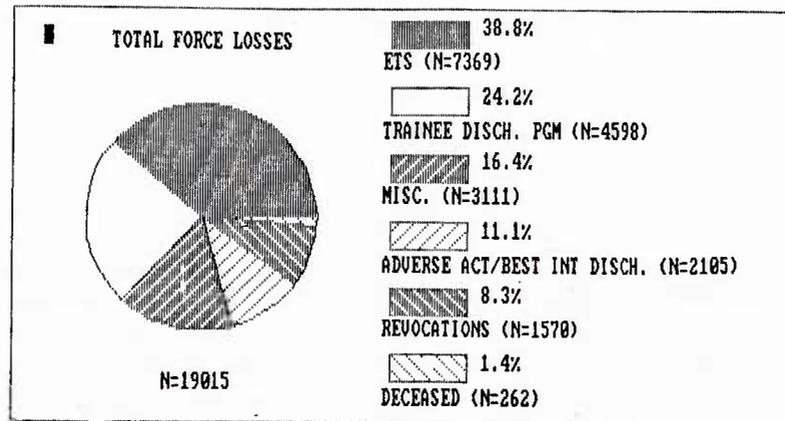
Attrition in the USAR Troop Program Unit (TPU). The Army Reserve (USAR) TPU attrition data can be used to illustrate the nature of attrition in the Reserve Component. Attrition in the TPU has been running about 30% for several years. The pie chart below depicts enlisted attrition for FY84, showing numbers and percentages of both losses to the Total Force and transfers within the Total Force.



The graph below shows TPU enlisted attrition by grade and is presented to illustrate the pattern of attrition. According to FORSCOM staff sources the peak at E2 represents those losses attributable to the trainee discharge program, adverse actions, etc., and the peak at E4 is attributable in most cases to the end of an initial tour with little or no opportunity for advancement.



An earlier pie chart showed losses to and transfers within the Total Force. The two pie charts below show a finer breakdown of losses and transfers for FY84; and it is very clear that not all losses to a Reserve Component are losses to the Total Force. There is a degree of movement both to Active Components and to other Reserve Components.



In a study of Non-ETS attrition McGovern (1983) developed case studies of ten selected reserve companies, which were used to determine the intrinsic and extrinsic and factors which cause Non-ETS attrition. McGovern also discussed detailed examples of specific policies and practices which significantly reduced losses.

McGovern concluded:

1. Non-ETS losses are manageable.
2. This problem must be handled on a unit-by-unit basis.
3. Applying well established leadership principles will reduce Non-ETS attrition.
4. Squad leaders and platoon sergeants are key players.
5. Effective unit retention personnel focus on Non-ETS attrition as much as they do reenlistment.
6. Effectiveness depends on paying attention to junior enlisted members.
7. Quality and content of training is a basic factor.
8. Battalion Training Management System has a positive effect on training but junior members still complain about not having enough to do.
9. Equipment shortages frustrate junior members.
10. Pay is high enough unless a person is seriously dissatisfied; then it is not.
11. There is no evidence that enlistment or reenlistment bonuses have significant impact.
12. The perception that leaders "take care of their troops" can play a major role in minimizing attrition.
13. A positive social atmosphere is effective.
14. Increased family involvement can influence spouses' attitudes in a positive way.
15. Negative employer attitudes continue to be a serious problem for some units.
16. Local employment conditions can significantly increase Non-ETS losses, even in well-run units.

Attrition data are maintained in a Reserve Personnel Master File Inventory at the Reserve Component Personnel and Administration Center. When reservists/guardsmen leave a unit, data are collected which include stated reasons for leaving. These data are then forwarded to the Master File. Stated reasons for transferring from the Unit to the Individual Ready Reserve (IRR) usually fall into one of the following categories:

1. Local economic situation.
2. Civilian job transfer.
3. Family dynamics.
4. Employer considerations.
5. Promotion.
6. MOS change.
7. Reorganization.
8. Reserve Center availability.

Returning to ETS attrition, Burrigh, Grissmer, and Doering (1982) conducted a study to develop a model of reenlistment decisions as a part of the 1978 Bonus Experiment. Fifteen thousand reservists and guardsmen were sampled. This number included between two thousand and four thousand members who did not intend to reenlist, and who responded with their reasons. Table 4 summarizes the results of that survey.

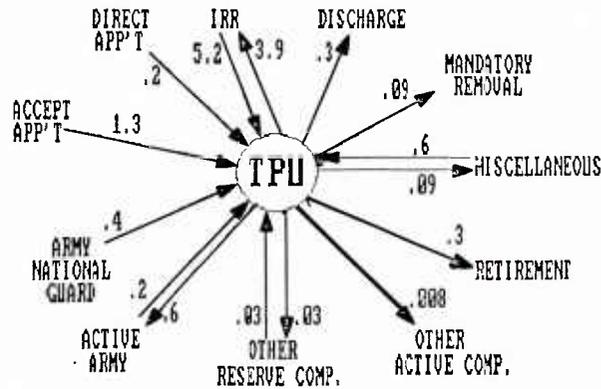
Table 4
Reasons for Not Reenlisting

Response Category	Percent
Conflict With Family and Leisure Time	31.6
Conflict with Civilian Job	30.8
General Dislike of Military	11.4
Dislike of Unit's Training Practice	7.1
Not Eligible for Reenlistment Bonus	4.5
Moving to Take New Job	2.9
Insufficient Pay	2.0
Disagree With Personnel and Pay Policies	1.9
Moving, Job Transfer to Another Area	1.9
Distance to Guard/Reserve Unit	1.7
Conflict with Educational Program	1.7
Callups/Mobilization	0.8
Other (Health, Extra Income Not Needed)	1.7

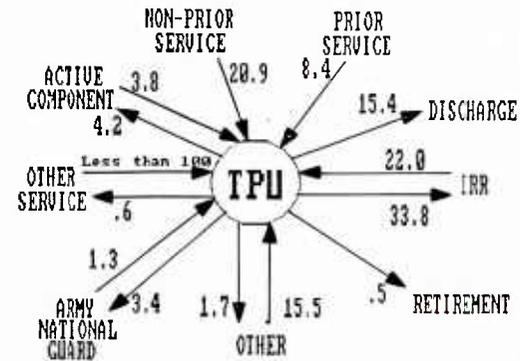
There appears to be ample evidence that the reasons for attrition are known, at least by category.

Turbulence in the Troop Program Unit (TPU). Turbulence is cited, consistently, in Active and Reserve Component units as a principal distractor to training. The two charts below show enlisted and officer flow in the TPU for FY84.

OFFICER PERSONNEL FLOW
(THOUSANDS)
FY 84



ENLISTED PERSONNEL FLOW
(THOUSANDS)
FY 84



Manpower/Personnel R&D to Increase Readiness in the RC. Manpower and personnel R&D can increase Reserve Component readiness through increasing strength in times when additional strength is required and funded. Since the supply of military age men and women is dwindling, and both the Active Component and private industry are competing for this resource, an organized program of R&D seems needed to address such key issues as:

1. What will motivate technically skilled officers and enlisted personnel to serve in the RC?
2. Are there particularly fertile areas (Silicon Valley?) for recruiting hi-tech qualified individuals?
3. What would be expected benefits and losses from separating RC recruiting from AC recruiting?
4. Given that a larger percentage of military jobs will be high technology, what impact will high technology have on the RC? In particular:
 - a. How will hi-tech affect personnel requirements?
 - b. Will fewer people be needed?
 - c. Will higher skill levels be needed?
 - d. Can lateral entry at grades E-5, E-6 or higher for civilian-acquired skills be accepted?

- e. Can reduced physical standards be tolerated?
- f. Is a larger percentage of women for these jobs feasible? What jobs?

For what kinds of units? With what projected effect on unit cohesion?

Attrition, and its corollary retention, are not static issues. A program of behavioral science R&D could develop a computer simulation model to forecast RC retention/attrition behavior under various conditions of such parameters as the state of the local and national economy, international events, unit equipment status and so forth. What are all of the parameters? How should they be weighted?

Motivations and morale for the RC is another area of manpower/personnel R&D to increase readiness. For example, if it is true that RC duty is a welcome source of additional income, provides welcome "camaraderie" with peers, is admittedly a part-time job, taking second place to the primary, civilian, job, and assorted other nonmilitary motivations to join and stay, then the following research questions are posed.

1. What is the projected effect of a call to mobilization?
2. What will be expected troop morale?
3. How can the motivational and morale effects be prepared for?
4. What programs of attitudinal training can be developed?
5. What is the expected success of these programs?

A final readiness/strength factor to be evaluated is the potential RC recruitment disincentive of travel, and hence absence from the civilian job, for military training. To the extent that this is significant, the R&D program could investigate the magnitude of recruiting offset provided by:

1. Use of under-utilized colleges in the community as a location to provide military training (the reduction in numbers of young adults in the country will result in availability of many educational institutions).
2. Use of educational technology to provide more and more training on-the-job, in the unit.
3. Technology of training simulators, exportable training programs, and other media which would not involve travel disruption.

Some current or recently completed ARI R&D of direct relevance to the above issues is pointed out below.

Econometric Manpower Models. ARI is currently developing economic equations and computer programs to estimate the relative importance of factors such as pay, bonuses, labor market conditions, and educational benefits, to the decisions to enlist and reenlist. Population projections are in development, as are early warning systems for recruiting. This work, at present for the AC, is readily adaptable to RC needs and issues.

Individual Enlistment Decision Making. Survey methods are in development to quantify the impact of demographic, socioeconomic, and individual motives as variables in the enlistment decision process; and in development is modeling the process. Again, although directed to AC enlistment, the work is readily adaptable for RC purposes.

Management Techniques to Improve Recruiting. A recruiter assessment program, to screen out potentially unsuccessful recruiters and to provide job samples for training those who qualify, is currently operational. Other techniques, such as artificial intelligence, various other recruiting management topics are in study or can be in this program.

Technology to Improve Retention and Career Management. Development of an enlisted life cycle data base to include data on how personnel policies, individual variables, and organizational practices and leadership affect soldiers' decisions to serve in the Army.

Individual and Family Retention Decision Making. Identification of policies which take into account Army family needs, identify motivators and detractors in family views of Army retention; perhaps even more relevance to RC than AC.

Life Cycle Cohesion Technology for Units. Development of methods of integrating soldiers into, and retaining them in, units to maximize readiness. Unit cohesion data examined for vertical and horizontal "bonding", various personnel policies and group management techniques with their effects on cohesion, retention, readiness.

TRAINING FACTORS AND READINESS

Training is the principal task of military units in peacetime, according to FORSCOM Regulation 350-2. There are impediments to training RC units that are not experienced by AC counterparts. The table below was compiled from comments made by FORSCOM staff personnel in response to the question: "From your perspective, what is the number one problem facing RC units today?"

Table 5

Significant Problems Facing Reserve Component Units

TOPICAL ISSUE	PROBLEM
I. CAPSTONE (name designating procedure whereby RC units are assigned to "round out" active units upon mobilization)	<ol style="list-style-type: none"> 1. CAPSTONE is somewhat unstable; unit alignments may change sometimes because of a change in command or at the request of the RC commander. 2. CAPSTONE has command and control problems; some units may not know their mission.
II. Turbulence	<ol style="list-style-type: none"> 1. Turbulence runs about 30% annually.
III. Leader Qualification	<ol style="list-style-type: none"> 1. Junior leaders lack technical proficiency. 2. Junior leaders lack tactical proficiency.
IV. Training Days	<ol style="list-style-type: none"> 1. Most reserve units are limited to 38-39 training days per year.
V. Equipment Shortages-- Equipment Readiness	<ol style="list-style-type: none"> 1. Army Reserve units are short of equipment. (The Army National Guard has been experiencing stepped-up emphasis on equipment) 2. Force modernization fielding plans are inadequate.
VI. Training Methods, Procedures, Locations	<ol style="list-style-type: none"> 1. No areas suitable for maneuver training. 2. There is no good approach for tying together the initiatives for regional training sites. 3. Units are dispersed; training is difficult. 4. Self-paced training is not held in high esteem. 5. Level of training is at something less than company/battery level. 6. People in responsible positions are not trained. 7. Units tend to train for their number one priority only.
VII. MOS Qualification	<ol style="list-style-type: none"> 1. There needs to be a centralized approach to MOS qualification.
VIII. Training Proficiency	<ol style="list-style-type: none"> 1. Level of proficiency is at something less than company/battery level.

RC Unit Annual Training Performance. Each RC unit that undergoes Annual Training (AT)

is rated in each of five categories:

- Command and Staff
- Training Management
- Training Performance
- Maintenance Performance
- Overall AT Performance

Performance in each category is rated on a 5-point scale where 1 = Outstanding; 2 = Excellent; 3 = Satisfactory; 4 = Marginal; and 5 = Unsatisfactory.

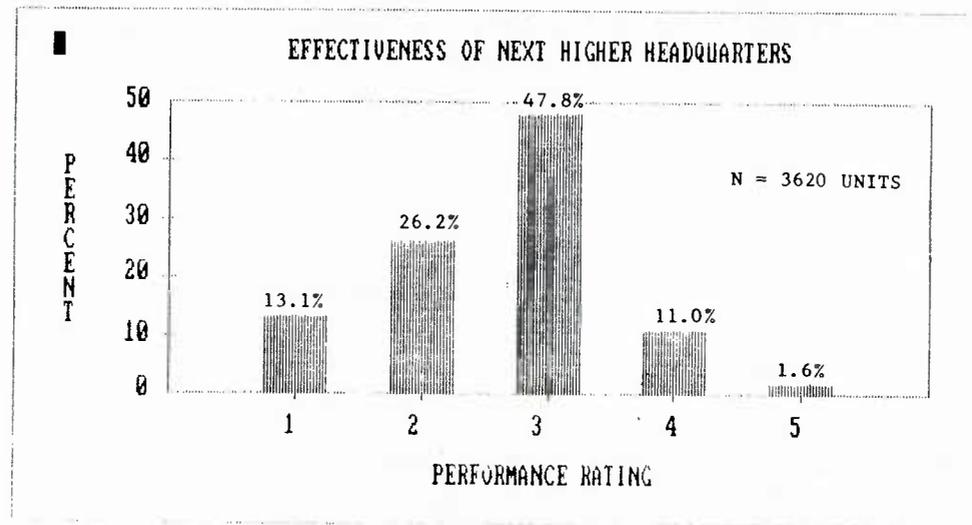
Experienced observers complete the ratings but no attempt has been made to establish inter-rater reliabilities. However, if one assumes that there would be substantial agreement among raters on ratings of "Marginal" or "Unsatisfactory", then those elements on which ten percent or more of the units received such ratings, singularly or in combination, might be indicative of problems. Bar graphs for the "problem" elements are presented on the following pages. Bar graphs of performance on all 42 elements for all RC units are at Appendix A.

CATEGORY:

COMMAND AND STAFF

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

How effective was the next higher headquarters:

- a. In providing realistic guidance and objectives aimed at improving the evaluated units wartime/mobilization mission capabilities.
- b. In providing necessary support and resources to permit the unit to achieve annual training objectives?
- c. In providing assistance to the unit, as required, in the accomplishment of training objectives and in the overall supervision of annual training?

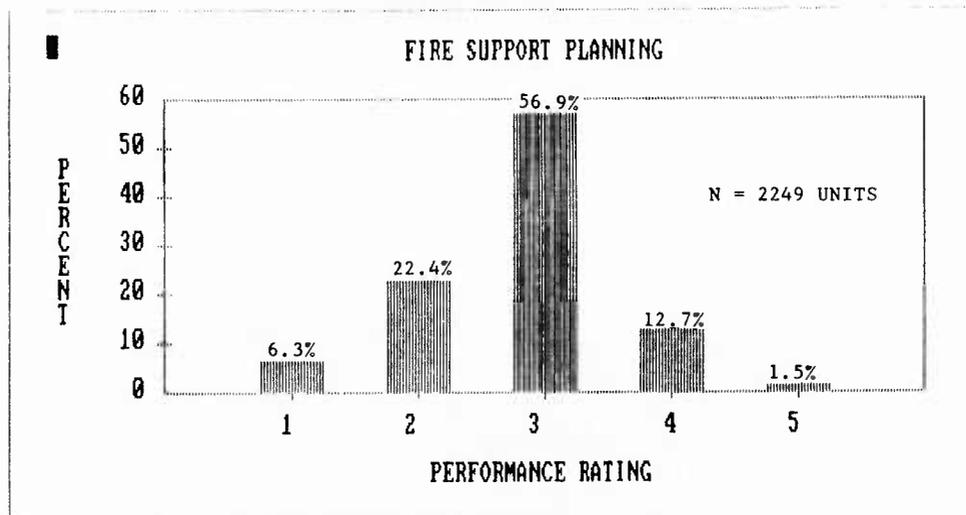
CATEGORY:

COMMAND STAFF

ELEMENT:

FY83
AT PERFORMANCE

EVALUATION
GUIDELINES:



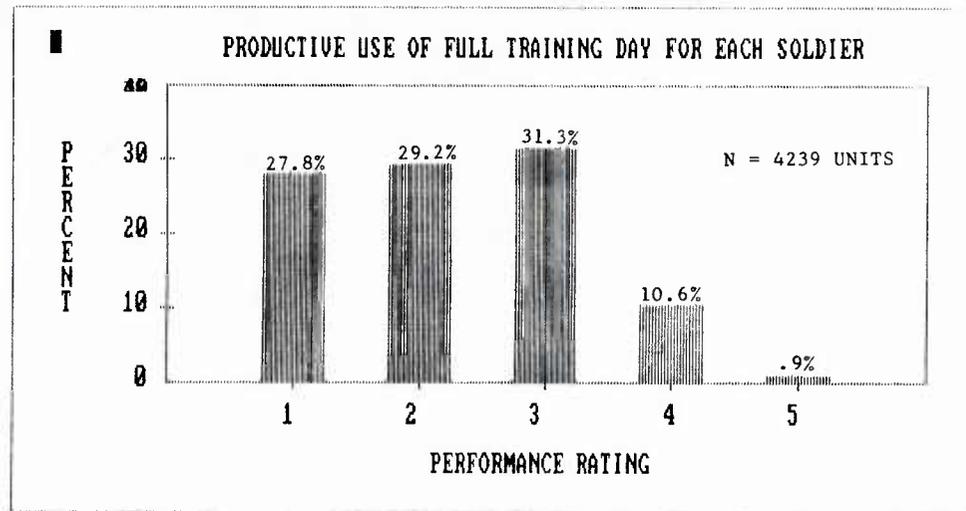
1. Did the unit's fire support plan include all organic, attached, or indirect support weapons?
2. To what extent did the fire support plan support the accomplishment of the unit's mission?

CATEGORY:

TRAINING MANAGEMENT

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

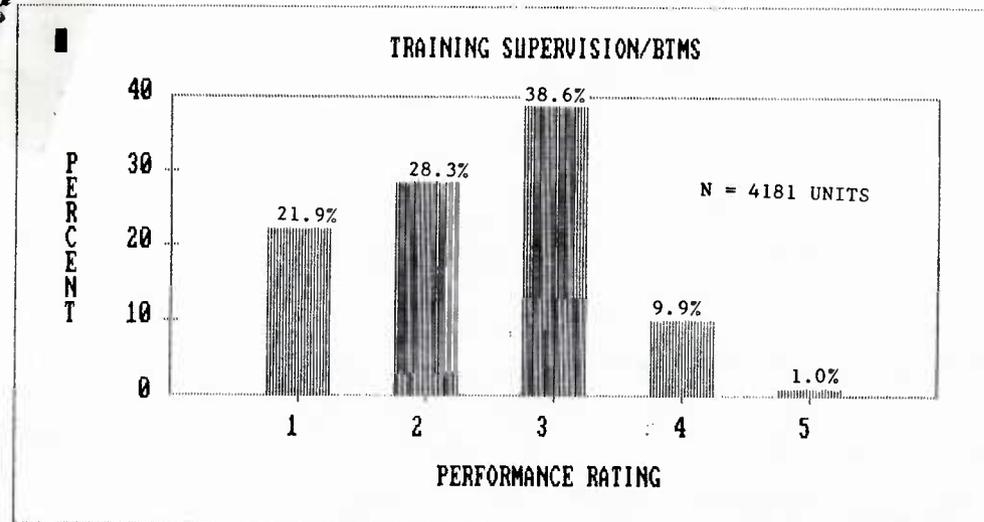
1. To what extent was available training time used to maximize training benefits?
2. Consider the plan to keep each soldier in a learning/teaching situation throughout each training period/exercise.

CATEGORY:

TRAINING MANAGEMENT

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

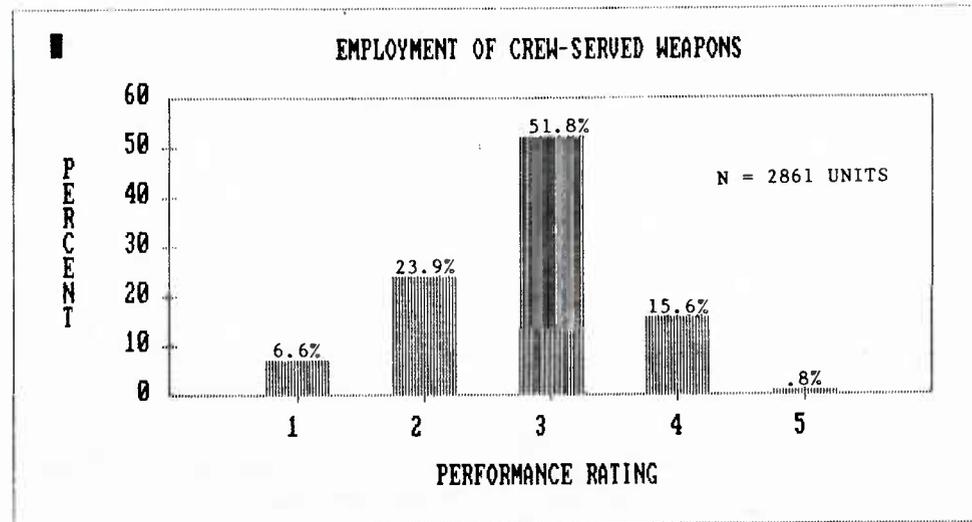
1. Were training tasks and responsibilities properly apportioned between officers and NCOs?
2. Did commanders set objectives provide resources, coach subordinates, and measure results?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

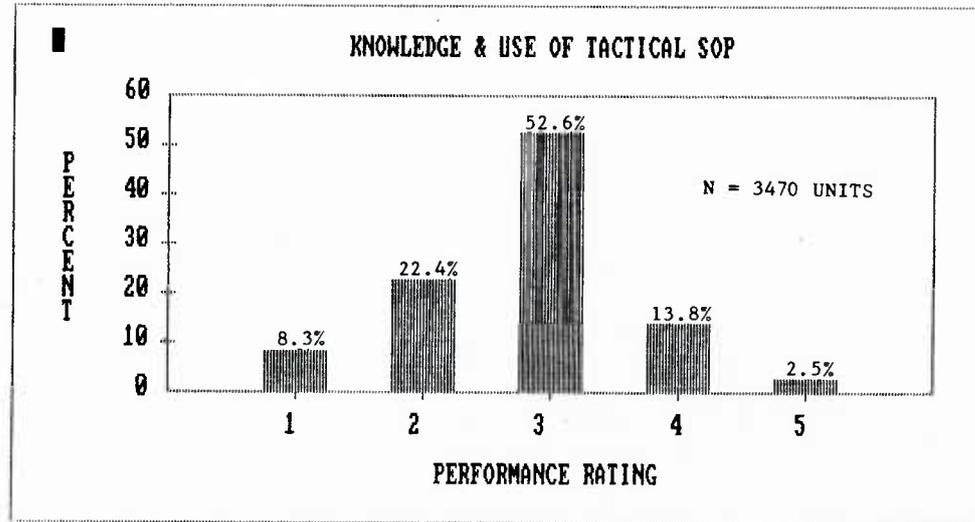
1. Were crew served weapons stored, maintained, moved, and employed properly?
2. Were weapons systems integrated into defensive fire plans to maximize coverage and minimize threat?
3. Consider all crew-served type weapons, not just those reported in Part II.

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

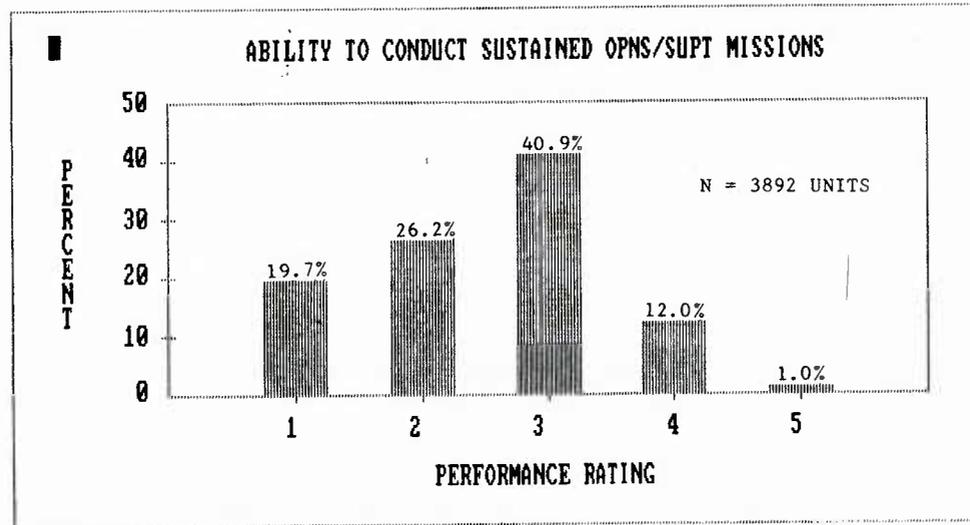
1. Did the unit have a tactical SOP?
2. Were personnel familiar with and did they understand and comply with the unit tactical SOP?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

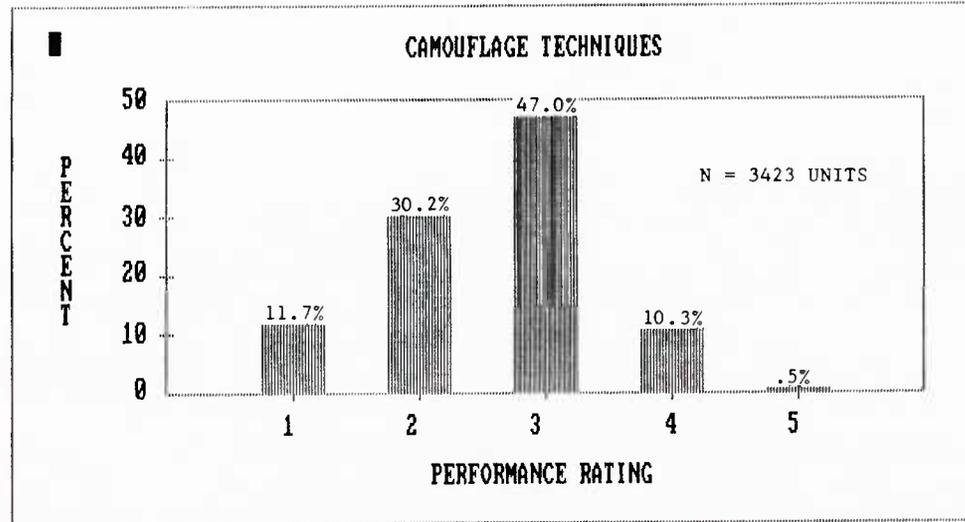
1. Did the unit demonstrate the ability to operate in a field environment over extended periods or "around-the-clock" with available resources?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

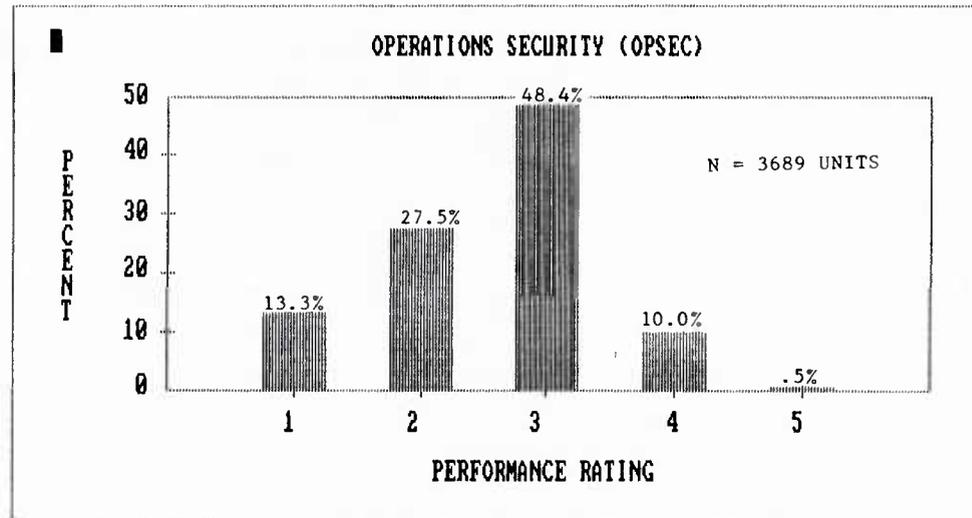
1. Were proper camouflage procedures and techniques used throughout all tactical operations by all unit personnel, including proper individual and equipment techniques?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

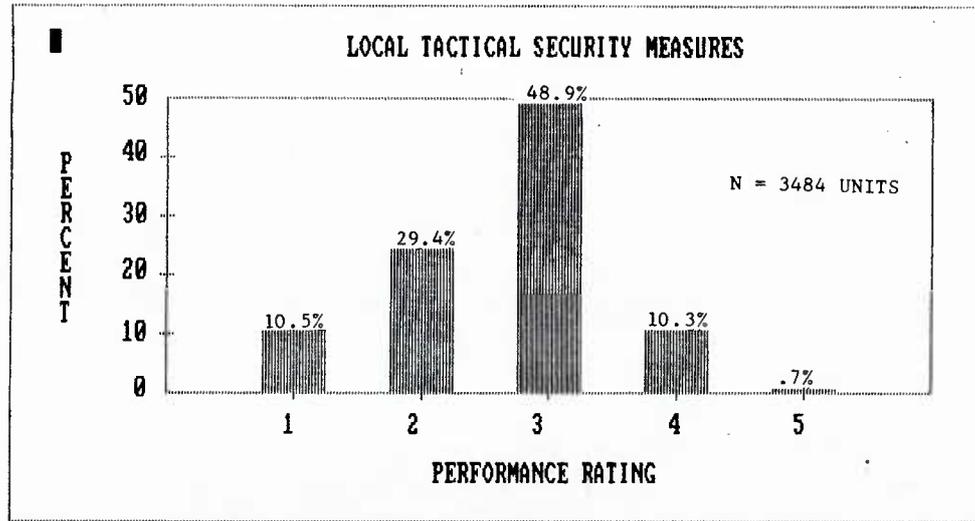
1. Were correct OPSEC procedures employed including:
 - a. TOC security?
 - b. Document security?
 - c. Signal security?
 - d. Employment of deception techniques?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

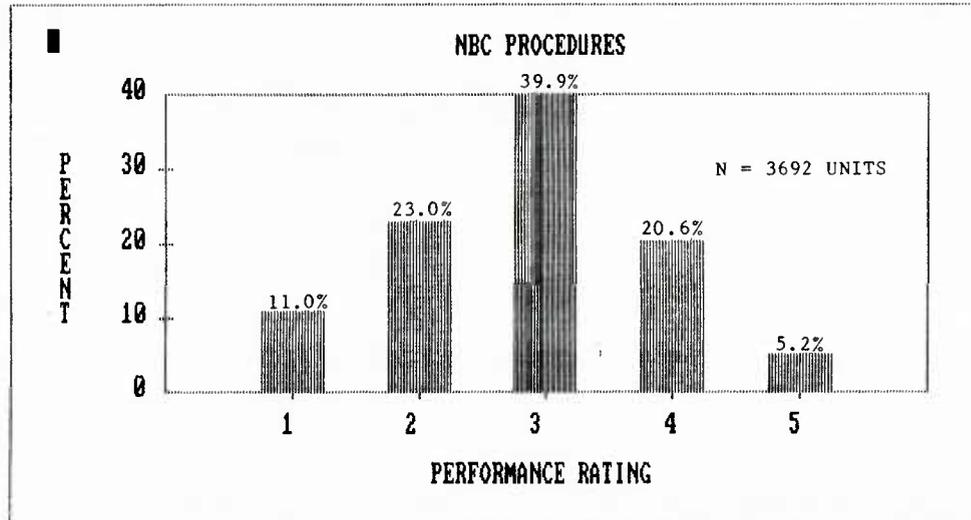
1. Did the unit have and employ effective tactical security measures as outlined in the unit tactical SOP?
2. Were all personnel familiar with these measures?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

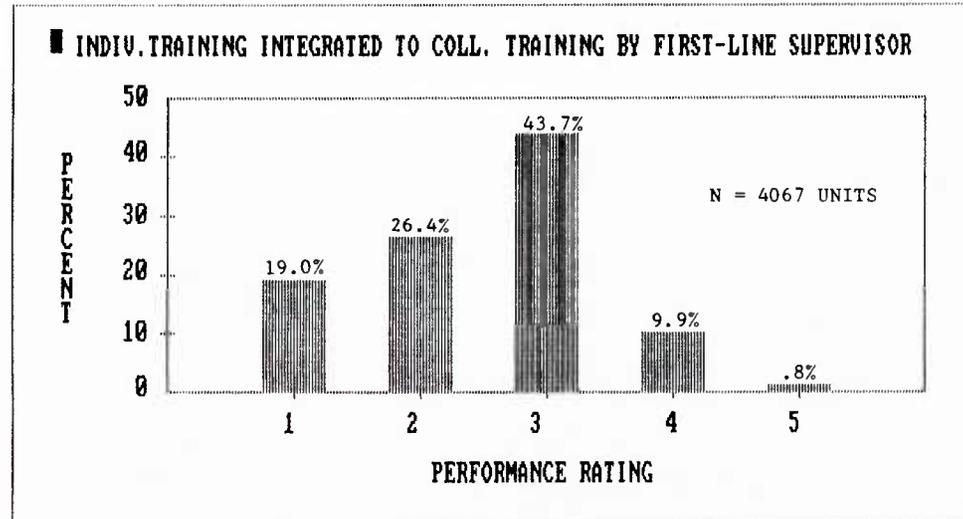
1. Did the unit have a tactical plan for the reaction to nuclear, chemical, or biological attack, including both individual and team responsibilities?
2. Did the unit function effectively while performing its mission in an NBC environment?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

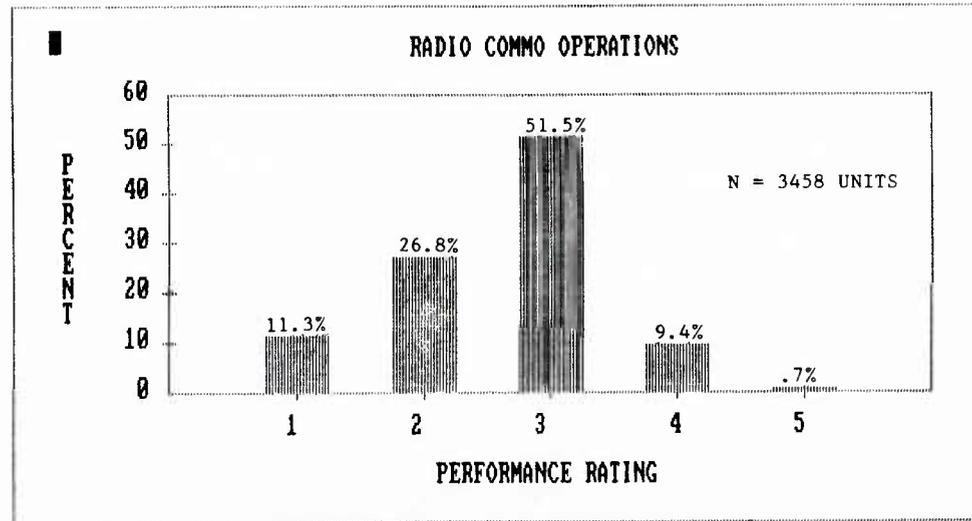
1. Were individuals training in areas of weaknesses as diagnosed by first-line supervisors at every opportunity and when not specifically engaged in collective training?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

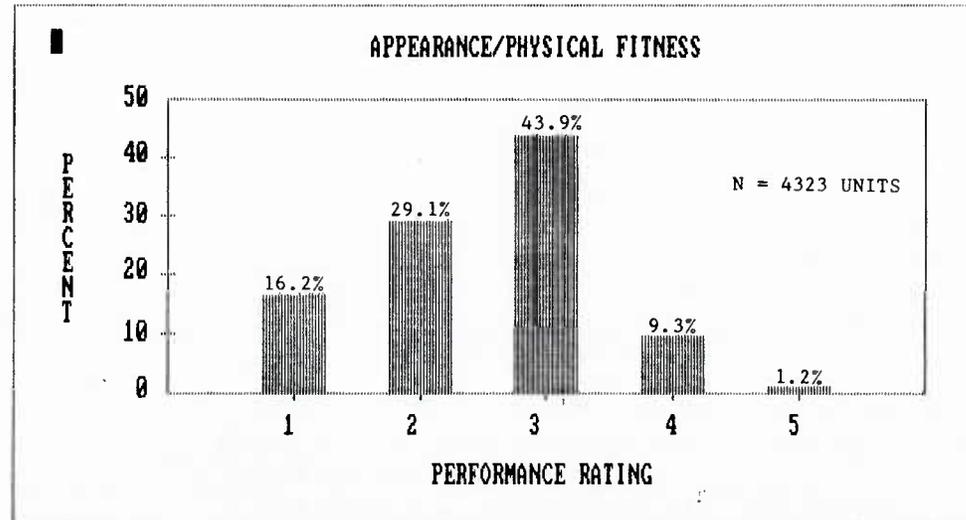
1. Were proper radio procedures used during tactical operations?
2. Did operators understand and use CEOI?
3. As a whole, did the unit demonstrate full capability to establish, operate, and maintain authorized communication systems?

CATEGORY:

TRAINING PERFORMANCE

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

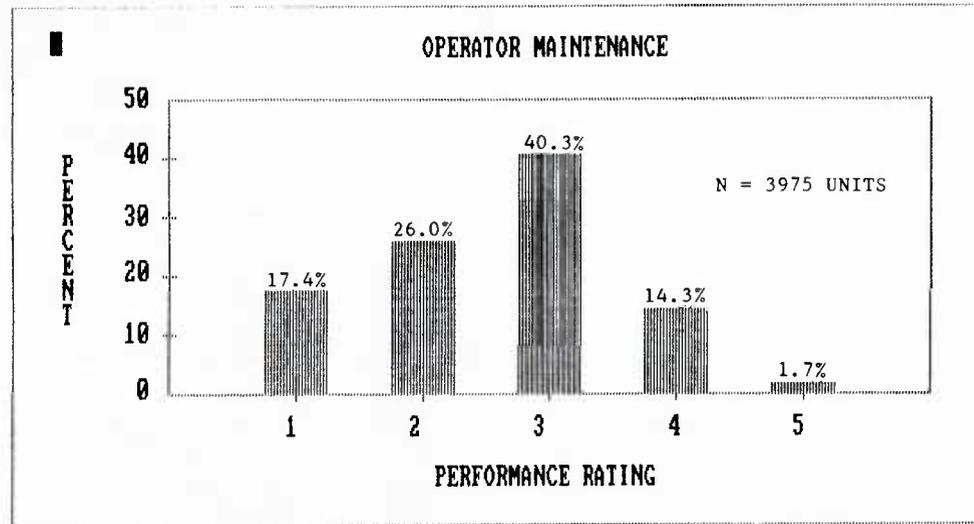
1. Did all personnel demonstrate proper military bearing throughout at period, including personal appearance and conduct?
2. Did the unit have an adequate physical fitness program?
3. Did unit personnel exhibit good physical condition?
4. Was the unit complying with the Army Weight Control Program?

CATEGORY:

MAINTENANCE OPERATIONS

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

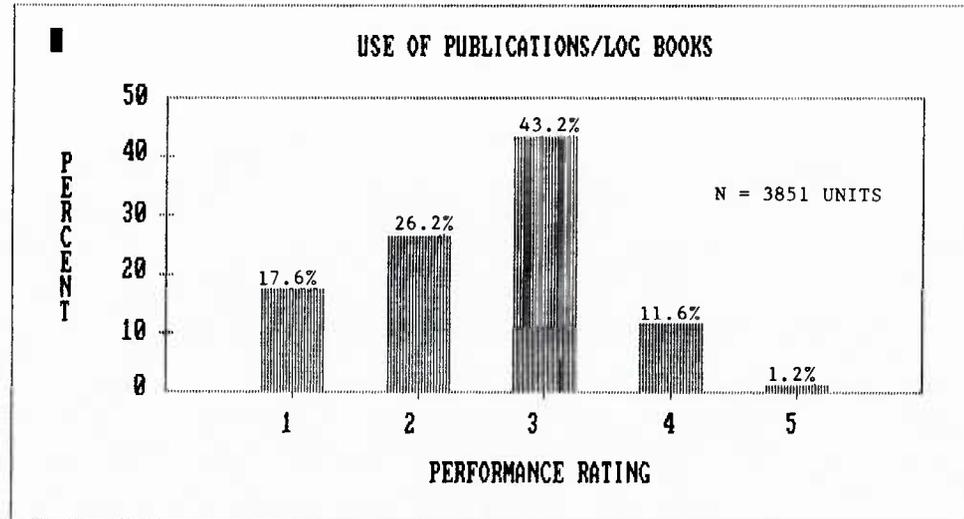
1. Were preventive maintenance services performed as required throughout the AT period?
2. Did unit personnel demonstrate the ability to properly maintain and effectively operate authorized equipment?

CATEGORY:

MAINTENANCE OPERATIONS

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

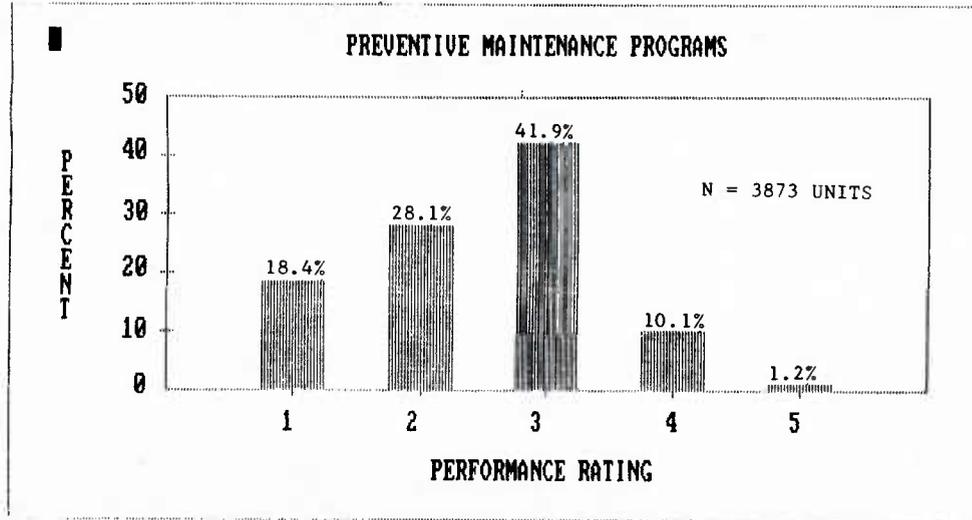
1. Were required log books, applicable maintenance publications, and forms on hand and properly used throughout the AT period?

CATEGORY:

MAINTENANCE OPERATIONS

ELEMENT:

FY83
AT PERFORMANCE



EVALUATION
GUIDELINES:

1. Did the unit have and implement an effective preventive maintenance program for all echelons?

Training R&D to increase Readiness in the RC. Readiness ratings of RC units could be increased by changes in funding to increase equipment and by elevating the Authorized Level of Organization (ALO) which would shift the priority of the unit. Without the required TO&E equipment it is obviously difficult to meet readiness requirements. Likewise, it would be rare indeed for units with ALO 3, 4, or 5 to achieve better than a readiness rating of C3, C4, or C5, respectively, because the nature of the ALO priority dictates the resources available to the unit and these, in turn, are an integral part of the readiness equation. Nonetheless, it is our hypothesis that if a training research and development program is initiated specifically for the RC and the resulting products are implemented, then performance in recipient units should improve independent from the unit's priority. The increase in performance should lead, then, to increase in readiness of the RC unit.

The opinions of FORSCOM staff personnel and the observations of performance during Annual Training have been cited in this paper as indicative of areas where concentration of R&D efforts would likely lead to improvements in performance and concomitant increase in readiness. To focus on the problem areas and to develop a hypothetical (or "strawman") plan, the problems we have mentioned previously can be conveniently subsumed in three categories: (a) Improving training quality; (b) Making efficient use of time; and (c) Training dispersed units. The research question then is: What R&D has been done or should be done that would improve training quality, or help the unit commander make more efficient use of time, to help the commander train dispersed units? As

appropriate answer to the question would be to adapt and apply completed R&D to the immediate problems; consider RC application of on-going R&D for the intermediate or near future; and plan for adapting high-technology products and solutions as they become available in the future.

Training R&D Goals and Objectives. The goal of this suggested R&D effort is to improve individual and unit performance in the RC. Attaining this goal can be judged on the basis of whether or not the objectives listed below are reached.

The following objectives are recommended:

1. Improved Training Quality
2. Efficient Use of Time
3. Trained dispersed Personnel

To be effective these objectives must be reachable and to determine this the objectives must be measurable. For example, time is rather easily quantified. Improvement in training quality can be more easily measured if it is operationally defined in such terms as relative levels of knowledges and skills of soldiers, levels of retention of knowledges and skills, standardization of instruction, SQT performance, ARTEP performance and the like. Therefore, R&D and the resultant products should be tested in RC units and adopted for use only when there is quantitative evidence that one or more objectives have been reached.

In the following paragraphs we cite some on-going and recently completed ARI R&D actions whose products are good candidates for trial as immediate and near-immediate actions to reach one or more of the objectives above.

Maintenance Performance System: Direct Support is a computer based reporting system which measures daily, on-the-job individual technical performance and maintenance shop operation. The system is designed for use of unit level supervisors for unit level training. It can identify/describe technical performance practices, strengths, and deficiencies. The system collects and reports measures such as job completion time, job status time, manhours per job , and on-the-job training occurrences.

Maintenance Performance System: Organizational is a computer based maintenance system designed to support decision-making at the battalion level. There are four components: a Management Information System (MIS); action meetings, skill development; and mechanic certification. The MIS tracks maintenance performance. Action meetings use the MIS data and mechanics receive skill training and certification based on the MIS data.

Skill Retention Research was conducted to develop a technique that permits estimation of skill decay based on task characteristics. Infantry and artillery soldier tasks were measured. This research could be validated in RC units, to determine whether reliable differences exist between data obtained in the AC and RC, then used by unit training managers.

Skill Training Methods Research is being defined to determine which training methods and strategies result in the best acquisition and transfer for varying types of military skills and how technology can be used to increase effectiveness of training systems. Comparisons of skill training methods on like RC units could make a valuable contribution to the knowledge of skill training.

Portable Electronic Aid for Maintenance (PEAM) is a compact, hand-portable, device that presents maintenance information at the field site. The PEAM design integrates flatpanel thin-film electroluminescent displays, speech synthesis, speech recognition, sold-state mass memory and microprocessor technologies. This device is presently in prototype development. If it performs as designed it should minimize supervisor training requirements, help circumvent soldier reading problems and improve the quality of maintenance because it will supply on-the-spot guidance for technicians.

Multipurpose Arcade Combat Simulator (MACS) is a low cost part-task simulator/trainer for light infantry weapons. Different targets and backgrounds are presented on a TV monitor by computer graphics and a specially designed long distance light pen and trigger switch "shoot" the targets. Software permits effects of wind and gravity for different wind/distance combinations. Other programs train target engagement by video replay of point-of-aim prior to firing and feedback on shot location. Night firing can be simulated using black, white, and gray graphics viewed through light attenuating goggles; a bright white light and voice synthesizer provide feedback. Any MACS program can be fired with NBC MOPP gear. Software have been developed for the M16A1 rifle, M203 grenade launcher, and the M72A2 LAW. Research on the utility of MACS to transfer and retain light infantry weapons skills in RC units would be valuable.

Model Training Program for Reserve Component Units is a computer-based training program for training M1 Tank maintenance personnel at the organizational, direct support and general support levels in the RC. This program is in development and courseware for MOS 45K, 63H, 45E, and 63E will be available soon. Sixty hours of courseware for each MOS are being developed. Courses stress simulation of trouble-shooting and repair actions based on use of appropriate technical documents. Videodisc computer graphics are used extensively. In addition, supervisor, trainer, and student guides are being developed to support a management system designed for the RC training environment.

Rapid Train-Up for Force Mobilization is a development whose purpose is to shorten small-unit mobilization training time by developing methods for quickly training MOS qualified and non-qualified soldiers in combat-critical tasks. Initial efforts center on armor crewmen tasks. In this program trainers are assumed to be subject matter experts so information is presented on "how to train"; "how to perform" tasks is omitted. The tank commander and platoon sergeant are the targets and materials consider the time and resource constraints operating in a mobilizing TO&E unit. Training and program management materials will be evaluated in Active Component and Reserve Component units.

Simulation in Combined Arms Training (SIMCAT) is a lowcost tank platoon training simulation program, extendable to combined arms operations no higher than company team, using state-of-the-art training technologies and techniques. The program involves four player stations and one instructor station and features live communication among the stations; programmed command, control, and communications from a tactical operations center; and positive and negative consequences of actions taken. This R&D effort could be used to increase skill levels of junior leaders and improve command and control performance in RC units.

Advanced Technology Unit Training and Management System (ATUTMS) is a prototype distributed computer system designed for location in a battalion. It is specifically constructed to test the concept of a single, integrated computer system, with a Relational Data Base Management System employed as its foundation, which could function as an automated unit management information system. It can serve the battalion staff and companies in a variety of functions, some of which are listed below.

- Preparation of training program/calendar
- Maintenance of training records
- Maintenance of files
- Preparation/maintenance of vehicle status reports
- Maintenance of inventory
- Analysis of vehicle maintenance problems
- Analysis of trends for supply requisitioning
- SIDPERS data entry/retrieval
- Personnel management
- Files management
- Word processing

Army National Guard (ARNG) Aviator Training Requirements Evaluation is a project to determine whether or not the current training time available for aviators in the ARNG is sufficient to complete the established training requirements.

Aviator Skill Decay and Refresher Training is a project to determine the conditions and course of loss of individual aviator skills, the relations among original aviator skill level, amount of skill loss, and amount of re-training required. Research will emphasize expanding the skills sampling to include instrument and night flight conditions and investigating the use of flight simulators for skill sustainment and re-training. The ultimate product will be an RC IRR aviator training program.

Computer Operated and Managed Battlefield Tactical Training System (COMBATTS)

is a program to design and develop prototype training programs for light infantry units.

Some of its products are:

Basis unit training program (ARTEPS with battle drill guidebooks)

A taxonomy of tactical principles (decision making model, process analysis and rules)

A tactical simulation model computer program (individual soldier through platoon)

A tactical training simulation system (breadboard hardware/software)

An integrated unit training program (simulation and on-the-ground)

Target Acquisition and Analysis Training System (TAATS) is a series of interrelated combat vehicle identification programs which have been developed and adopted for use on an Army-wide basis. Both basic and advanced programs have been developed. Programs provide learning in minimal training time, require minimal support, train soldiers to recognize at realistic combat ranges, measure recognition training skills, permit simulation of realistic engagement ranges with all optics, and provide for recognition and identification of masked vehicles and vehicles viewed through thermal sights. Current research, which could be conducted for RC units, includes self-pacing via interactive videodisc technology, multiple target arrays, image enhancement training programs, and special thermal CVI programs for the TOW and Bradley vehicles.

Investigation of Methodologies and Techniques for Intelligence Analysis is a recently completed four-year research project. Descriptive models of intelligence analysis processes were developed, concentrating on the cognitive activity of the analyst and how this activity could be supported with automation. Decision aids pertaining to different types of intelligence were developed. One such aid, ENCOA--Enemy Courses of Action--was recently made available. ENCOA exists in two forms: a paper-and-pencil manual accompanied by a hand-held calculator, and a computerized version. ENCOA divides the

decision problem into tactical components, with each division more specific than the previous one. Two additional projects are underway. The integrated Tactical Analyst Training (INTACT) project is aimed at tactical all-source analysis. The Handbook for Strategic Intelligence Analysis (HASTIA) project focuses on strategic intelligence analysis.

Many of the on-going or completed projects cited above have proposed or incorporated the latest technological advances such as the use of computers for assisting and managing instruction, the networking of computers to share training data, and development and use of data banks for data storage and retrieval. PEAM is an example of a job performance aid with the latest in technology. As other technological advances become reality, their application to the problems of training and maintaining RC readiness must be tested. The following is a partial list of applicable technologies and their possible contributions.

<u>Technology</u>	<u>Application</u>
Teleconferencing	Interactive audio and video instruction
Random Access Memory Chips (RAM)	Information storage and access
Intelligent Videodisc	Interactive video instruction
Satellite Communication	Interactive instruction, digital data transmission
Integrated Self-Instructive Equipment (ISITE)	Combined test and training devices
Speech Input Systems	Speech recognition
Robotics	Manipulative skills training
Holography	Three-dimensional images, training devices

In the following Training R&D Matrix we have listed the proposed objectives and potential payoffs. These payoffs have circular quality about them in that they may also serve to operationally define the objectives. That is, some payoffs of improved training quality are improvements in skill levels, improvements in knowledge, improved performance, etc. On the other hand, if improvement in skill, knowledge, or performance can be demonstrated as a result of applying one or more of the R&D products then we can state that the quality of training improved. The matrix also lists products and technologies according to an imprecise time schedule and we estimate possible payoffs of the R&D.

CONCLUSION

This paper has argued for the application of "people-related" research and development as one important way to increase readiness of the Army's Reserve Component. Several points merit highlighting.

In 1970 the Secretary of Defense established the concept as the Reserve Component of the Total Force. Because the Reserve Component makes a significant contribution to the combat, combat support, and combat service support components of the Total Force, the personnel, training, and equipment readiness of the RC is paramount. Although budget and policy dictate in large measure the end strength and equipment status of the RC, the Army should develop an R&D program whose target is increased readiness through adapting on-going and recently completed behavioral research to the unique RC environment. This program should be designed to monitor, obtain, test, and develop emerging technologies, also. Personnel management and its attendant problems are not unlike those experienced in the Active Component but there are some unusual circumstances. Recruiting, retention, and personnel turbulence problems are still a concern in the RC. Much is known about the problems but more needs to be learned. In addition, data that are being collected and added to a "bank" need to be extracted and solutions to the problems need to be derived and tested in specific units. An attrition rate of approximately 30 percent has been the trend for

several years in the selected reserve and, while not all soldiers who are lost to a unit are lost to the RC, hypotheses for reducing this rate need to be tested in specific units. More data need to be collected on the relationship of monetary factors to attrition. Data are needed on differential reenlistment rates according to sex, Guard versus Reserve, etc. Data have been compiled which explain, at least categorically, why soldiers transfer from the units to the Individual Ready Reserve (IRR), but data need to be compiled to show "who is where". Reservists who possess critical MOS have left units because of job moves. Data have shown this migration to be westward where there is a less likely match of MOS with unit availability. A data bank that would identify individuals by location and MOS is important to the RC's ability to train and use these soldiers. As strength of the RC continues to rise, research is called for to determine whether or not it is feasible to alter physical, age, and sex requirements to ensure needed strength figures in the RC. In short, more data are needed and more actual testing of hypotheses are called for to determine how the application of the research findings will change the RC.

Training problems in the RC are, again, not unlike those in the Active Component. But, again there are some unique differences. The single most prevalent problem is lack of MOS qualification at any one time in the RC. CAPSTONE has caused some unique situations with respect to alignment. Junior leaders and those in responsible positions often lack

the technical and tactical training necessary for the proper functioning of the unit. Training performance, as measured during annual training shows typical trends. A number of units are deficient in the areas of command and staff, training management, training performance, and maintenance management. It is the environment in which the RC unit must exist that is unique. The limited training days, the fact that battalion sized units are often dispersed to opposite ends of a state, or may be in other states, and the fact that soldiers must divide time between their unit and their career or job makes for a challenging training environment. Research needs to be adapted and applied that will increase the quality of performance, make efficient use of the time available, and train dispersed personnel while holding physical movement to a minimum. Increasing skills and knowledges, increasing retention, standardizing instruction, and improving the training of leaders can make a difference in training quality. Research needs to be adapted and applied that will increase the quality of performance, make efficient use of the time available, and train dispersed personnel while holding physical movement to a minimum. Increasing skills and knowledges, increasing retention, standardizing instruction, and improving and training of leaders can make a difference in training quality. Developing and adapting ways to retrieve data, reduce training time, use job aids, automate records keeping, and reduce reading level requirements can save time. Improving communication and coordination,

capitalizing on innovative technology in satellite communications, videodiscs, simulations and training devices can reduce dislocation and provide adequate training to dispersed soldiers.

Personnel, training, and equipment are the three key elements in readiness. Current behavioral research on equipment has been concerned with acquisition of new systems. Some of this research might be of value in addressing the RC readiness issues, but it is more likely that researching, developing, adapting, and testing personnel and training research will have the more immediate return on the investment.

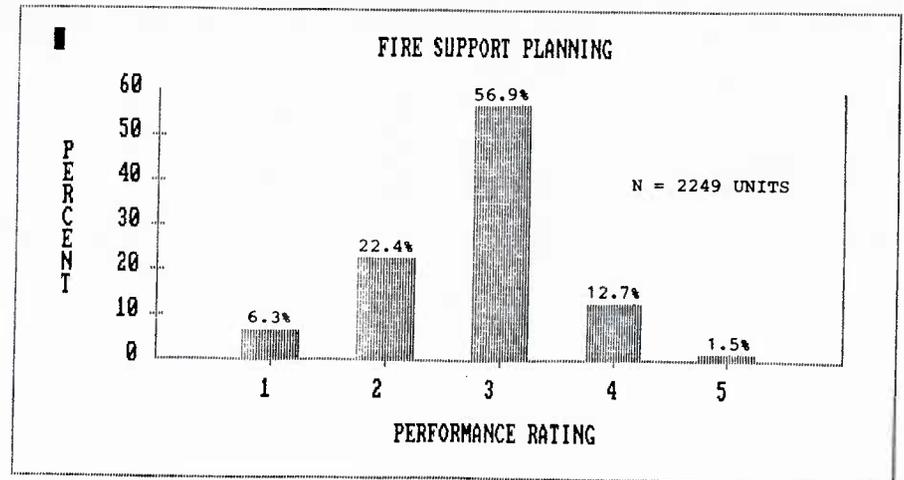
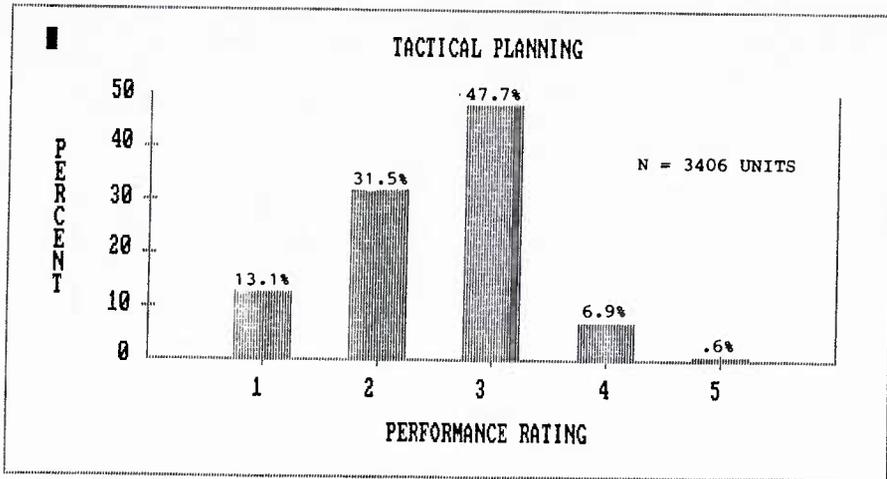
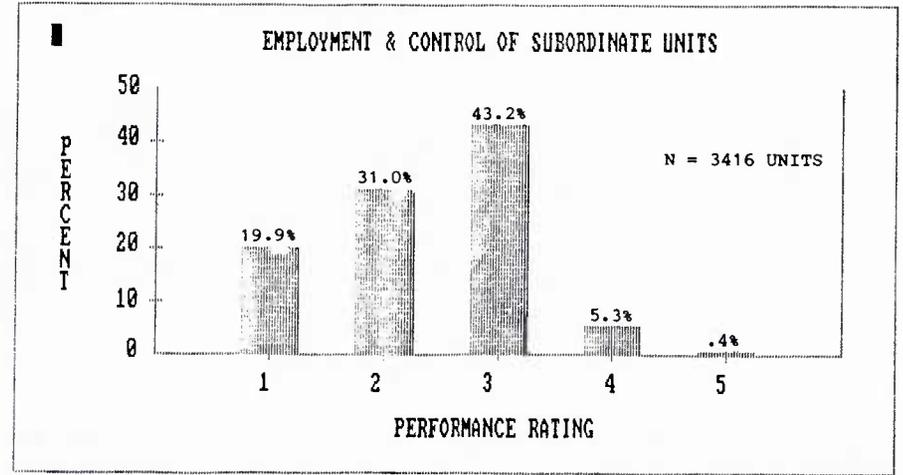
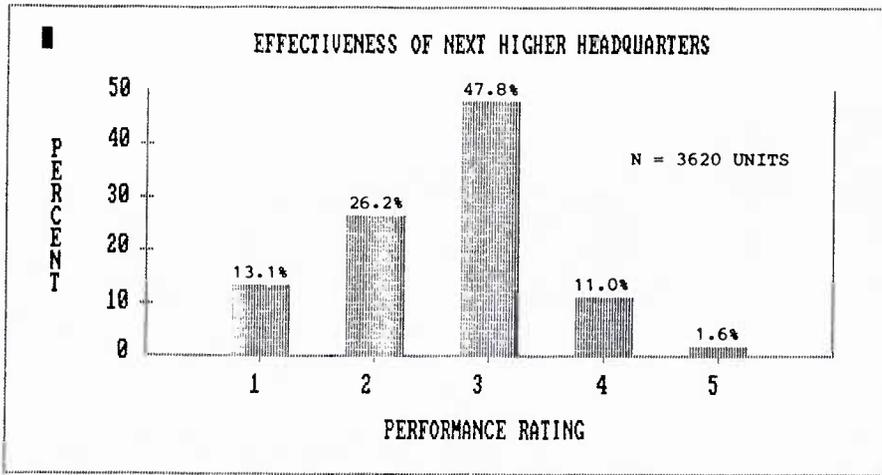
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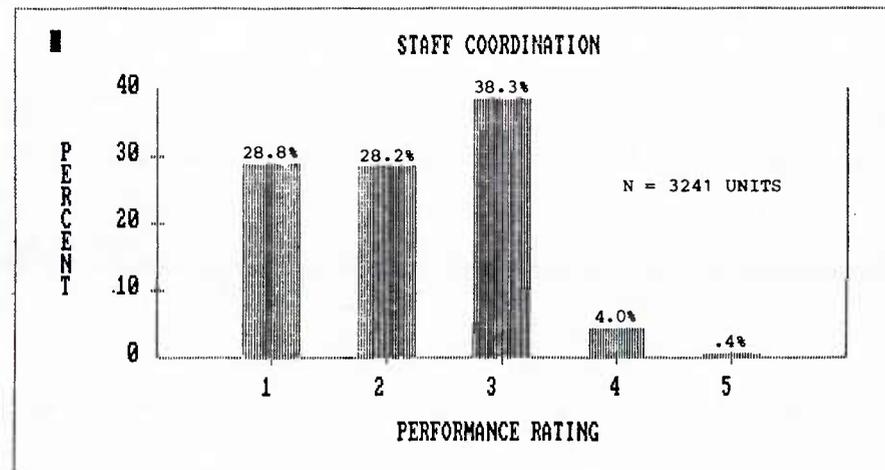
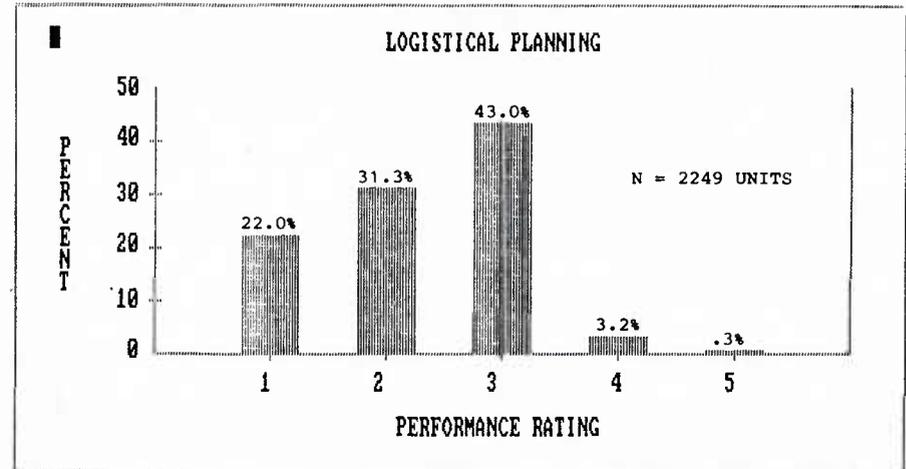
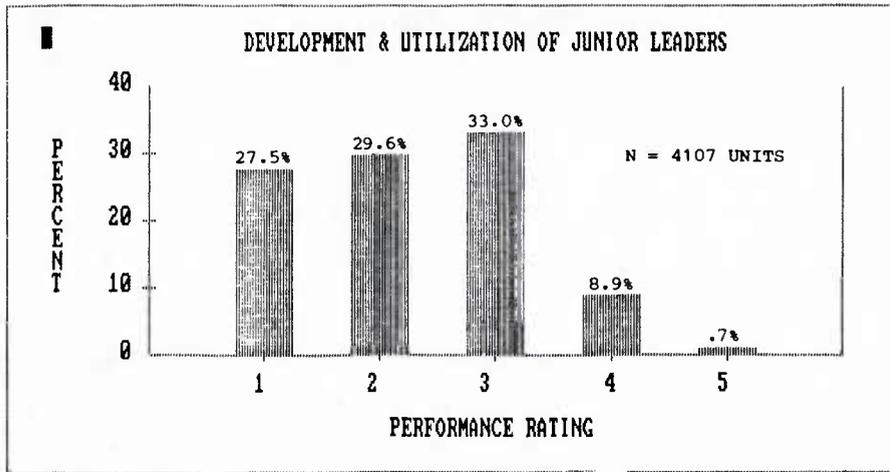
APPENDIX A

FY83 UNIT ANNUAL TRAINING PERFORMANCE

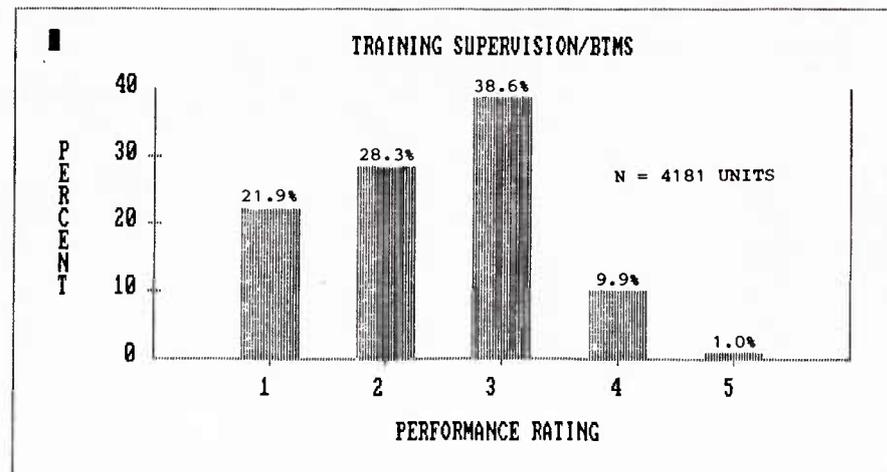
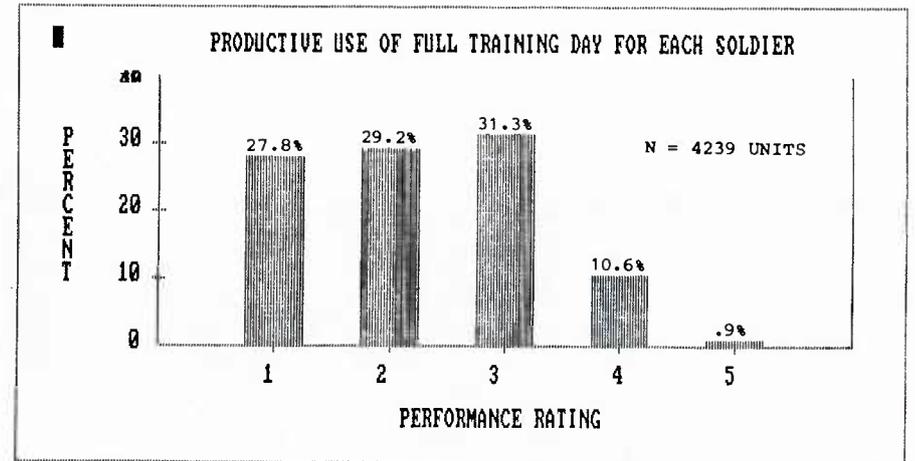
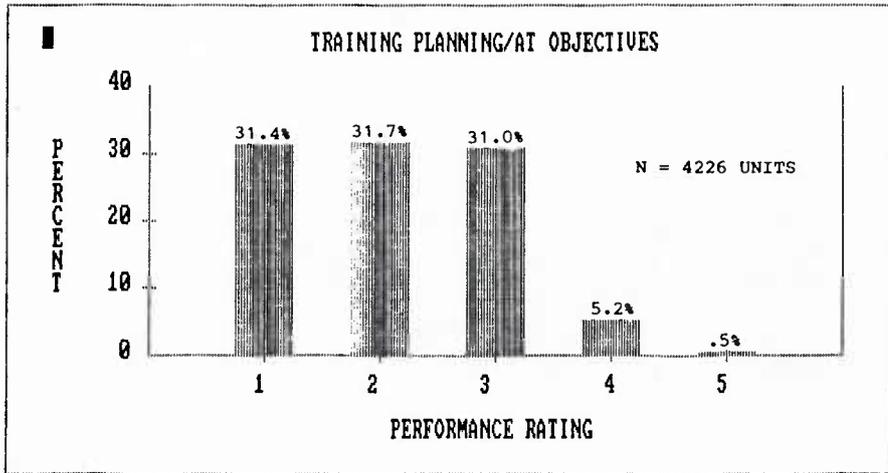
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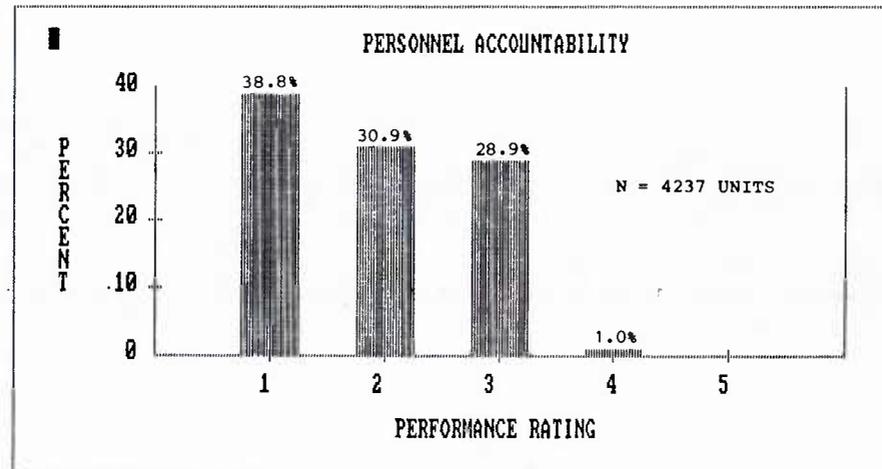
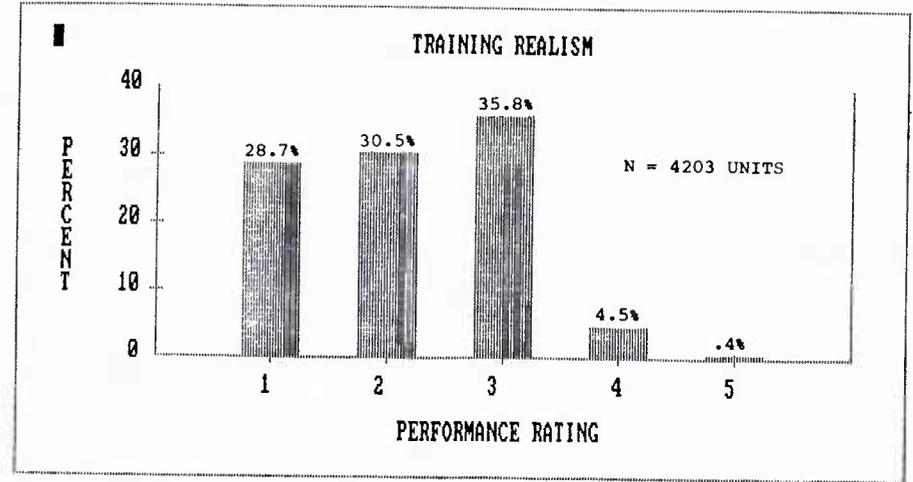
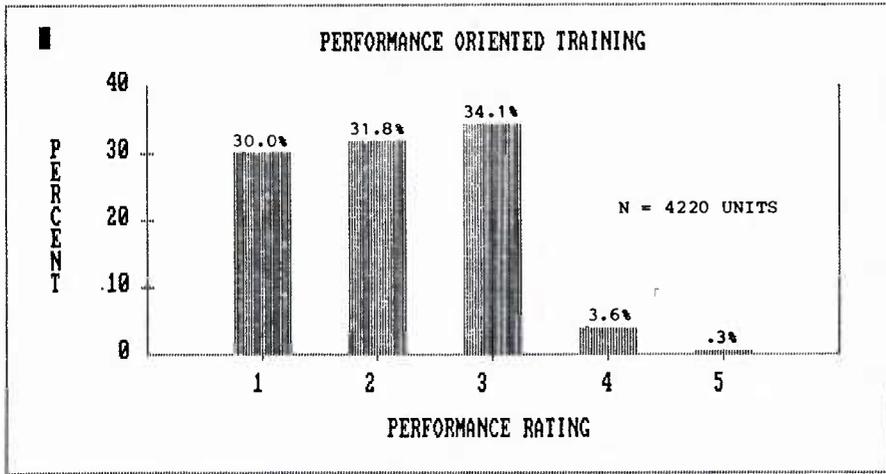
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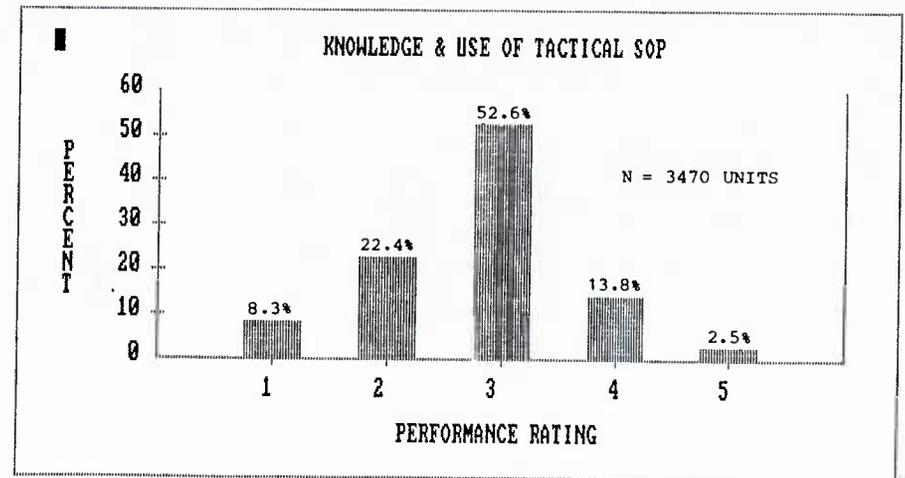
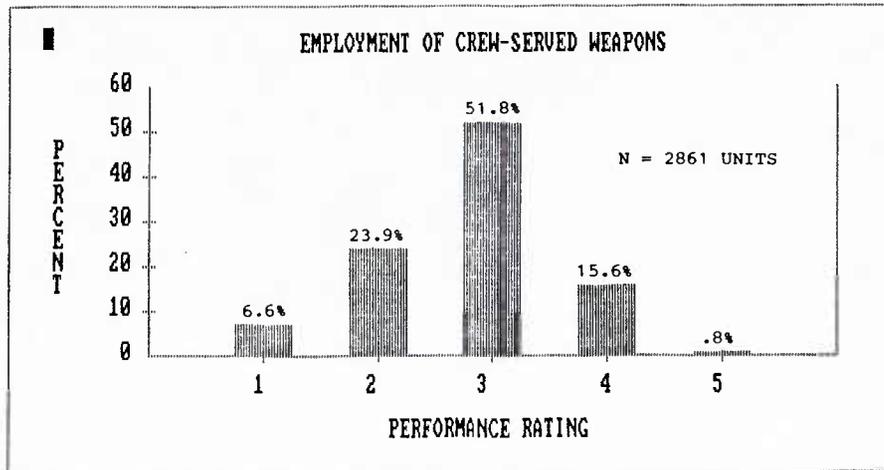
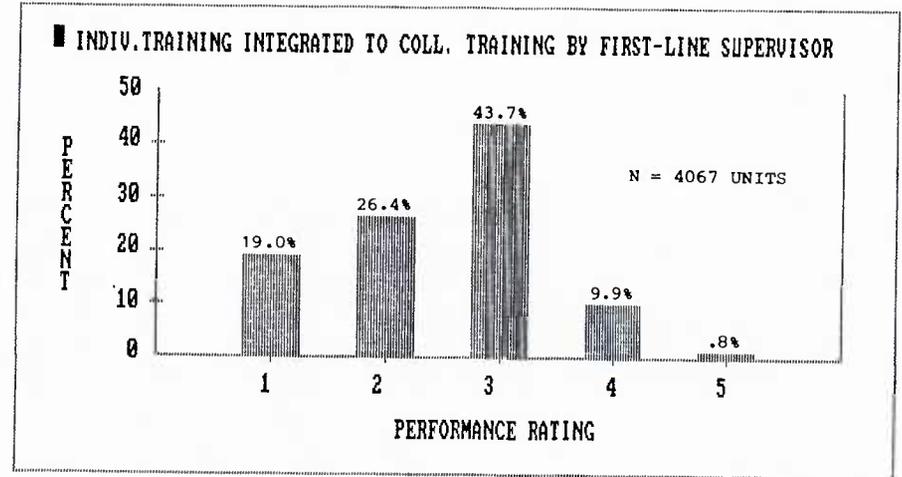
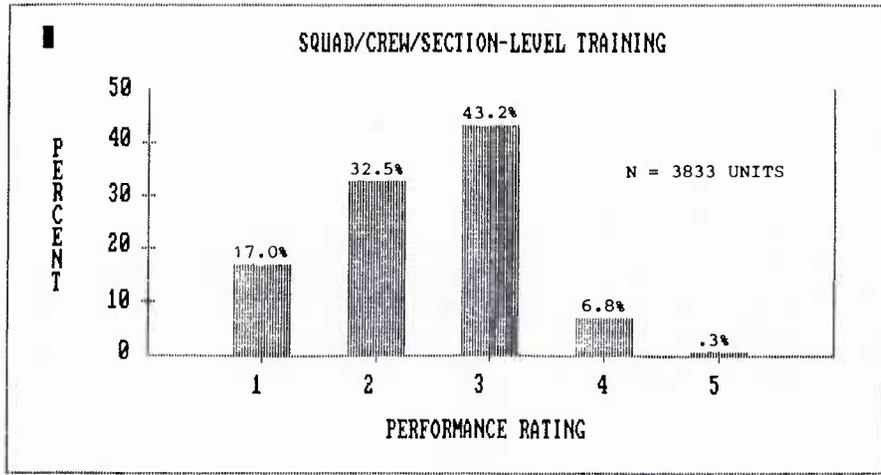
TRAINING MANAGEMENT



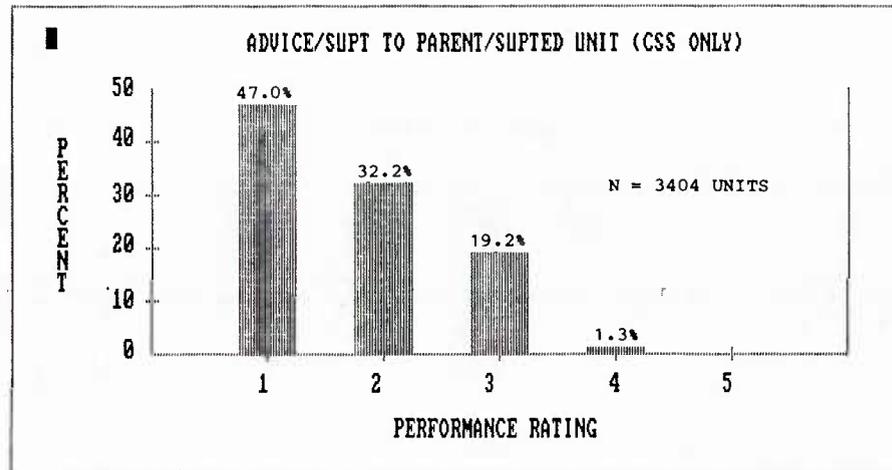
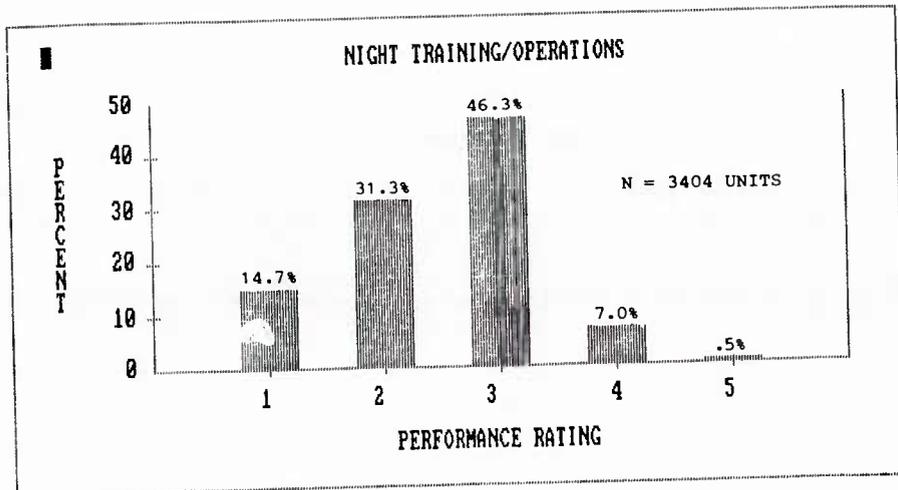
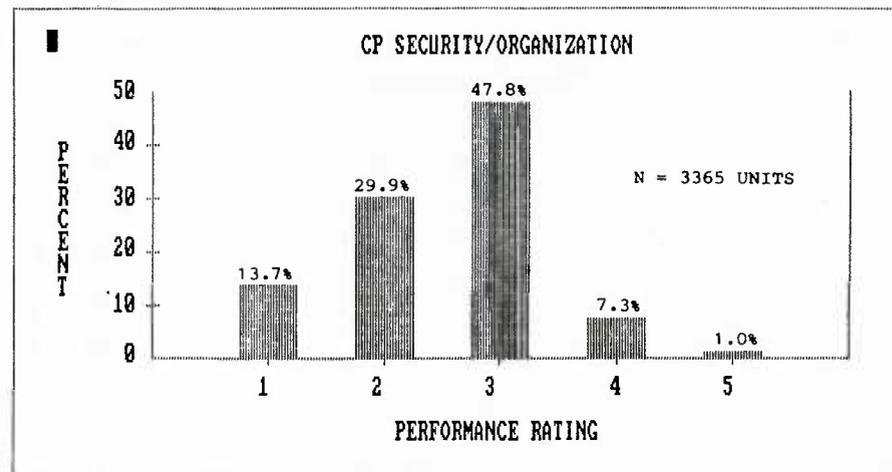
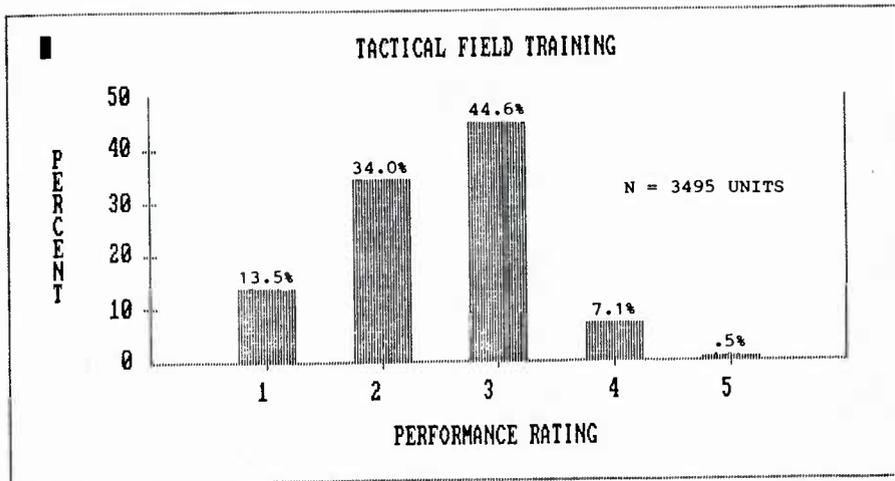
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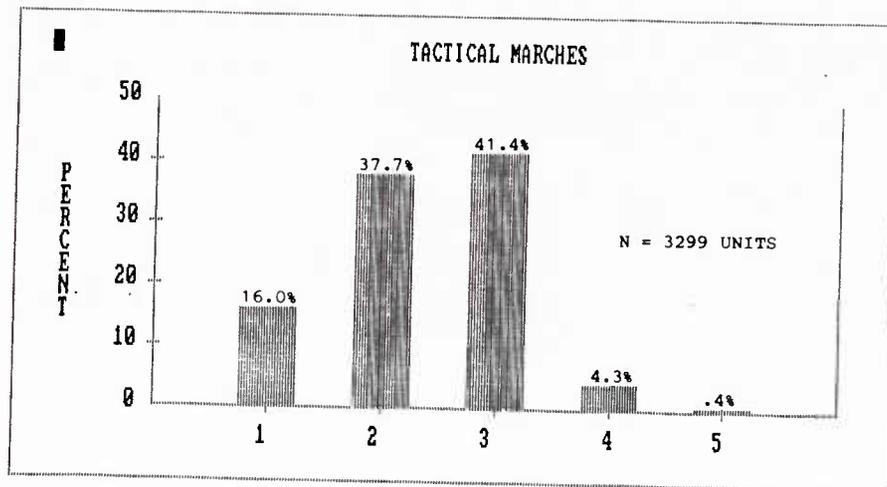
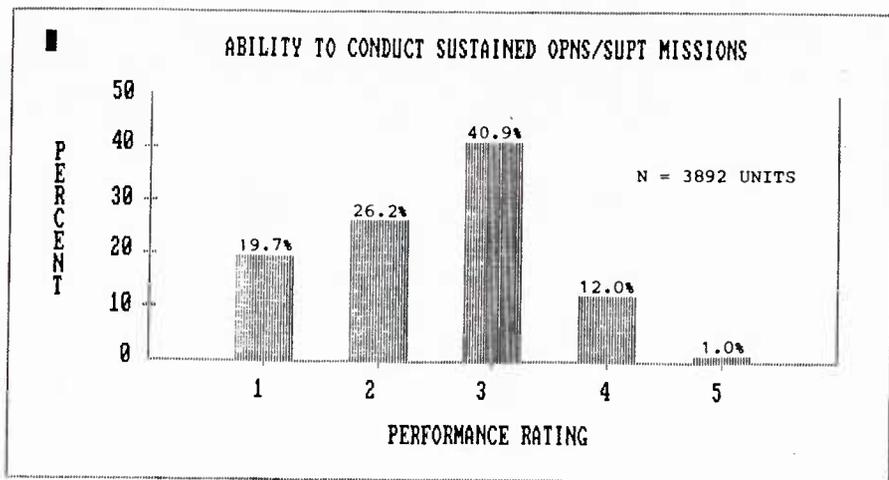
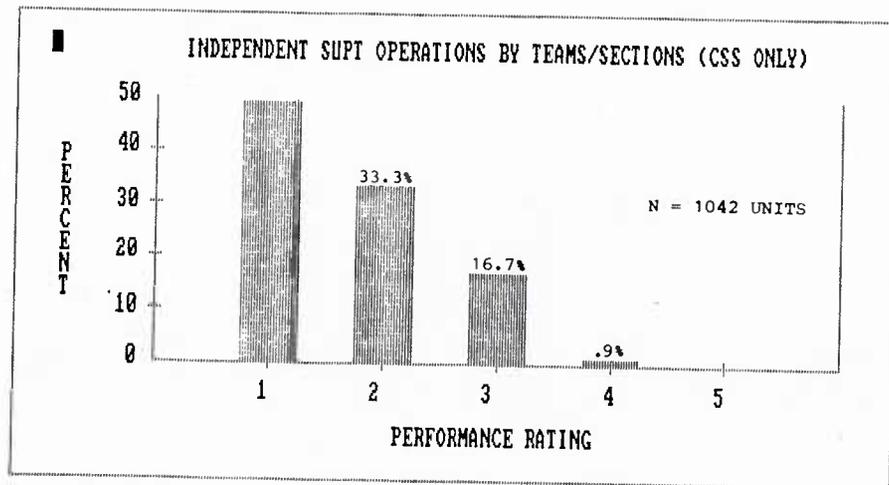
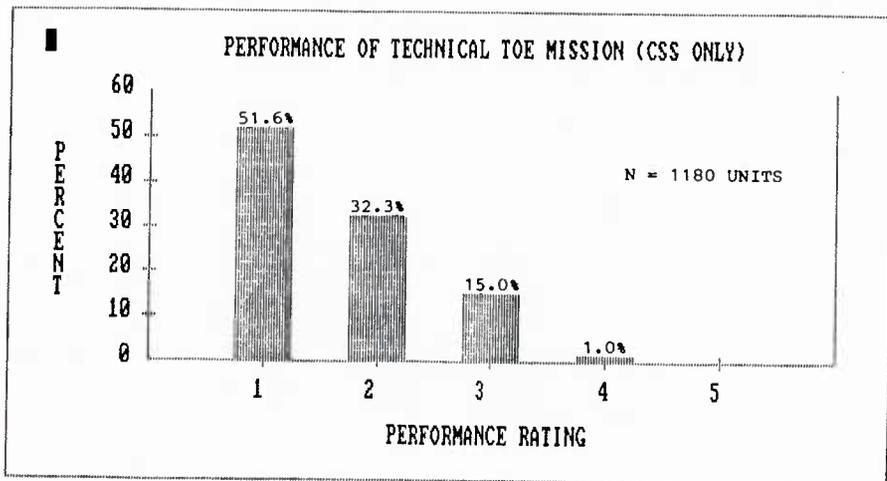
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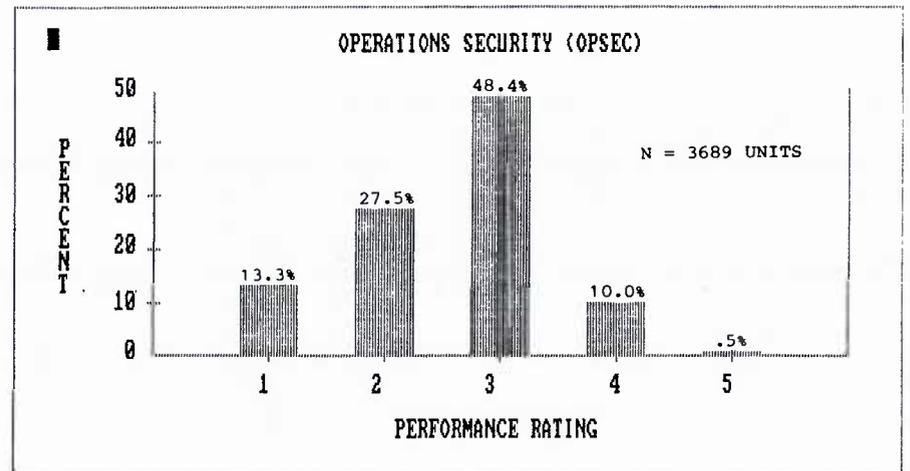
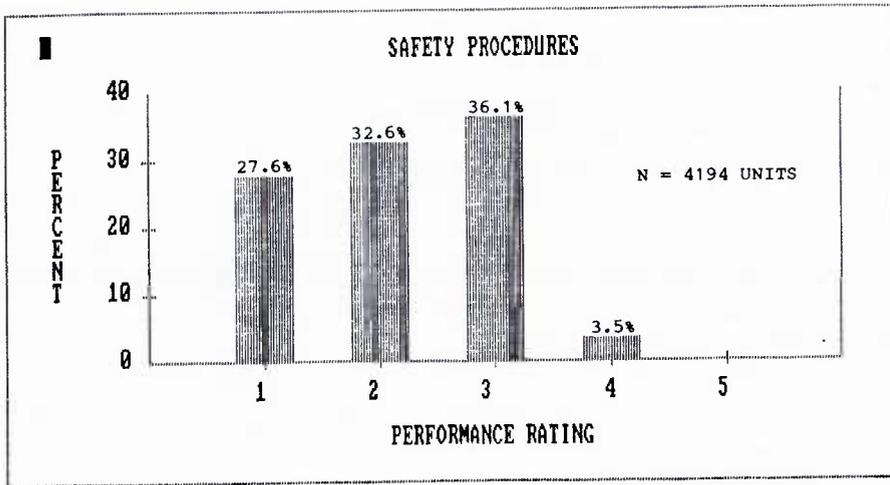
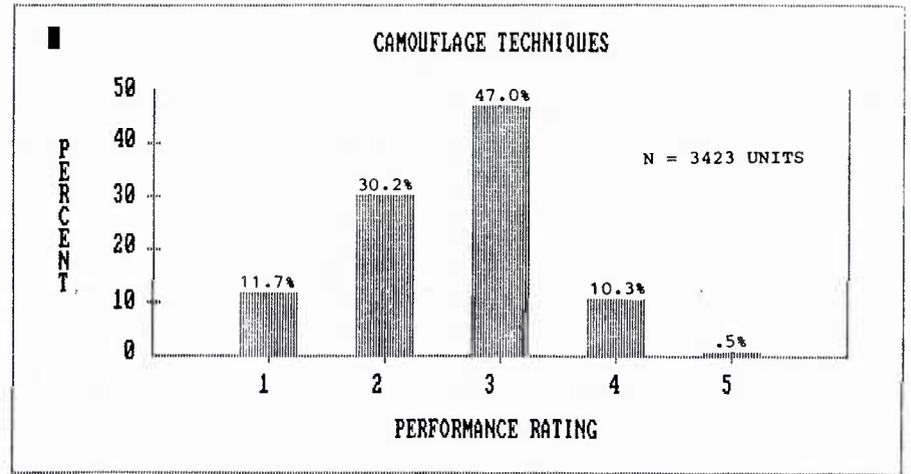
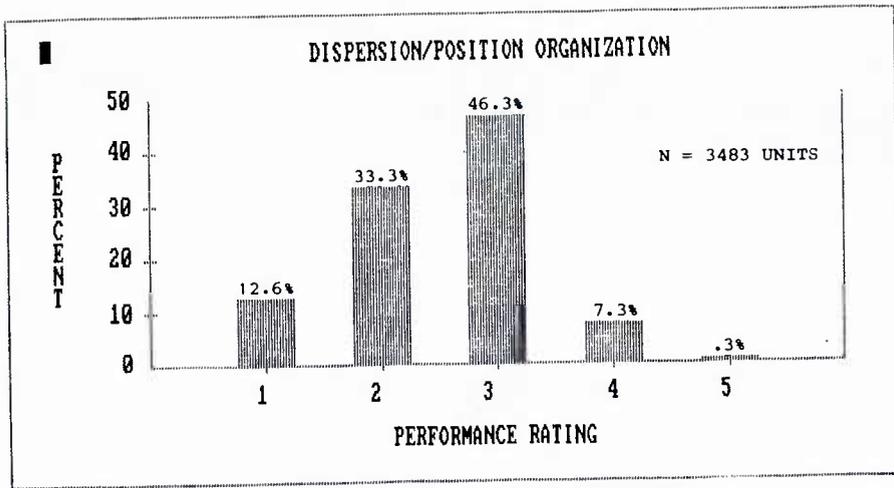
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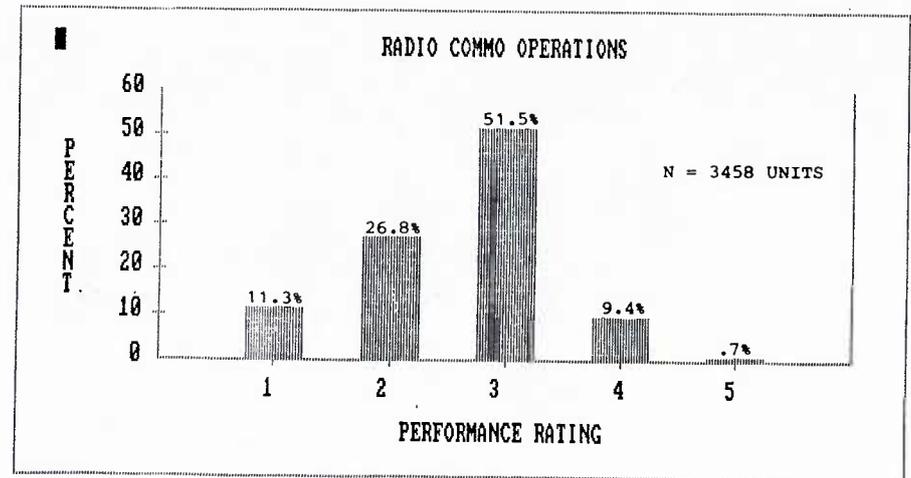
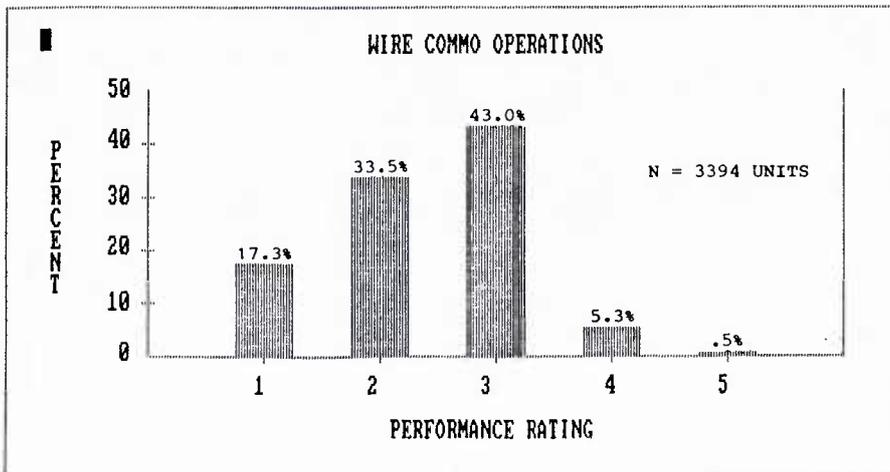
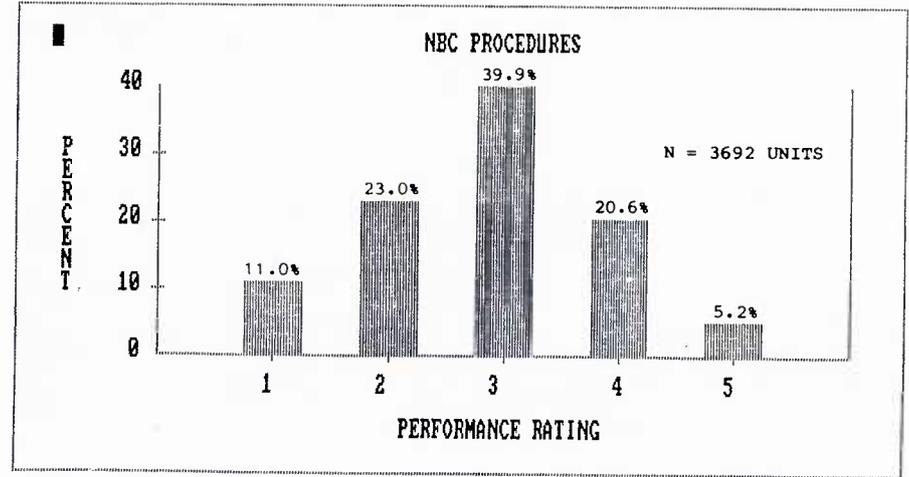
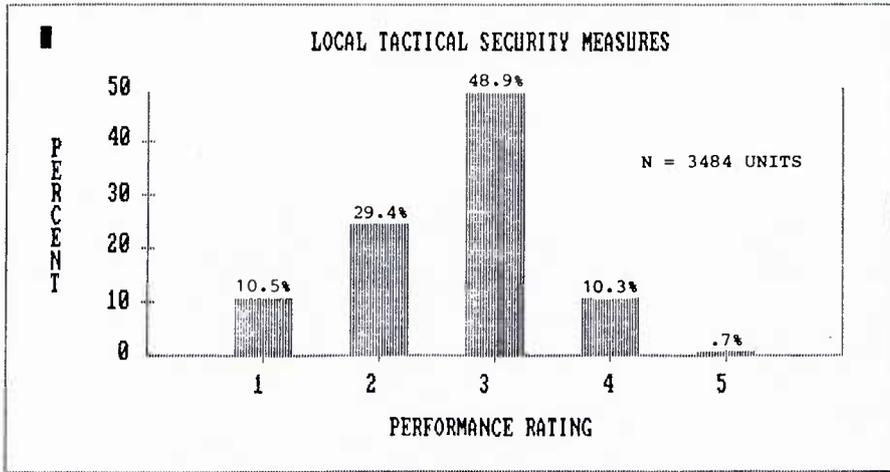
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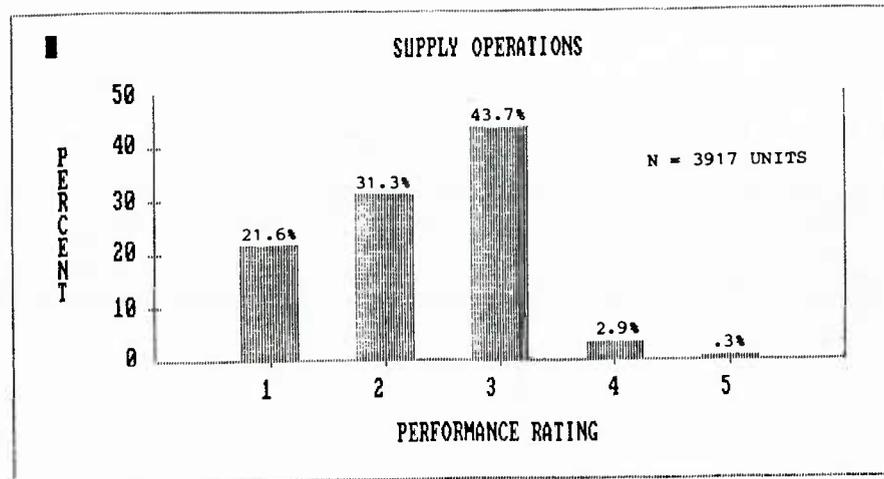
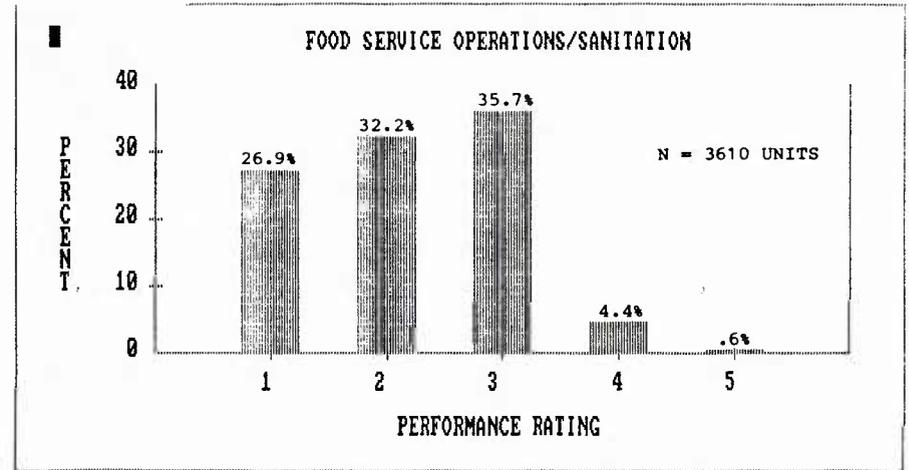
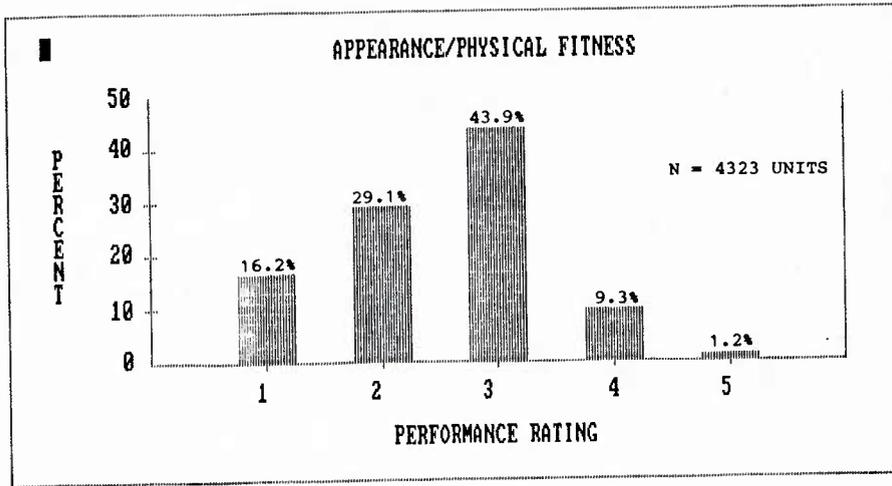
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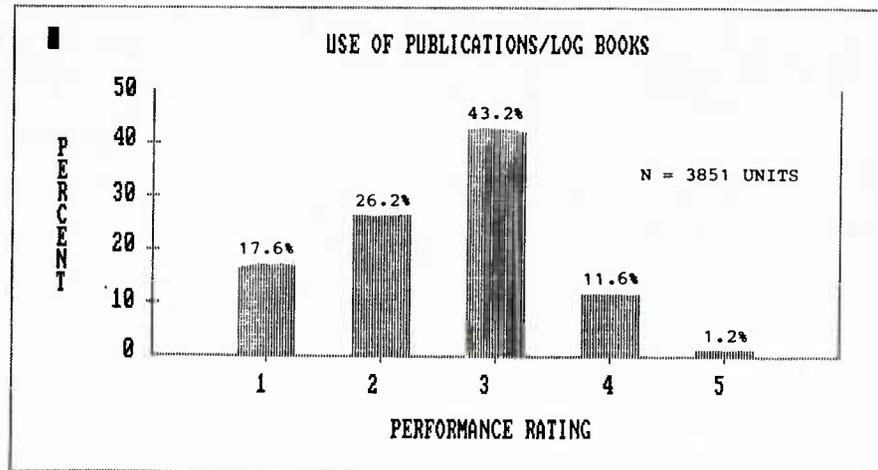
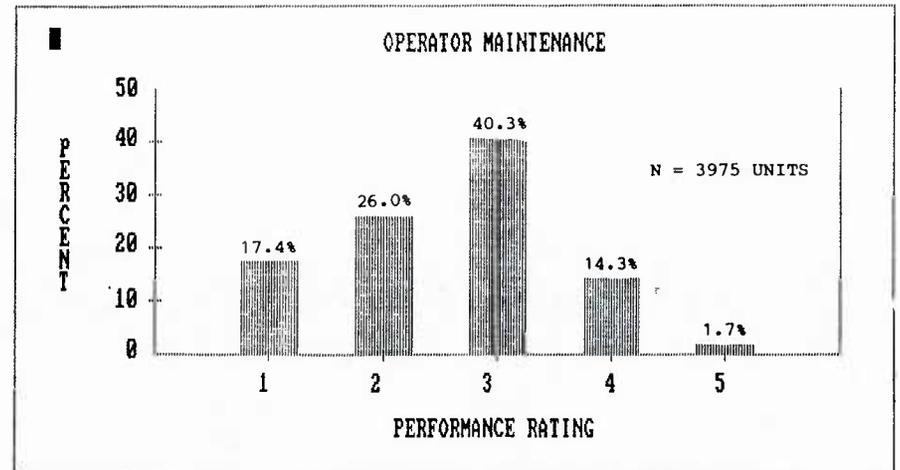
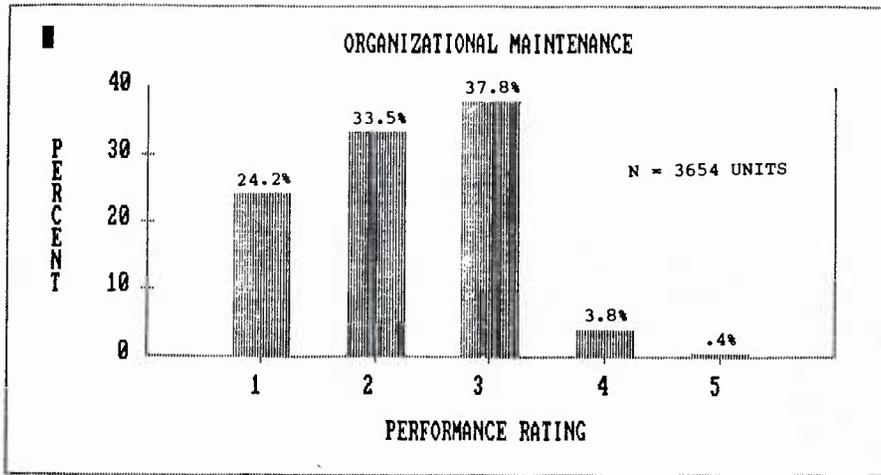
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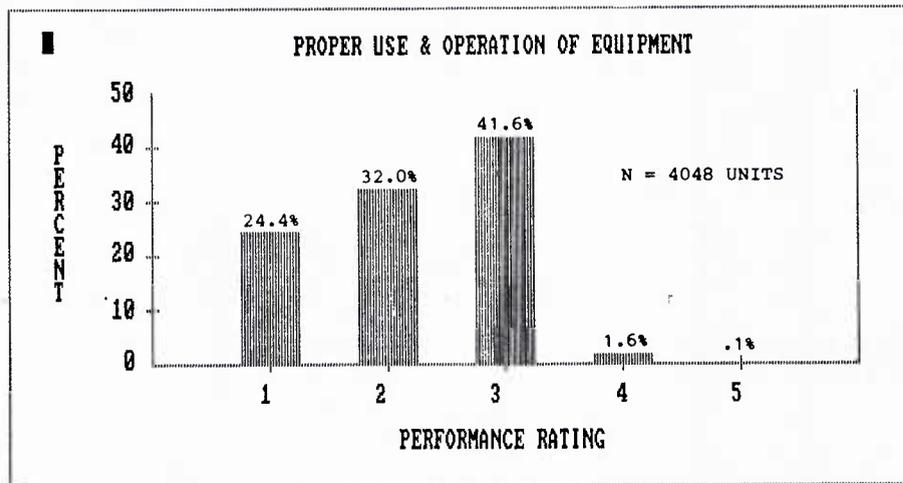
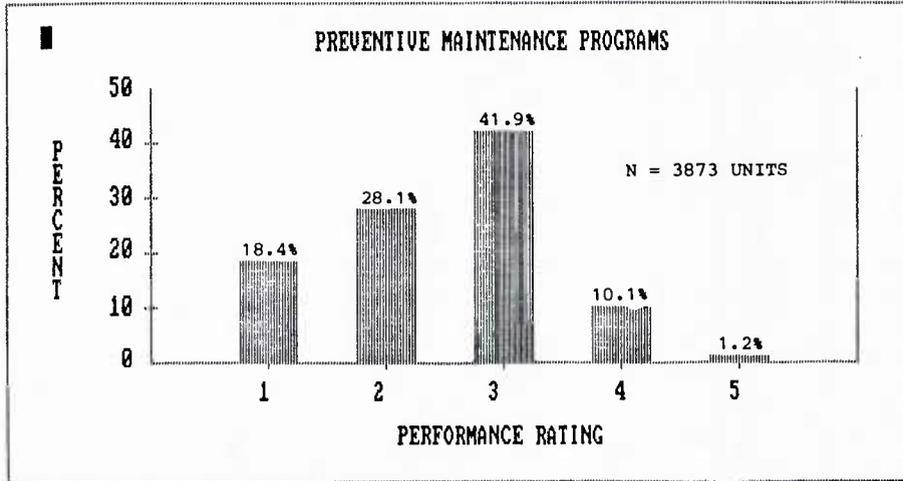
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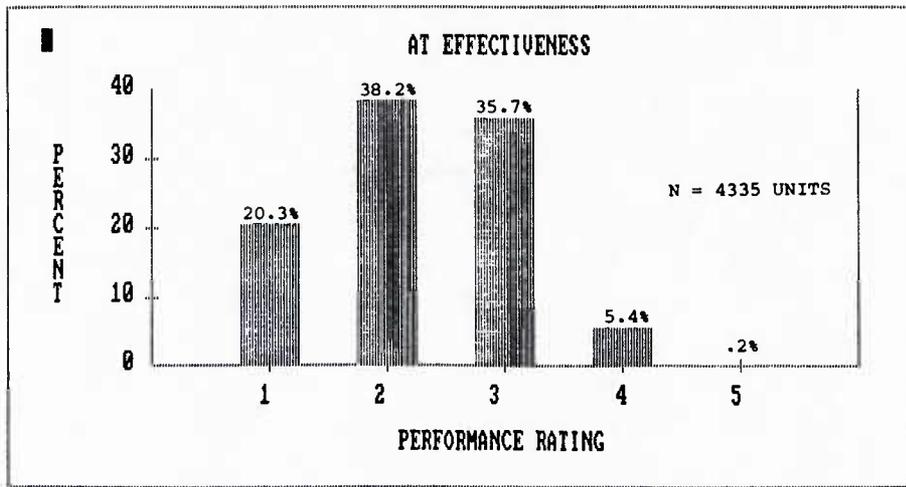
MAINTENANCE OPERATIONS



MAINTENANCE OPERATIONS



OVERALL PERFORMANCE



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