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**COMMAND VEHICLE CHOICE DURING FIELD
TRAINING EXERCISES: PROBLEMS
AND PROPOSED SOLUTIONS**

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and

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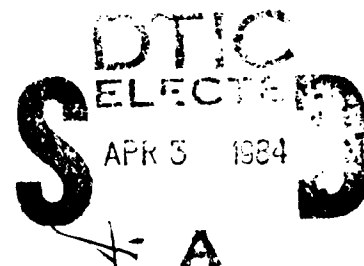
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doctrine related to command vehicle choice, and demonstrated that Armor officers acknowledge the necessity of training C³ functions in tanks. Officers surveyed responded favorably to suggested product improvements intended to facilitate C³ functions in the areas of communications, navigation, and workspace human factors.

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FOREWORD

The US Army Research Institute for the Behavioral and Social Sciences (ARI) conducted this research as a specific focus of work on training tactical leadership tasks for platoon and company commanders and in response to a request by the Assistant Commandant of the Armor School. Research described in this report was conducted in two phases. Phase I of the research investigated Armor commanders' use of their tanks during field training exercises, determined several reasons for commanders choosing to command from vehicles other than tanks during field exercises, and isolated specific problem areas in command, control, and communication (C³) when commanding from a tank. Phase II of the research focused on specific proposals for product improvements and procedural changes based on C³ problems that were isolated during Phase I. The results are particularly relevant for Armor battalion and brigade commanders, as well as for personnel involved in armored vehicle design and development of Armor doctrine.



EDGAR M. JOHNSON
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COMMAND VEHICLE CHOICE DURING FIELD TRAINING EXERCISES: PROBLEMS AND PROPOSED SOLUTIONS

EXECUTIVE SUMMARY

Requirement:

The Fort Knox Field Unit of ARI investigated company commanders' use of command vehicles during field training exercises. Because of the high lethality of the modern battlefield, company commanders must be able to command, control, and communicate effectively while having the protection afforded by a tank. The research was an extension of ongoing work at the Fort Knox Field Unit dealing with training of tactical leadership tasks and in response to a request by the Assistant Commandant of the Armor School, following reports of widespread failure of company commanders to use their tanks as command vehicles. The Assistant Commandant's office asked that ARI determine the extent of the problem, identify factors contributing to the problem, and investigate officers' attitudes toward various proposals for product improvements and procedural changes.

Procedure:

Phase I of the project began with interviews of personnel from the Command, Staff, and Doctrine Department of the Armor School, personnel from the MILES NET team, personnel from the Command and Staff Department of the Infantry School at Fort Benning, and personnel from the Combined Arms Center at Fort Leavenworth to determine their perception of factors influencing command vehicle choice. On the basis of factors surfacing during interviews, a questionnaire was constructed and administered to Armor and Armored Cavalry officers attending the Advanced Course at Fort Knox. Based on Phase I findings, personnel from the Armor School and ARI, Fort Knox proposed a series of product improvements and procedural changes to address the primary C³ problem areas in commanding from a tank. Phase II of the research included administration of a second questionnaire that assessed attitudes toward the proposed product improvements and procedural changes. As in Phase I, Armor and Armored Cavalry officers attending the AOAC course at Fort Knox responded to the questionnaire.

Findings:

Results of Phase I revealed widespread failure of Armor officers to use the M60 tank as a command vehicle during field training exercises. Map reading and navigation were indicated as the primary difficulties when commanding from a tank, as well as less important but nevertheless significant factors of space limitation inside the vehicle, communication problems, and mobility required for things such as returning to battalion headquarters for meetings. Another significant issue revealed by the results was a perceived lack of clarity of Armor doctrine or misunderstanding of Armor doctrine by approximately 38% of the Armor and Armored Cavalry officers responding. A factor further contributing to commanders' failure to use tanks as command vehicles may be an underestimation of the lethality of the modern battlefield by some officers, in that over 10% of those interviewed did not feel that it will be necessary to remain in an armored vehicle to survive in combat. One clear finding is Armor officers' acknowledgement that company commanders must spend training time in a tank (about five three-to-four

day exercises estimated to become proficient, and an estimate of four three-to-four day exercises per year to maintain proficiency). Phase II results centered primarily on acceptance of proposed product improvements in the areas of navigation, communication, and workspace and human factors. Only five out of the 19 proposed equipment modifications were not received favorably by significantly more than 50 percent of the officers receiving the questionnaire. The most favorably received product improvement proposal was for an electronic position locating system that would provide the tank's position in six-digit coordinates; over 85 percent of those surveyed felt it would be helpful. Officers' responses provided little insight into training procedures problems and solutions.

COMMAND VEHICLE CHOICE DURING FIELD TRAINING EXERCISES: PROBLEMS AND PROPOSED SOLUTIONS

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COMMAND VEHICLE CHOICE DURING FIELD TRAINING EXERCISES:
PROBLEMS AND PROPOSED SOLUTIONS

INTRODUCTION

The question of the vehicle from which company commanders should command has raised much controversy in the past, and continues to raise controversy today (cf. Mosher, 1981; Snedden, 1981; Marlin, 1982; and Borque, 1982). Although this question has several important facets, the central issue in the controversy over command vehicle choice concerns the role of the company commander. The Armor company commander's role falls somewhere along a continuum going from leader/fighter to planner/manager. If the company commander is primarily a leader/fighter, his command vehicle must not provide a distinctive silhouette, but must provide maximum protection, high mobility, and firepower equivalent to those in his command. If the company commander is primarily a planner/manager, his command vehicle must provide room to lay out maps and papers, flexible and reliable communications, and quick and easy access to his subordinates. While the ideal command vehicle would incorporate all of these features to fit different command styles and tactical situations, the vehicle characteristics needed are to some extent exclusive of one another. For example, an APC such as the M113 provides room to lay out maps and papers, but it lacks sufficient protection and firepower to engage in direct combat against tanks; a tank provides firepower and protection, but does not provide sufficient room to lay out maps and other papers, much less allow room for a commander to meet with his subordinates inside the vehicle. The limitations imposed by vehicles currently in the inventory demand a clear definition of the commander's role that swings either to one side of the leader vs. manager continuum or to the other.

Despite personal opinions and continuing controversy over the best choice of command vehicle, the Armor School has clearly defined the company commander's role and the command vehicle he is to choose. The company commander is to be a leader, located forward in his tank (Operational and Organizational Concept - Division 86 Tank Battalion, 1980; Assistant Commandant, USAARMS, personal communication, 1981; The Abrams Battalion: Division 86, Volume II, 1982). The potential of the Warsaw Pact and their allies in other areas of the world to deliver massive amounts of artillery, as well as nuclear, biological, and chemical munitions, and the expected density of direct fire of all sizes on the modern battlefield all demand that commanders remain in their tanks in any future conflict. Combat experience has convinced the Israeli Defense Forces (IDF) that their commanders must lead from their tanks (Spiller, personal communication, 1981; Wass de Czege, personal communication, 1981; Prosch, 1979) in Armor operations, even without NBC utilization. Current Armor doctrine, therefore, dictates that Armor commanders will be forward in their tanks.

Commanding from a tank, however, requires practice. Directing a company or battalion while controlling one's own vehicle and operating in the cramped turret of a tank requires experience that must be obtained before commanders enter combat. However, many observations and informal reports indicate that commanders do not always conduct or participate in field exercises from their tanks. Given the necessity of command and control training in tanks during field exercises, Phase I of this research was conducted to (a) document the extent to which company commanders command from their tanks during field exercises, (b) determine reasons why Armor commanders might not command from their

tanks, and (c) to suggest ways to improve C³ (command, control, and communication) performance from tanks. Phase II investigated the reactions of Armor and Armored Cavalry officers to several proposed product improvements and procedural changes intended to address the C³ problems emphasized by Phase I results.

PHASE I

Method

The experimenters conducted interviews with a number of personnel to obtain perspective on the problems associated with the use of various command vehicles during field exercises, and to determine factors contributing to decisions regarding command vehicle choice. At the beginning of the interview phase, the Assistant Commandant of the Armor School met with the experimenters and provided input concerning those factors he felt had an impact on command vehicle choice. These were:

1. Equipment characteristics, including communications equipment.
2. Doctrinal guidance, specifically with respect to clarity.
3. Psychological factors (such as comfort, visibility from a tank, ease of mounting and dismounting).

Following the interview with the Assistant Commandant, the investigators conducted interviews with personnel on the MILES NET team to determine what their experiences had been in observing field exercises, to determine their opinions of why officers might choose to command from some vehicle other than a tank, and to glean any information they might offer on possible solutions to the command vehicle choice problem if one exists. Based on these initial interviews, an interview protocol was constructed addressing all issues that surfaced. Appendix A contains a copy of the interview protocol. Formal interviews were conducted with personnel from the Command and Staff Department in the Infantry School at Fort Benning, and personnel from the Combined Arms Center at Fort Leavenworth. Interviewees generally agreed upon several issues that potentially impact upon command vehicle choice. These were:

1. Extent of the problem.
2. Knowledge of doctrine.
3. Equipment and communication features, including navigation equipment.
4. Environmental factors.
5. Administration and training management.

From the specific concerns in the above areas, a questionnaire was constructed and administered to students in the AOAC course at Fort Knox. Appendix B contains a copy of the resulting questionnaire.

Participants. Of the 122 AOAC students completing the questionnaire, 83 were Armor or Cavalry officers (60 Armor, 23 Cavalry). Data from these 83 officers were used in the analyses below. Not all officers responded to each question. The number of officers responding to a given question is shown in parentheses when fewer than 83.

The median age for the officers was 27.2 years ($N = 82$). They had come to the AOAC course from units in the US, Germany, Korea, Okinawa, and Puerto Rico. Seventy-seven of the 83 were Captains; the other six were First Lieutenants. Fifty-two of the officers (62.6%) had had at least one tour in Europe. Fifty-two officers ($N = 75$) had experienced at least one MILES or Realtrain tactical exercise. Those who had participated in tactical exercises had a median of 1.9 exercises. Seventy-three officers ($N = 82$) had been involved in at least one ARTEP and 76 were involved in at least one FTX. The median number of ARTEPs participated in was 3.1 for all officers (3.5 considering only those who had participated in ARTEPs) and the median number of FTXs was 8.3 (8.8 considering only those who had participated in FTXs). Only three officers had had any combat experience; their combined combat experience totaled 41 months.

Results and Discussion

Specific findings as a result of the questionnaire are listed below, by problem area.

Vehicle Use. The results confirmed the reports of widespread failure to use M60 tanks as command vehicles. Reports by personnel serving as company commanders, XO's, platoon leaders, and staff officers showed that a majority of them did not ever use an M60 tank as a command vehicle in either their last ARTEP or FTX. Information was not gathered about whether Cavalry officers were in units using APCs or tanks, so figures are shown separately in Table 1 for both Cavalry and tank units to avoid influence on Armor results by Cavalry officers with no tank experience. As one can see from Table 1, failure of officers to use tanks during field training exercises occurs in tank units and is not attributable solely to results from Cavalry officers. Furthermore, reported observations of command vehicle choice by company commanders paint a similarly dismal picture, as shown in Table 2.

Clearly, Armor commanders do not primarily use tanks as command vehicles during field exercises; the vehicle primarily used during field exercises is the M151 Jeep. The number of officers using the M151 during ARTEPs was greater than the number using any other vehicle ($p < .05$ for the comparison of M113 and M151 use, $p < .001$ for all other pairwise comparisons with the M151, by a series of pairwise sign tests). The same held true for FTXs, with the M151 preferred over all other vehicles ($p < .001$ for all comparisons again by a series of sign tests). These results can be seen in the tables of vehicle use for field exercises in Appendix C. The responses of those taking the questionnaire agree with the observations of those originally bringing attention to the problem, and are consistent with reports from the battalion level (Rowland, 1982) that commanders do not tend to conduct field exercises in their tanks.

Doctrine. One factor that may be partly responsible for the widespread use of M113s and M151s is an apparent misunderstanding of current Armor doctrine (BG Ballantyne, Personal Communication) by many Armor officers. Table 3 shows that only 61.7% of the officers chose the correct statement of Armor doctrine, while 21% responded in one of the three categories stressing CO

TABLE 1. PERCENT OF ARMOR OFFICERS WHO NEVER USED M60 THEMSELVES

		<u>Cav Units</u>					
		<u>Position</u>					
Exercise		CO	XO	Plt Ldr	Staff	Number Not Responding	Total
Last ARTEP							
Percent		100.0	100.0	50.0	85.7		
Number of Officers in Each Position		(1)	(7)	(6)	(7)	(2)	(23)
Last FTX							
Percent		100.0	100.0	75.0	83.3		
Number of Officers in Each Position		(2)	(7)	(4)	(6)	(4)	(23)
		<u>Tank Units</u>					
		<u>Position</u>					
Exercise		CO	XO	Plt Ldr	Staff	Number Not Responding	Total
Last ARTEP							
Percent		33.3	86.7	87.5	100.0		
Number of Officers in Each Position		(3)	(15)	(24)	(8)	(10)	(60)
Last FTX							
Percent		50.0	90.0	62.5	100.0		
Number of Officers in Each Position		(2)	(20)	(16)	(17)	(5)	(60)

TABLE 2. PERCENT OF ARMOR OFFICERS REPORTING THEY NEVER OBSERVED
COs IN AN M60 TANK DURING FIELD EXERCISES

	<u>First Unit Officer Assigned To</u>	<u>Company</u>		<u>Battalion</u>	
		<u>ARTEP</u>	<u>FTX</u>	<u>ARTEP</u>	<u>FTX</u>
Percent of COs Not Using an M60	72.2	37.8	60.0	40.8	47.4
(Number Responding)	(79)	(74)	(75)	(71)	(76)

TABLE 3. PERCEPTIONS OF CURRENT ARMOR DOCTRINE

	Percent of 81 AOAC Students Responding	
Armor Company Commanders Will Be -		
Forward in a tank when commanding	61.7	
Forward in an APC when commanding	1.2	
— — — —		
Forward in a tank in heavy combat, an APC during lulls or when operating on a broad front, and using a jeep for rapid transportation	(13.6)	
Flexible depending on situation	(6.2)	21.0
Forward in vehicle of choice	(1.2)	
— — — —		
Doctrine does not specify or is unclear	16.1	

flexibility and 16.1% said that current doctrine does not specify or is unclear. Of those stressing CO flexibility, the majority chose the category of being forward in a tank in heavy combat, in an APC during lulls or when operating on a broad front, and using a jeep for rapid transportation -- the doctrinal statement for battalion, not company commanders according to FM 71-1. FM 71-1 contains no such single clear statement of command vehicle choice and position for company commanders. TRADOC Pamphlet 525-4 (Dec 1980) does not specify the location and command vehicle to be used by the company commander, but states on p. 13:

"The company commander commands his company from the location at which he can best assess and influence the battle. This is normally done mounted in a combat vehicle." (Author's emphasis)

Such a statement seems to imply flexibility in command vehicle choice. However, the Operational and Organizational Concept-Division 86 Tank Battalion states the following on p. 10:

"The duration and pace of operations and the difficulty of communications dictate that the company commander be primarily a leader. He must be well forward in his tank both to see and to communicate with his platoons . . .

To survive the company commander must be mounted in a tank. This will not be convenient in view of the constricted space in the tank turret. Nevertheless, it is an absolute necessity, and commanders must train in peacetime to be able to cope with this constraint in wartime."

Given the conflicting doctrinal guidance described above with respect to command vehicle choice, perhaps the diversity of doctrinal perceptions is understandable.

In line with this uncertainty about doctrine, either some Armor officers interviewed seem to underestimate the potential lethality of the modern battlefield or most discussions of the modern battlefield in Army publications tend to overemphasize it. Specifically, 87.8% (72 out of 82 responding) agreed that company commanders must remain in their armored vehicles to survive during combat. Only 34.6% (28 out of 81 responding) agreed that in any future war company commanders must remain in their armored vehicles even when traveling in rear areas. On this particular item, a sign test showed no significant difference between the number of officers agreeing and disagreeing; a large number of officers remained neutral. Perceptions of the lethality of the battlefield almost certainly influence commanders' willingness to command from an armored vehicle. Given Soviet capability for an airborne assault on rear areas, the Soviet emphasis on breakthrough of front-line defenses and the perceived fluidity of the modern battlefield, our troops may need the protection provided by armored vehicles even in rear areas (see Frazier, 1979).

Questionnaire results indicated two factors related to the lethality of the battlefield that may impact on C³ performance. These were confidence in second in command and the amount of personal involvement in combat by company commanders. Thirty-five out of 82 officers (42.7%) agreed that confidence in the second in command influences a commander's willingness to be forward in his fighting vehicle. Twenty (24.4%) felt that confidence in the second in command has no impact; 27 were neutral. The number of officers agreeing that confidence in second in command exerts an influence on a commander's willingness to be forward in his fighting vehicle significantly exceeded the number of those who felt it did not, beyond the five percent confidence level ($p < .05$ by a normal approximation to the binomial).

Regarding personal involvement in combat, the majority (58%) of officers agreed that company commanders will become personally involved in combat at least half the time. Only 3.7% felt that becoming personally involved in combat would not hinder the commander's ability to command. This proportion demonstrates the clear consensus that having to fight reduces the commander's ability to manage his men during a battle.

Workspace and Station Factors. The problem of space to lay out maps, CEOI (Communications-Electronics Operation Instructions), etc., was listed as the factor that interfered the most with commanding from an M60 tank by 71.2% of the 80 Armor officers responding. An additional 20% listed it as the second or third greatest problem interfering with command and control. The data shown in Appendix D support this conclusion, in that few officers preferred reading maps in an M60. One aspect of the problem of space is the limited space in the commander's hatch. Space in the commander's hatch was listed as one of the three greatest problems by 41.2% of those responding, and was the problem ranking second to that of space to lay out maps, CEOI, etc. As one can readily see from the data in Appendix D, however, room to lay out maps, etc., was indicated as a problem by a much higher proportion of officers than the second greatest problem.

Enlarging the work space available for the company commander is impractical, if not impossible for existing tanks. However, the problem of map handling, and navigation in general, seems to be one area that holds a great deal of potential for future improvements. Currently, folding the map seems to be the primary means for reducing the amount of space required for map reading, as shown in Table 4.

TABLE 4. TECHNIQUE USED WITH MAPS

PERCENT OF 82
AOAC STUDENTS

25.9	Making A Map Book
31.7	Installing A Map Board
67.1	Folding Map In A Specific Way
2.4	Having Loader Handle Map
7.3	Other (Variants Of Map Case, Board, Book)

Other work station factors such as internal lighting, noise level, .50 cal position, sight configuration, and night and day visibility were not considered by most officers to interfere with C³ from the M60. Each of these factors was listed as first, second, or third most interfering with command from an M60 by fewer than 10% of the Armor officers. Only 20% of the officers reported that the extent to which a commander can rest on road marches influences command vehicle choice.

Personnel interviewed indicated a problem with wearing webgear in the TC's station. Fifty out of 81 respondents (61.7%) responded that wearing webgear in the commander's station is dangerous, and only 7.4% felt it is easy to adapt to wearing webgear in the TC's station. Fifty-four respondents made suggestions to reduce the problems with wearing webgear while commanding, as shown in Table 5.

TABLE 5. SUGGESTIONS FOR WEARING WEBGEAR IN TC's STATION

PERCENT OF 54 AOAC STUDENTS RESPONDING	NUMBER OF RESPONDENTS SUGGESTING EACH FACTOR
46.3	Don't wear
18.5	Redesign tank (change cupola, remove sights, or just redesign)
16.7	Reduce items carried or redesign webgear
11.1	Develop tanker's uniform with pockets
3.7	Provide place to store webgear
1.8	Practice
1.8	Loosen webgear for comfort

Communications. Over one-fourth of the officers (26.3%) listed "radio equipment, including the intercom" as one of the three factors interfering the most with C³ from an M60. A number of officers felt that the position of the radio in an M60 interfered with C³; 15% indicated it was either the second or third most interfering aspect of attempting to command from an M60.

The number of radios available to the company commander concerned many of the personnel interviewed. Fifty-two out of 82 (63.4%) felt that a company commander's vehicle needs at least three radios. This requirement seems to be directly opposed to the major problem of a lack of space in the TC's station. One proposed solution to be addressed in a second research effort, is to modify the communications system to be like that in Army aircraft. In aircraft, crewmen can opt to monitor one or more of several preset nets through a series of toggle switches; by setting different toggle switches a crewman can monitor any net or any combinations of nets desired. Such a configuration in tanks would greatly facilitate Armor communications without the liability of handling several microphones or being concerned with several sets of radio controls at the same time.

As a related concern, a number of officers commented that it is difficult to monitor both company and battalion nets in a tank. Since it is critical for a company commander to monitor company and battalion nets, Appendix E shows officers' responses to the relative ease of monitoring nets from an M60, an M113, and a jeep. Appendix E also contains specific reasons given by officers for preferring each vehicle in pairwise comparisons, and officers' preferences in communicating from different vehicles in several different situations.

It appears that contributions could be made in C³ performance in the area of communications equipment. However, one must keep in mind that this problem is not nearly as significant in the minds of Armor officers as the problem with space to lay out maps and other papers.

Environmental Factors. Fifty-two out of 82 (63.4%) Armor officers felt that terrain is one of the main considerations in choosing a command vehicle during field exercises. Under the inclement weather and rugged terrain conditions listed in Table 6, the M113 seemed to be the preferred command vehicle.

TABLE 6. PERCENTAGES OF OFFICERS PREFERRING EACH VEHICLE UNDER THE FOLLOWING TERRAIN AND WEATHER FACTORS

	<u>M60</u>	<u>M113</u>	<u>M577</u>	<u>M151</u>	<u>No Difference</u>
Desert, offense	40.3	48.1	6.5	3.9	1.3
Desert, defense	48.1	39.1	7.8	2.6	2.6
Mountain, offense	2.5	65.8	2.5	26.6	2.5
Mountain, defense	4.4	60.8	2.5	24.1	1.3
Rain, offense	8.6	43.2	16.0	18.5	13.6
Rain, defense	12.3	38.3	18.5	19.8	11.1
Snow, offense	19.5	60.0	7.5	11.2	3.8
Snow, defense	20.3	58.2	8.9	8.9	3.8

A-Friedman analysis of variance for ranks showed that the four vehicles plus the response of "no difference" were unequally ranked over all the weather and terrain conditions listed, while pairwise sign tests showed the M113 to be preferred over all other response categories ($p < .05$ in all cases). However, there is no clear second choice under all conditions.

As one would expect, officers expressed no single vehicle preference for hot and cold temperatures, as can be seen in Table 7. The jeep was clearly indicated as coolest in summer, but also the least warm in the winter. The information in Table 7, however, is moot in that external temperature was not indicated as an important factor in command vehicle choice; 77.5% of the officers responding indicated that temperature in an M60 does not interfere with C³ functions.

TABLE 7. PERCENTAGES OF OFFICERS PREFERRING
EACH VEHICLE FOR THE FOLLOWING
TEMPERATURE CONDITIONS

	<u>M60</u>	<u>M113</u>	<u>M577</u>	<u>M151</u>
Warm in winter	31.3	38.7	20.0	10.0
Cool in summer	1.2	3.7	4.9	90.1

Administration and Training Management. In contrast with the actual use of vehicles, most officers agreed that experience in commanding from a tank is necessary. One can reasonably assume that this indicates a need for experience in a tank in almost any command or staff capacity. Officers estimated that a median of about five three- to four-day exercises are needed for a company commander to become proficient in commanding from a tank. The officers also estimated the number of three- to four-day exercises required each year for company commanders to maintain proficiency in commanding from tanks; the median estimate was approximately four. It is clear from these responses as well as from the complexity of the commander's job that a good deal of training time must be spent in the tank, and it is also clear that Armor officers are well aware of the necessity of experience in a tank. Interviews conducted early in this work indicated that some battalion commanders have addressed this problem by ordering company commanders to operate from their tanks during field exercises; clearly, command emphasis would result in an increased use of tanks as command vehicles.

Nearly half (48.8%) of the officers responding agreed that company commanders should command from their tanks during exercises to better appreciate the limits of the tanks and the men in them; a lower proportion (34.1%) disagreed, while the remainder (17.1%) were neutral. The proportions agreeing and disagreeing differed significantly at the 95% confidence level by a normal approximation to the binomial. An additional reason for conducting training with the commander in the tank is to assure that the commander and the crew of his tank can function as a unit. Only 23.2% of the officers felt that it is all right for a CO to attach his crew to a platoon for training rather than training with them, while a significantly higher proportion (53.7%) of the officers felt the commander must train with his crew; the remaining 23.1% were neutral. The difference in the proportions for and against attaching the CO's crew to a platoon differed significantly beyond the 99% confidence level by a normal approximation to the binomial.

Slightly over sixty percent of the officers agreed that training management and evaluation is one of the main considerations in choosing a command vehicle. Primary concerns in training evaluation and management are factors such as visibility and speed in getting from one unit to another, as well as speed in returning to battalion headquarters. (Speed of returning to battalion headquarters was listed as a main consideration in choosing a command vehicle for field exercises by 69.5% of the officers responding.) The percent of officers preferring each vehicle for training management and evaluation and the percent of officers preferring each vehicle for access to headquarters are shown in Table 8.

TABLE 8. PERCENT OF OFFICERS PREFERRING EACH VEHICLE

	<u>M60</u>	<u>M113</u>	<u>M577</u>	<u>M151</u>	No <u>Difference</u>
Day Training	3.9	23.4	1.3	71.4	0.0
Night Training	7.7	29.5	0.0	60.3	2.6
Access to HQ	1.3	10.4	0.0	88.3	---

Considering the importance of experience in commanding from a tank, and the option battalion commanders have of simply ordering all officers in their command to operate from tanks in field exercises, officers were asked how they would feel about an order that would force all company commanders to command from their tanks during all field exercises. Responses were split; 43.6% felt it would be good and 42.3% felt it would be bad. The remaining officers were neutral. The proportions for and against such an order do not differ significantly by a normal approximation to the binomial. Appendix F shows the reasons given for and against issuing such an order. One must bear in mind that the percentages do not necessarily sum to 100% within each group, because each officer was free to provide multiple reasons for his preference.

As an additional item of interest, 50% of the officers who had participated in computer-assisted C³ exercises or other simulations felt they were helpful. Given the need for in-tank C³ experience, and the tremendous financial and time costs such experience would incur, serious consideration should be given to developing more realistic C³ simulations for company commanders.

Conclusions

Although this research pointed out some significant problems in the areas of map reading and communications, perhaps the greatest contribution made was in verifying that a problem does indeed exist in that relatively few Armor officers direct field exercises from their tanks even though they clearly recognize the necessity of training C³ from tanks. It is very likely that inconsistent or unclear doctrinal statements in Army literature are responsible for part of the problem in command vehicle choice, and a cavalier attitude toward the lethality of the modern battlefield by some officers may impact on vehicle choice during field exercises. However, it is also possible that actual vehicle use during exercises is influenced by a number of factors that are inconveniences when considered separately, but that collectively make it difficult to use a tank as a command vehicle during field exercises. The current attitude reflected by figures on actual vehicle use seems to be one of avoiding training rather than increased training emphasis, which one would expect on critical tasks that are high in difficulty.

Phase I results further indicated that C³ from a tank poses particular problems in the areas of workspace and human factors, navigation, and communication, and that problems may exist in administrative procedures, such as CO commanders returning to battalion headquarters for meetings. Results showed

that Armor and Armored Cavalry officers recognize the need for C³ training in the tank and that, while they acknowledge that a good deal of time must be spent commanding from a tank to be prepared for combat (approximately four days every three to four months on the average), most officers do not receive the opportunity for this amount of training.

If Armor company commanders are to survive in combat, command emphasis must be placed on training in the tank during field exercises. In addition to command emphasis on training and fighting in the tank, company commanders must receive as much aid as possible to facilitate C³ from a tank. This aid must not be provided simply to make training in the tank more palatable in peacetime, but to enhance commander's effectiveness and efficiency in C³ functions. Product improvements to facilitate C³ functions will be essential in combat, and will provide the benefit of enhancing effectiveness and safety of field training exercises. Phase II of this research investigated officers' attitudes toward several such proposed product improvements.

PHASE II

Method

To facilitate C³ functions, a series of equipment innovations and procedural changes were suggested through the combined efforts of the Assistant Commandant of the Armor School, several research psychologists at ARI-Fort Knox, and personnel from the Armor School. Appendix G contains a questionnaire that was generated, based on the proposed equipment innovations and procedural changes.

Participants.

The questionnaire was administered to 122 Armor and 32 Armored Cavalry officers in two Armor Officer Advanced Course (AOAC) classes at Fort Knox. Nineteen of the 154 officers were First Lieutenants, and the remaining 133 were Captains.

Results and Discussion

The proposed product improvement that received the most favorable responses was an electronic position locating system that would provide the tank's position in six-digit coordinates. Over seventy percent (72.7%) of all officers receiving the questionnaire indicated that such a system would help a company commander in his C³ functions a great deal, while only 14.2 percent felt it would not help or would actually hinder commanders; the remainder felt it would only be slightly helpful. This finding points to the same kind of navigation problem reflected by Phase I of this research, (i.e., that map reading is a major problem in commanding from a tank).

In addition to this primary finding, several other proposed product improvements were extremely well received by those completing the questionnaire. Proposed product improvements fell into the areas of (1) communication, (2) navigation, and (3) workspace and human factors. These areas will be discussed in turn.

Communications.

Proposed communications equipment innovations are listed below, in the order in which they appeared on the questionnaire:

- a. A series of toggle switches, with one for each of several radio nets (battalion, company, platoon, intercom) that would allow the CO to monitor and transmit on any one net or any combination of nets at a given time. Each toggle switch would turn a given net on or off.
- b. A series of toggle switches as described above, plus an extra switch so the CO can monitor or transmit on any other frequency he chooses.

- c. A series of volume controls next to the toggle switches as described above, to allow the CO to monitor one primary net at a given volume and one or more other nets at a lower volume.
- d. A visual indicator above each toggle switch, such as a light or a meter, that would indicate to the CO when a message is coming in over each individual net, intended to help in discriminating among nets.
- e. Placing the TC's radio transmission switch on the TC's override or some other position rather than on the CVC helmet.
- f. A computerized display to provide CEOI information.
- g. A small pocket card containing CEOI information rather than having it in a book.

Table 9 orders the seven proposed communications equipment innovations from the innovation indicated to be helpful by the highest percentage of officers to the innovation indicated to be helpful by the lowest percentage of officers. As one can see, a majority of officers sampled responded favorably to all proposed improvements with the exception of a suggestion to move the TC's radio transmission switch; 50 percent felt it would help either a lot or a little, while 50 percent were neutral or expressed an unfavorable opinion. All of the other proposed communications innovations produced a number of favorable responses that differed significantly from 50 percent beyond the one percent confidence level, except for the CEOI display, which produced a number of favorable responses that differed significantly from 50 percent beyond the five percent confidence level.

Table 10 shows the responses to the communications innovations separately for Armor and Armored Cavalry personnel. The only difference between Armor and Armored Cavalry personnel with respect to number of favorable responses (combining both "help a lot" and "help a little" responses) was on the issue of moving the TC's radio transmission switch. The proportion of Armored Cavalry personnel that favored moving the TC's radio transmission switch significantly exceeded the proportion of Armor personnel in favor of moving it. This difference reached significance beyond the five percent confidence level by a test for significance of difference between two proportions (Bruning and Kintz, 1968, p. 199). However, since this suggestion received so little support, any differences do not warrant further discussion.

In addition to indicating the extent to which each innovation would be helpful in C³ from a tank, officers were asked which of the items they would install on a tank and why they would install them. Reasons given by the officers surveyed for installing each of the proposed radio control innovations (items a-e above), various combinations of innovations, or none of the innovations are provided in Appendix H. (Note that the number of soldiers making all suggestions sums to more than 154, since each officer could provide more than one reason for a given choice.) Over half of the reasons given for

TABLE 9
PERCENTAGE OF OFFICERS
RESPONDING IN EACH CATEGORY

	COMMO		
	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE
TOGGLE SWITCHES FOR NET MONITORING	61.7	18.1	20.1
VISUAL INDICATORS FOR EACH NET	57.1	21.4	21.4
CEOI POCKET CARD	46.8	28.6	24.6
TOGGLE SWITCH FOR AN EXTRA NET	52.6	22.1	25.2
SEPARATE VOLUME CONTROLS - EACH NET	48.7	24.7	26.6
CEOI DISPLAY	37.0	20.1	42.8
Merge TC TRANSMIT SWITCH	29.2	20.8	50.0

TABLE 10

PERCENTAGE OF OFFICERS
RESPONDING IN EACH CATEGORY

	COMMO				ARMOR				ARMORED CAV			
	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE
TOGGLE SWITCHES FOR NET MONITORING	60.7	18.0	21.3	65.6	18.8	15.6						
VISUAL INDICATORS FOR EACH NET	55.7	22.1	22.1	62.5	18.8	18.8						
CEOI POCKET CARD	45.1	30.3	24.6	53.1	21.9	25.0						
TOGGLE SWITCH FOR AN EXTRA NET	52.5	21.3	26.2	53.1	25.0	21.9						
SEPARATE VOLUME CONTROLS - EACH NET	48.4	23.8	27.9	50.0	28.1	21.9						
CEOI DISPLAY	34.4	22.1	43.4	46.9	12.5	40.6						
MOVE TC TRANSMIT SWITCH	28.7	18.9	52.5	31.3	28.1	40.6						

installing the toggle switch commo system fall into the three main areas of speed/convenience in switching nets, accessibility of commo controls, and to ease monitoring of multiple nets.

Appendixes I-K contain other responses to questions regarding communications equipment modifications. Appendix I contains ideas from a free-response question asking ways to improve radio and intercom controls. Although many officers made no suggestions, it is clear that many of those responding desired more flexibility of some form or another in communications. Appendix J contains suggested positions for moving the TC's radio transmission switch; several officers specifically answered that it should not be moved, while several others suggested moving it into the cupola. Human factors research must be conducted to evaluate the most efficient location if it is to be moved, however, a majority of officers did not favor moving it, as stated earlier. Appendix K contains ideas to help COs use the CEOI more effectively. As one can see, few suggestions were made in this area.

Navigation.

Proposed innovations for aiding navigation are listed below, in the order in which they appeared on the questionnaire:

- a. An electronic heading reference system display at the TC station to tell which direction the tank is moving.
- b. An electronic position locating system display in six-digit coordinates to tell the tank's position.
- c. Small maps with a magnification device for reading them; the magnifier's display could be set up to accept acetate overlays.
- d. A thumb-indexed map book.
- e. An electronic map display.
- f. A map folding aid and map holder.

Table 11 shows the six proposed navigation innovations, ordered from the innovation indicated to be helpful by the highest percentage of officers to the innovation indicated to be helpful by the lowest percentage of officers. All but the last two of the proposed navigation innovations in Table 11 produced a number of favorable responses that were significantly greater than 50 percent (beyond the one percent confidence level).

Table 12 shows the same information presented in Table 11, but broken down by Armor and Armored Cavalry officers. The overall proportions of favorable responses for Armor and Armored Cavalry personnel differed significantly on three proposed modifications. Armored Cavalry personnel received the ideas of an electronic heading reference system, map folder and holder, and small maps with a magnification device more favorably than Armor personnel (beyond the one percent confidence level for all three).

TABLE 11
PERCENTAGE OF OFFICERS
RESPONDING IN EACH CATEGORY

	NAVIGATION		
	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE
SIX-DIGIT POSITION LOCATING SYSTEM	72.7	13.0	14.2
ELECTRONIC HEADING REFERENCE SYSTEM	48.7	27.3	24.0
MAP BOOK	37.0	35.1	27.9
MAP FOLDER AND HOLDER	35.1	31.8	33.1
SMALL MAPS WITH MAGNIFIER	20.8	15.6	63.5
ELECTRONIC MAP DISPLAY	17.5	17.5	64.9

TABLE 12
PERCENTAGE OF OFFICERS
RESPONDING IN EACH CATEGORY

	NAVIGATION				ARMORED CAV			
	ARMOR		NAVIGATION		ARMOR		ARMORED CAV	
	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE		
SIX-DIGIT POSITION LOCATING SYSTEM	73.8	13.1	13.1	68.8	12.5	18.8		
ELECTRONIC HEADING REFERENCE SYSTEM	46.7	25.4	27.9	56.3	34.4	9.4		
MAP BOOK	35.2	35.2	29.5	43.8	34.4	21.9		
MAP FOLDER AND HOLDER	33.6	30.3	36.1	40.6	37.5	21.9		
SMALL MAPS WITH MAGNIFIER	17.2	15.6	67.2	34.4	15.6	50.0		
ELECTRONIC MAP DISPLAY	16.4	17.2	66.4	21.9	18.8	59.4		

Appendixes L-O contain responses to other questions regarding navigation procedures and equipment. Appendix L contains officers' written responses to a question requesting ideas for providing a position locating system (as with many questions, few proposals were made). Appendix M contains ideas given by the officers for providing a heading reference system. Again, few ideas were proposed. Appendix N shows reasons given for installing various proposed map reading devices. The manual aids, such as the map book and map folder/holder were indicated as those that would be installed by more officers. The number of officers checking each of the map aids either alone or in some combination with other aids were as follows: map book-85, map folder and holder-71, electronic map display-42, and small maps with magnifier-39. Appendix O lists ideas provided by the officers surveyed for improving map reading and navigation in a tank. Again, few ideas were provided.

Workspace and Human Factors. Proposed workspace and human factors innovations are listed below, in the order in which they appeared on the questionnaire.

- a. A swing-down ladder on the side of the tank to aid mounting and dismounting. The ladder could be latched in place when not in use.
- b. Small handles or hand and foot grips welded onto the tank glacis to aid mounting and dismounting.
- c. Additional lighting in the turret ceiling above the TC's position.
- d. Additional lighting in the turret wall next to the TC's position.
- e. A platform with hydraulics to allow the TC to move up and down between hatch and sights; up and down movement would be controlled by a switch at the commander's position.
- f. A small swing-up shelf in front of the commander's station to lay maps, papers, etc., on.

Table 13 shows the six proposed workspace and human factors innovations, ordered from the innovation indicated to be helpful by the highest percentage of officers to the innovation indicated to be helpful by the lowest percentage of officers. All of the proposed workspace and human factors innovations proposed produced a number of favorable responses that were significantly greater than 50 percent (beyond the one percent confidence level), with the exception of the hydraulic TC platform and the ladder for mounting and dismounting.

Table 14 repeats the information in Table 13, but broken down by Armor and Armored Cavalry. Armor personnel had an overall higher proportion of favorable responses to installing lighting beside the TC position than did Armored Cavalry personnel ($p < .01$); no other overall proportions differed significantly.

Appendixes P-U contain written responses to questions concerning the workspace and human factors in the tank commander's station. Appendix P contains officers' written responses to questions about improving lighting in the TC's

TABLE 13
PERCENTAGE OF OFFICERS
RESPONDING IN EACH CATEGORY

WORKSPACE & HUMAN FACTORS

	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE
LIGHTING BESIDE TC POSITION	39.0	37.0	24.0
SWING-UP SHELF IN TC POSITION	39.0	29.9	31.1
FOOT GRIPS AND HANDLES	36.4	26.6	37.0
LIGHTING ABOVE TC POSITION	29.9	30.5	39.5
HYDRAULIC TC PLATFORM	14.3	11.0	74.6
LADDER FOR MOUNTING/ DISMOUNTING	7.8	14.9	77.1

TABLE 14

PERCENTAGE OF OFFICERS
RESPONDING IN EACH CATEGORY
WORKSPACE AND HUMAN FACTORS

	ARMOR				ARMORED CAV			
	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE	HELP A LOT	HELP A LITTLE	NEUTRAL OR UNFAVORABLE		
LIGHTING BESIDE TC POSITION	40.2	38.5	21.3	34.4	31.3	34.4		
SWING-UP SHELF IN TC POSITION	38.5	28.7	32.8	40.6	34.4	25.0		
FOOT GRIPS AND HANDLES	36.1	27.9	36.1	37.5	21.9	40.6		
LIGHTING ABOVE TC POSITION	30.3	31.1	38.5	28.1	28.1	43.8		
HYDRAULIC TC PLATFORM	15.6	10.7	73.8	9.4	12.5	78.1		
LADDER FOR MOUNTING/ DISMOUNTING	9.0	14.8	76.2	3.1	15.6	81.3		

position. Most officers failed to provide additional ideas for lighting in the turret. Appendix Q lists ideas provided by the officers for providing a small swing-up shelf in front of the TC's station. Again, few new ideas were provided, but several have potential and deserve attention from those designing such a device, such as providing clips on the shelf, making it to be clipped either inside or outside the turret, and assuring that it has some sort of weatherproof cover.

Appendix R shows officers' ideas to improve mounting and dismounting. This question did not yield much useful information, as one can see in Appendix R. Appendix R also lists reasons for installing each of the proposed mounting and dismounting aids. The reasons given for such modifications are mainly for safety purposes.

Appendix S shows ideas to help TCs move up and down from the hatch to the sights. Many comments on the proposed hydraulics were negative, and many officers provided no ideas.

Appendix T lists suggestions provided by the officers for modifying the TC station to provide more room in an M60 tank (although many of the suggestions will apply to the M1 also), and Appendix U lists ideas to aid wearing webgear in the TC station. Most of the responses with respect to webgear were "don't wear it in a tank."

Training Issues.

In addition to the above areas, the questionnaire addressed several issues that could be put under the rubric of training issues. One of the findings from Phase I of this research showed most officers' keen awareness that combat proficiency in C³ from a tank requires practicing C³ from a tank during field exercises. Most officers were similarly aware that sustaining C³ proficiency requires several field exercises during the year and that steps must be taken to assure that even experienced CO Commanders receive field training in their tanks. Several questions on the Phase II questionnaire addressed this issue, and the results are shown in the next four tables. Table 15 shows some suggestions forwarded by officers in Phase II to assure that commanders receive practice commanding from a tank. As one can see, very few suggestions were proposed. Table 16 contains officers' recommendations of what could be done to assure that CO Commanders receive the amount of practice required (estimated from Phase I data) in commanding from a tank. Again, few suggestions were put forward, but most of those that were proposed fall into the categories of either command emphasis of training priorities or providing more training resources. Table 17 goes on to show the responses given to the question of when officers felt the opportunity could be given to practice commanding from a tank. It is unclear whether the officers who made no response failed to respond because they disagreed that practicing C³ from a tank every quarter is necessary, or because they were unable to determine when the time might be available. Table 18 shows some of the reasons provided by officers for why they cannot practice commanding from a tank for the amount of time indicated as necessary by the results of the Phase I research. Again, the most striking thing about the responses is the large number of failures to respond. It is unclear what these failures to respond reflect.

TABLE 15

SUGGESTIONS TO ASSURE THAT COMMANDERS
RECEIVE PRACTICE COMMANDING FROM A TANK

	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
REQUIRE CERTAIN NR. OF FIELD HOURS IN A TANK PER QUARTER	3
FORCE CDRS TO USE TANKS, NOT JEEPS	2
PROVIDE PLATOON AND COMPANY FIELD TIME	2
COMMAND EMPHASIS	2
MORE MONEY FOR TRAINING	1
EMPHASIZE TACTICAL PROFICIENCY	1
USE CIVILIANS TO TAKE OVER POST SUPPORT	1
PROVIDE INTERNAL EVALUATION OF CDR DURING EXERCISES	1
PROVIDE MORE TRAINING AREAS AND LOGISTICS	1
GIVE MORE ACCESS TO BN TRAINING AREAS	1
ABOLISH ESCORT RULES ON ARMY POSTS AND GET COs OUT OF JEEPS	1
MORE REALISTIC UNIT MISSION REQUIREMENTS	1
INCORPORATE ARTILLERY EFFECTS INTO FIELD EXERCISES	1
SQTs FOR CO CDRS, WITH ALLOCATED TRAINING PERIODS	1
SET UP ONE OR TWO MORE NATIONAL TRAINING AREAS	1
IMPROVE MAINTENANCE	1
FREE FLOW MANEUVER	1
NO SUGGESTIONS	132

TABLE 16

RECOMMENDATIONS OF WHAT COULD BE DONE TO ALLOW
COMMANDERS TIME TO PRACTICE COMMANDING
FROM A TANK FOR 3-4 DAYS EVERY QUARTER

NUMBER
OF SOLDIERS
MAKING
RECOMMENDATION

DECREASE PAPERWORK/ADMIN REQUIREMENTS/SUPPORT	
MISSIONS FOR CO CDRS	9
PUT TRAINING PRIORITIES IN ORDER	9
DECENTRALIZE CONTROL MORE - MORE CO INDEPENDENCE	3
PROVIDE MORE LOCAL MANEUVER/TRAINING AREAS	3
SCHEDULE TRAINING AND DO IT REGULARLY	2
MAKE IT MANDATORY	2
MORE MONEY	2
PROVIDE TRAINING FOR SMALL SCALE PLATOON MANEUVERS	2
GET RID OF JEEPS OR ALLOW CDR TO USE JEEP ONLY	
TO AND FROM TOC	2
USE SIMULATORS	1
NO CDR IS TOO BUSY IF HE CARES	1
NEED LTAs THAT ALLOW CO TO CPX WITH HIS PLT, PSG,	
AND XO	1
NEED LTA AND MTA TIME	1
ELIMINATE MULTI-LEVEL EXERCISES	1
NEED CPXs WITH LEADERS AND COMMAND VEHICLES ONLY	1
BACK TO BASICS	1
NO PROBLEM IN GERMANY	1
ORGANIZE UNITS AS EITHER TRADOC OR FORSCOM	
WITH NO OVERLAP	1
INCLUDE FTXs DURING SCHOOLS	1
BN SHOULD SET TIME ASIDE FOR CO CPXs IN THE TANK	1
TRAIN AS YOU WILL FIGHT	1
HAVE BDE AND BN PLAN EXERCISE AND PROVIDE OPFOR	1
REQUIRE 10-DAY TACTICAL EXERCISES AT BN LEVEL OR ABOVE	1
REALISTIC TIME MOVEMENT ON BATTLEFIELD	1
BETTER BN AND BDE TRAINING OF CO CDRS	1
INCLUDE AS ARTEP TASK FOR CDRS AND PLATOON LEADERS	1

NO RESPONSE

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TABLE 17

RESPONSES TO WHEN ARMOR AND ARMORED CAVALRY
OFFICERS COULD FIND TIME TO PRACTICE COMMANDING
FROM A TANK EVERY QUARTER

	NUMBER OF SOLDIERS MAKING RESPONSE
DURING SCHEDULED FIELD EXERCISES	33
WHENEVER NECESSARY OR POSSIBLE/NO PROBLEM	16
ONLY ONCE EVERY 4-6 MONTHS	4
WHENEVER TA AND LOGISTICS AVAILABLE	4
DEPENDS ON THE UNIT	3
DEPENDS ON BN TRAINING SCHEDULE	3
WHENEVER RESOURCES AVAILABLE AND NO DETAILS	2
PLANNING WILL ALLOW IT TO HAPPEN	2
WHEN DIVISION OR OTHER PRESSURE FROM ABOVE MAKES IT A PRIORITY	2
NEVER	2
ANYTIME UNIT DOES NOT HAVE SOMETHING SPECIFIC TO DO	2
AT TRAINING AREAS (LOCAL AND MAJOR)	2
DURING MAINTENANCE	2
INCORPORATE INTO MOTOR STABLES/GUNNERY TRAINING, ETC.	1
THE SECOND MONTH	1
SCHEDULE IT AND STICK TO IT	1
10 MINUTES A WEEK WOULD BE ENOUGH	1
BY VISITING PLATOON TRAINING IN A TANK RATHER THAN A JEEP	1
GUARD DETAIL, SQT, MTA, GUNNERY PREP, ETC.	1
TUES, WED, AND THURS OF SECOND WEEK OF MONTH	1
WILL COMMAND FROM A 113 ANYWAY	1
NO RESPONSE	69

TABLE 18

REASONS WHY OFFICERS CANNOT PRACTICE
COMMANDING FROM A TANK FOR 3-4
DAYS EACH QUARTER

	NUMBER OF SOLDIERS GIVING REASON
TIME LIMITATIONS DUE TO DISTRACTIONS, INTERRUPTIONS, AND ADMINISTRATIVE DETAILS	28
RESTRICTED TRAINING AREAS	7
RESOURCES UNAVAILABLE	3
GOING TO SCHOOL	3
DO NOT USE TANKS	3
MANEUVER RESTRICTED	2
NEED TO TRAIN PLATOONS	1
WOULD HAVE TO BE INCORPORATED INTO CURRENT FIELD TRAINING	1
IF YOU NEED PRACTICE, LOOK FOR A NEW CAREER	1
DIVISION MUST SET PRIORITIES	1
IFV WOULD BE BETTER THAN A TANK	1
NOT QUALIFIED TO ANSWER	1
NO RESPONSE	117

Another problem uncovered by research during Phase I was that CO Commanders desired a vehicle more mobile than the tank for returning to Battalion headquarters during field exercises. The Phase II questionnaire asked what could be done to reduce the number of trips to Battalion headquarters. Table 19 shows the resulting answers. As one can see, only five of the officers specifically answered that trips to Battalion headquarters are not a problem. Again, a large number of officers failed to respond (54). It is unclear whether this indicates that they do not acknowledge that such a problem exists, or whether they simply had no good suggestions to present.

Another aspect of the mobility problem involved travel in restricted areas. Table 20 shows officers' responses to a question asking what could be done to loosen travel restrictions that currently exist. Apparently, little may be able to be done other than exercising care and assuring that all maneuver damage is taken care of quickly.

Table 21 shows suggestions for lifting excessive safety restrictions to allow greater realism during field exercises, which was indicated as a problem during Phase I. Table 22 shows officers' suggestions for helping COs manage and evaluate training from tanks. It appears that incorporating some of the product improvements in the Phase II survey would help in managing and evaluating field exercises to some extent.

Finally, Table 23 shows officers' reactions to the questionnaire administered in Phase II. Perhaps one of the most significant aspect of their responses besides the number of failures to respond was the number of concerns expressed about the cost, reliability, and maintainability of any of the proposed innovations. Such concerns are bound to surface, especially considering the increasing reliance in technology in our armed forces (for example, see Prillaman, 1982).

Overall Conclusions

While some product improvements and procedural changes will undoubtedly ease the difficulty of C³ from a tank, immediate action must be taken to assure that commanders receive training in commanding from their tanks. It will take time to go through required testing of product improvements and to field them. Furthermore, it is unlikely that existing M60A1 and M48A5 tanks will be fitted with extensive product improvements regardless of benefits shown. Hence, National Guard and Army Reserve units, who will need the most assistance in C³ will receive the least technological help. Training seems to be the only ready solution to their C³ problems.

C³ from the M60A3 and M1 tanks can probably be facilitated greatly by some product improvements, particularly in navigation through aids such as the position locating system and heading reference system, and communications through aids such as a radio like that in Army aircraft. However, while work is continuing in these areas little will probably be done to aid C³ for the part our tank fleet consisting of M60A1 and M48A5 tanks. In the case of these vehicles,

TABLE 19

SUGGESTIONS FOR REDUCING CO TRIPS TO BN HEADQUARTERS
DURING FIELD EXERCISES

	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
FORCE BN CDRS TO PLAN/ORGANIZE MORE EFFECTIVELY AND ISSUE CLEAR OPORDs	18
USE MESSENGERS (ON MOTORCYCLES, IN HELICOPTERS OR APCs)	14
DEVELOP SECURE AND RELIABLE RADIO COMMO	11
DEVELOP IMPROVED, SECURE WAY TO TRANSMIT OVERLAYS, OPORDs, AND FRAGOs	7
BRING BN CDR UP FRONT/PROVIDE GREATER MOBILITY	7
ALLOW PARTICIPATION OF XO's, 1ST SG, OR SENIOR PLS	6
PROVIDE PRINTOUT CAPABILITY FROM BN TO CO	5
REVISE SOP, POSSIBLY REDUCE OPORDs TO SOP RADIO TRANSMISSIONS	5
NOT A PROBLEM	5
CORRECT INITIAL CLEAR OPORD IF NECESSARY WITH FRAGO	4
PROVIDE COPY MACHINE FOR OVERLAYS AND OPORDs TO SUBORDINATE UNITS	3
HAVE CAVALRY USE DATA BURSTS TO RELAY SPOTREPS	2
COs USE MOTORCYCLES	2
BN CDR CONFIDENCE IN CO CDRS LIMITS REQUIRED INFO	2
ESTABLISH A TIME LIMIT ARMY-WIDE ON C&S MEETINGS	2
TRIPS FOR ORDERS AND GUIDANCE ARE NECESSARY	2
TAKE AWAY JEEPS	2
LIMIT C&S MEETINGS TO ONE/DAY OR AS NEEDED TO COORDINATE AND CRITIQUE	2
DISCOURAGE BN/SQD CDRS FROM MICROMANAGING	2
CUT DOWN ON NUMBER OF DISTRACTORS FROM THE REAR/EXCUSE OFFICERS FROM ADDITIONAL DUTIES DURING FIELD EXERCISES	2
ANY CHANGE WILL INCREASE ARTIFICIALITY	1
LOCATE CO CDRS BETWEEN FRONT AND BN HQ	1
BN CDRS BRIEF OVER RADIOS	1
KEEP BDE CDRS AWAY FROM "APPEARANCES"	1
REDUCE NUMBER OF ORAL ORDERS	1
BN CDRS SHOULD GIVE FIELD PROBLEMS TOP PRIORITY	1
TRAIN AS YOU WILL FIGHT	1
MAKE THE PAC GO TO FIELD WITH AG/FINANCE CONTACT TEAM AND THE UNIT'S FIELD FILES	1
100% ACCURATE REPORTS TRANSMITTED TO BN TOC	1
BETTER TRAINED CO CDRS	1
MORE MILES TRAINING	1
DEVELOP LEADERSHIP SKILLS	1
USE MESSENGERS PLUS BRIEF RADIO COMMO	1
PLAN TWO DAYS AT A TIME	1
ONLY PULL CO CDR BACK WHEN ABSOLUTELY NECESSARY	1
MORE TRAINING EMPHASIS ON CO LEVEL, LESS DEBRIEFS	1
UNINTELLIGIBLE ANSWER	1
NO SUGGESTIONS	54

TABLE 20

SUGGESTIONS FOR LOOSENING TRAVEL RESTRICTIONS
IN CURRENTLY RESTRICTED AREAS

	NUMBER OF SOLDIERS MAKING SUGGESTION
NOTHING CAN BE DONE	16
PAY MANEUVER DAMAGE QUICKLY OR REPAIR DAMAGE	13
BETTER PUBLIC RELATIONS/EDUCATE THE PUBLIC	8
SMALLER, LIGHTER, QUIETER TRAINING VEHICLES	5
EXERCISE MORE CARE IN MANEUVERS	4
CHANGE POLICY/LAWS	3
DO IT IN SPITE OF CIVILIANS/PUBLIC OPINION	3
RESTRICT POVS IN THE AREA/TRAFFIC CONTROL	2
USE BETTER RUBBER TRACK PADS	2
LESS EMPHASIS ON ENVIRONMENTAL PROTECTION	2
PUT TANK TRAILS PARALLEL TO POST ROADS	1
ELIMINATE CIVILIAN RESTRICTIONS ON MANEUVER AREAS	1
PUT REAR VIEW MIRRORS ON TANKS	1
DON'T TRAVEL IN COLUMNS	1
HAVE MANEUVER RIGHTS THE SAME AS THE GERMANS	1
LOOK AT WHAT GOVERNMENT SUBSIDIES COULD DO	1
HAVE SR CDRS CALL OFF EXERCISES WHEN MANEUVER DAMAGE POTENTIAL IS HIGH	1
IMPROVE TURN SIGNAL AND LIGHT SYSTEM	1
HAVE A MANEUVER AREA AUTHORIZED	1
RELAX MANEUVER DAMAGE RESTRICTIONS	1
USE DOWN RANGE AREA MORE EFFECTIVELY	1
BUY THE LAND	1
ADD SUBMACHINE GUN FOR TC	1
ACT OF GOD	1
LET THE GERMANS PAY FOR MANEUVER DAMAGE	1
WAR	1
AIR CUSHIONED TANKS	1
UNINTELLIGIBLE RESPONSE	1

NO SUGGESTIONS

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TABLE 21

SUGGESTIONS FOR LIFTING SAFETY RESTRICTIONS TO ALLOW
MORE REALISM IN, AND GREATER BENEFIT FROM, FIELD EXERCISES

	NUMBER OF SOLDIERS MAKING SUGGESTION
TURN OFF LIGHTS DURING NIGHT TRAINING	11
MORE LIVE FIRE EXERCISES	10
REMOVE ROAD RESTRICTIONS, ESCORT RULES	10
DON'T BE CONCERNED ABOUT MANEUVER DAMAGE	7
DON'T USE JEEPS	6
REMOVE RESTRICTIONS ON USE OF PYRO, GAS, ETC.	6
NONE, WITHOUT ACCEPTING POSSIBLE INJURIES	5
MORE FREE FIRE/MANEUVER EXERCISES	5
DO MORE TRAINING BUTTONED UP	4
REDUCE USE OF RADIOS	3
PROVIDE LARGER TRAINING AREAS	2
AVOID CASUALTIES, BUT DON'T DEGRADE TRAINING	2
STOP "PUTTING ON A SHOW" RATHER THAN TRAINING	1
ROTATE SITE TO HELP RECOVERY	1
REDUCE SPEED RESTRICTIONS IN MOVEMENT	1
HAVE BN CDR PRACTICE S ³ , ETC.	1
EITHER COMMAND FROM OR FIGHT FROM A TANK, NOT BOTH	1
STOP VIG DEMOS	1
MORE TARGET ID AND QUICK RECOGNITION PRACTICE	1
STOP BAD EXAMPLES BY SUPERIORS	1
MOVE AND SHOOT AS COMPANIES	1
DON'T USE TOO MANY OVERLAYS ON MAPS	1
NOTHING, MAIN CONCERN IS MANEUVER DAMAGE	1
FORCE CO CDR INTO HIS TANK	1
DO AWAY WITH FIRING LANES	1
LESS ENVIRONMENTAL CONCERN	1
LIFT LRF RESTRICTIONS	1
TOO MANY RESTRICTIONS ON TANK IN FRG	1
DEVELOP MOUT TRAINING AREAS FOR ARMOR	1
USE ARTILLERY SIMULATORS AND SMOKE	1
DON'T WEAR WEBGEAR	1
ELIMINATE OR REDUCE SAFETY DISTANCES	1
DON'T SACRIFICE SAFETY FOR REALISM	1
REQUIRED REPORTS IN DETAIL	1
ELIMINATE SCRIPTS	1
ALLOW JR LEADERS TO CONTROL WITHOUT OVER-CONCERN FOR ADMIN RESPONSIBILITY	1
WE ARE OVERLY SAFETY CONSCIOUS AND LOSE TRAINING VALUE	1
INCREASE SAFETY -- ALLOW MORE TIME	1
TOO NUMEROUS TO MENTION	1
NO SUGGESTIONS	76

TABLE 22

SUGGESTIONS TO HELP CO MANAGE AND EVALUATE
TRAINING FROM HIS TANK DURING FIELD EXERCISES

	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
PRACTICE - DON'T USE JEEPS, TRAIN IN TANK	18
MORE RADIO NET CAPABILITY/MORE RADIOS	10
BETTER OPTICS/VISION BLOCKS - INCLUDING THERMAL	10
MOVE TO AN M113, M3, OR A FAST, MOBILE TANK	9
MORE WORKSPACE/PLACE TO LAY OUT MAPS	9
APPLY SOME OR ALL OF SURVEY SUGGESTIONS	6
RELIABLE RADIOS	3
TAPE PLATOON RADIO TRANSMISSIONS	3
USE JEEPS FOR MOBILITY OR COMFORT	2
CAPABILITY TO SEE AND HAVE OVERHEAD COVER	2
LET XO REPORT TO BN SO CO CAN CONCENTRATE ON PEOPLE	2
PUT A SEAT BEHIND THE CUPOLA	2
REMOVE MG OR REPLACE WITH DUMMY	2
ACCURATE POSITION FIXES	2
HAVE BN COMMANDER SET THE EXAMPLE	2
MOVE/TRAIN WITH PLATOON	2
MORE MONEY FOR TRAINING	1
ALLOW CO MORE TIME	1
REDUCE MANEUVER RESTRICTIONS	1
ALLOW GREATER FLEXIBILITY TO STOP EXERCISE AND CRITIQUE	1
EMPHASIS ON COMPLETING ARTEP-TYPE TESTS	1
RECORD TRAINING ON VIDEO	1
CO MUST LOCATE TO OBSERVE	1
REMOVE CUPOLA	1
ATTACH MOUNT FOR BINOCULARS ABOVE TC'S HATCH	1
PROVIDE STORAGE FOR MAPS AND REFERENCE MATERIAL	1
GIVE PSG AND PLT LDRS, MORE RESPONSIBILITY	1
CO SHOULD LEAD, NOT MANAGE	1
HAVEN'T SEEN A CO YET WHO COMMANDED FROM HIS TANK	1
NO SUGGESTIONS	75

TABLE 23
GENERAL COMMENTS ON QUESTIONNAIRE

	NUMBER OF SOLDIERS MAKING COMMENT
EXPRESSED CONCERN ABOUT COMPLICATION WITH ELECTRONICS	12
CO COMMANDERS NEED GREATER COMMO CAPABILITY	4
NEED MORE ROOM	1
PLS (POSITION LOCATING SYSTEM) AND ELECTRONIC MAP	
DISPLAYS THE MOST WORTHWHILE	1
CEOI ACCESS DISPLAY WOULD SPEED OPERATIONS	1
HRS (HEADING REFERENCE SYSTEM) WOULD BE MOST IMPORTANT	
IN BATTLE	1
PUT SPONSON BOXES ON TURRET INSTEAD OF OPEN BUSTLE RACK	1
GET RID OF COMMANDER'S CUPOLA	1
PUT IN TC'S TARGET DESIGNATING SYSTEM	1
CONSIDER AMX-30 PERISCOPES	1
MAP STAND, SWING-DOWN DISPLAY, AND CEOI DISPLAY GOOD	1
CDR SHOULD NOT BE IN A TANK, NEEDS TIME TO COMMAND	1
DON'T ALLOW CREWS/PLTS TO G-2 COURSES	1
DON'T STRESS PURE TANK GUNNERY, INTEGRATE "COMBAT	
COURSES" ON ALL TABLES	1
ALLOW TCs TO ACQUIRE AND ENGAGE TARGETS AS IN COMBAT	1
REMOVE SOME OF AMMO AND USE SPACE FOR C ³ EQUIPMENT STORAGE	1
PUT EITHER XO OR CO IN SOME VEHICLE OTHER THAN A TANK	1
PUT XO IN A 577 COMMAND POST	1
C ³ REQUIRES A LOT, WITH SKILLED ASSISTANCE	1
CAN'T MAKE TRAINING IN GERMANY MORE REALISTIC	1
NEED TO COMMAND FROM A WHEELED VEHICLE	1
SOME COMMO CHANGES IN M1 AND M2 WOULD BE GOOD	1
USE SPECIAL TANKS FOR C ³ WITH DUMMY MAIN GUNS AND EXTRA	
EQUIPMENT	1
GIVE SURVEY TO TCs	1
SOME ANSWERS ON QUESTIONNAIRE USELESS UNLESS YOU'VE HAD	
A COMMAND	1
SHOULD BE A TAKE-HOME QUESTIONNAIRE	1
GOOD QUESTIONNAIRE	1
USELESS QUESTIONNAIRE	1

NO RESPONSE

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it is clear that the thing that will facilitate C³ performance the most is practice. Commanders must be made to realize that they are responsible for training themselves, and not just their men, to operate from their armored vehicles during field exercises. Doctrine must be stated clearly to them. Commanders must be impressed with the lethality of the modern battlefield before they have the opportunity to be impressed in combat. They must be proficient in the C³ skills they will need to survive and to enable their men to survive in combat.

REFERENCES

- Ballantyne, J. L. (Assistant Commandant, USAARMS). Personal communication, Fort Knox, KY. August 1981.
- Bourque, S. A. Leaders should lead. Letter to the Editor. Armor, March-April, 1982, 3.
- Bruning, J. L. and Kintz, B. L. Computational Handbook of Statistics. Glenview, IL, Scott, Foresman, and Co., 1968.
- Frazier, R. D. Security of the Corps rear area. Military Review. Dec 1979, 2-10.
- Marlin, D. W. Getting back on track. Letter to the Editor, Armor, Jan-Feb, 1982, 6.
- Mosher, C. C. Army needs a replacement CP vehicle. Armor, Sep-Oct 1981, 48-49.
- Prillaman, R. L. Command and control in the 2nd Armored Division. Military Review, July 1982, 36-43.
- Prosch, G. G. Israeli defense of the Golan: An interview with Brigadier General Avigdor Kahalani. Military Review, Oct 1979, 10, 2-13.
- Rowland, J. R. Combat readiness: Fifty percent. Armor, May-June, 1982, 43-44.
- Snedden, R. A. Equipment changes for the tank company. Armor, Sep-Oct, 1981, 50-51.
- Spiller, R. Personal communication, US Command and General Staff College, Fort Leavenworth, KS, 2 July 1981.
- US Army. The Tank and Mechanized Infantry Company Team. Field Manual 71-1. Washington, D.C.: Headquarters, Department of the Army, June 1977.
- US Army. Heavy Division Operations 1986. TRADOC Pamphlet 525-4. Fort Monroe, VA: Department of the Army, Headquarters, United States Army Training and Doctrine Command, December 1980.
- US Army. The Abrams Battalion: Division 86 (Vol II). TRADOC TT 71-1/2. Fort Monroe, VA: Department of the Army, Headquarters, United States Army Training and Doctrine Command, March 1982.
- Wass de Czege, H. Personal communication, US Command and General Staff College, Fort Leavenworth, KS, 2 July 1981.

APPENDIX A INTERVIEW PROTOCOL DEVELOPED FROM INITIAL INPUT BY ASSISTANT
COMMANDANT USAARMS AND THE MILES NET TEAM

The US Army Armor School has become concerned about the choice of command vehicles during field exercises. While the answers to many of the questions I am going to ask you are straightforward in a combat situation, it is clear that there are many reports of differing vehicle choices during field exercises. I am conducting interviews concerned with several major points: (a) what current doctrine dictates, (b) what common practices in vehicle choice are, and (c) some factors that might influence the choice of particular vehicles.

1.1 What does current doctrine dictate with respect to vehicles used by Co commanders; are they to command from a tank, an APC, a jeep, or does the vehicle choice depend on factors such as the terrain and the tactical situation? How does this differ between Infantry and Armor?

1.2 What does current doctrine dictate with respect to vehicles used by Bn commanders; are they to command from a tank, an APC, a jeep, or does the vehicle choice depend on factors such as the terrain and the tactical situation? How does this differ between Infantry and Armor?

1.3 Has this doctrine changed since Viet Nam? If so, how?

1.4. What are the advantages of the current doctrine?
What are the disadvantages of the current doctrine?

1.5 What effects have the Division 86 studies had on doctrine relating to the choice of command vehicles?

1.6 What effects do you believe the introduction of the M1, M2, and M3 will have on doctrine relating to the choice of command vehicles?

1.7 Where are Co and Bn commanders supposed to be located relative to their men during field exercises?
How does this differ, if at all, from combat?

1.8 How clear and consistent do you feel current doctrinal guidance relative to vehicle choice in field exercises in FM 71-1 is?
How about FM 71-2?

What about guidance in selecting command vehicles in any other specific documents you can think of?
How clear and consistent is guidance over all documents relevant to this issue?
If there is any unclarity or inconsistency, what do you feel it would take to clear it up?

2.9 How widespread would you suspect the practice of commanders choosing to command from a jeep or other non-armored vehicle is during field exercises?
What have you personally done with respect to choosing a command vehicle?
What have you personally observed others doing in choosing a command vehicle?
What proportion of the time would you estimate Armor commanders spend in their tank?
What proportion of the time would you estimate Infantry commanders spend in their command track?
Is communication with the commander's staff any easier out of the command vehicle than in it?

2.10 If you had to choose one vehicle as an all-around command vehicle for Armor, which would you choose and why? What modifications would you make in it and why?
If you had to choose one vehicle as an all-around command vehicle for Infantry, which would you choose and why? What modifications would you make in it and why?

2.11 What are some characteristics of men who might be more likely to command from their tank or command track versus a jeep?

Would Academy, ROTC, or OCS training have any impact?

Would number of exercises have any impact?

Would combat experience likely have an impact?

Do you think there are any differences with respect to Armor vs Infantry?

Do you think number of USAREUR tours would have any impact?

Do you think number of FORSCOM tours would have any impact?

Do you think number of exercises such as Realtrain or MILES would have any impact on behavior during exercises such as ARTEPS?

3.12 What equipment features of the tank commander's station make it especially good as a commander's station?

What equipment features make it especially bad?

Do the communications and associated station controls (including intercom) in a tank make it more or less desirable as a command station?

Do the sights and vision blocks in a tank make it more or less desirable as a command station?

Where would be the best crew position in a tank to command from, and why?

3.13 What equipment features of the track commander's station make it especially good as a commander's station?

What equipment features make it especially bad?

Do the radios in a command track make it more or less desirable as a command station?

Do the communications and associated station controls (including intercom) in a command track make it more or less desirable as a command station?

Do the sights and vision blocks in a track make it more or less desirable as a command station?

What would be the best crew position in a track to command from, and why?

4.14 What difficulties, if any, are there in implementing current doctrinal guidance from the tank commander's station?

What difficulties, if any, are there in implementing current doctrinal guidance from the track commander's station?

5.15 Do you feel that comfort of an armored vehicle versus a jeep is a factor in vehicle choice during exercises?

Why or why not?

Would comfort have any impact on vehicle choice during combat?

Do the heater, the ride, or the lighting in any specific vehicle have any impact on vehicle choice during exercises?

5.16 Do you feel there are likely to be seasonal differences in commanders' willingness to command from their tank or track versus a jeep?
If so, what are they?

5.17 Do you feel that night/day differences have any impact on choice of command vehicles during exercises?

5.18 Do you feel that a Mideast versus a European setting is likely to have any impact on choice of command vehicles due to comfort?

5.19 Do you feel that ease of mounting/dismounting is a factor in vehicle choice during exercises?

Why or why not?

Would the same be true during combat?

6.20 Do you feel that the need to return to headquarters for briefings and meetings plays a role in determining vehicle choice during exercises?

Why or why not?

Would the same be true during combat?

Does the speed of a jeep on roads have an influence on command vehicle choice during exercises?

Does the mobility of a tank or command track have an influence on command vehicle choice during exercises?

7.21 Do you feel that the dual role of the Co commander as trainer/evaluator and participant influences the choice of vehicle during exercises?

7.22 Do you feel that the dual role of the Bn commander as trainer/evaluator and participant influences the choice of vehicle during exercises?

7.23 If the answer to either of the above questions is yes, do you have any suggestions you would like to make about modifying this dual role, or improving the training value of field exercises for Co or Bn commanders?

7.24 Do you feel that Co commanders feel too much, not enough, or about the right amount of personal responsibility for evaluating the performance of their troops during exercises?

If not about the right amount, why?

7.25 Do you feel that Bn commanders feel too much, not enough, or about the right amount of personal responsibility for evaluating the performance of their troops during exercises?

If not about the right amount, why?

8.26 Do you feel that Unit SOP has any impact on the choice of command vehicles?

9.27 It is clear that there will be some increase in proficiency through practicing command from a tank or command track during field exercises or computer-assisted exercises in a commander's station mockup. Do you feel that the amount of increase in proficiency is worth instituting some controls on command vehicle choice during field exercises?

9.28 Do you feel that wearing combat gear in a commander's station interferes with the ability to command from a vehicle?

What are any specific problems associated with wearing combat gear other than simply having to operate in a cramped station?

9.29 What factors, other than those already mentioned, might make a commander leave the protection and mobility of a tank or track for a jeep or other vehicle?

APPENDIX B COMMAND VEHICLE CHOICE AND C³ PERFORMANCE QUESTIONNAIRE

AOAC QUESTIONNAIRE
COMMAND VEHICLE AND C³

Name _____ Previous Unit _____
 Age _____ Previous Unit Location _____
 SSN _____ Rank _____
 Source of commission _____ No. of USAREUR tours _____
 No. of MILES or REALTRAIN exercises _____ No. of FORSCOM tours _____
 Approximate No. of ARTEPs participated in _____
 Approximate No. of FTXs participated in _____
 Approximate No. of CPXs participated in _____
 Months of combat experience _____

1. Current doctrine dictates that an Armor company commander will be (check one)

____ forward in a tank when commanding
 ____ forward in a tank during heavy combat, in an APC during lulls or when
 operating on a broad front, and in a Jeep when rapid transportation is
 necessary
 ____ forward in an APC when commanding
 ____ forward in the vehicle of their choice when commanding
 ____ flexible in their choice of vehicle, depending on factors such as ter-
 rain, location of the enemy, etc.
 ____ doctrine does not dictate vehicle choice or position for company
 commanders
 ____ doctrine is unclear on this point

2. Check the command vehicle or vehicles you used during your last ARTEP.
 Indicate what percent of the time in a vehicle you spent in each (if more
 than one), where the ARTEP took place, and what level exercise it was.

vehicle	% of time	level of exercise	position filled during exercise	location of exercise
____ M60 tank	_____	____ platoon	_____	_____
____ M113	_____	____ company	_____	_____
____ M577	_____	____ battalion	_____	_____
____ Jeep	_____			
____ helicopter	_____			
____ other _____	_____			

month of exercise _____

Were you ordered to use the above command vehicle(s)? ____ Yes ____ No

3. Check the command vehicle or vehicles you used during your last FTX. Indicate what percent of the time in a vehicle you spent in each (if more than one), where the FTX took place, and what level exercise it was.

vehicle	% of time	level of exercise	position filled during exercise	location of exercise
___ M60 tank	_____	_____	_____	_____
___ M113	_____			
___ M577	_____			
___ Jeep	_____			
___ helicopter	_____			
___ other _____	_____			

month of exercise _____

Were you ordered to use the above command vehicle(s)? ___ Yes ___ No

4. Approximately what percent of the time have you seen Armor company commanders command from each of the following vehicles during company ARTEPs?

vehicle	% of time
M60 tank	_____
M113	_____
M577	_____
Jeep	_____
helicopter	_____
other _____	_____

5. Approximately what percent of the time have you seen Armor company commanders command from each of the following vehicles during battalion ARTEPs?

vehicle	% of time
M60 tank	_____
M113	_____
M577	_____
Jeep	_____
helicopter	_____
other _____	_____

6. Approximately what percent of the time have you seen Armor company commanders command from each of the following vehicles during company FTXs?

vehicle	% of time
M60 tank	_____
M113	_____
M577	_____
Jeep	_____
helicopter	_____
other _____	_____

7. Approximately what percent of the time have you seen Armor company commanders command from each of the following vehicles during battalion FTXs?

vehicle	% of time
M60 tank	_____
M113	_____
M577	_____
Jeep	_____
helicopter	_____
other _____	_____

8. How often would a company commander need to use an M60A1 tank's range-finder in exercising his command during a field exercise?
____ Hourly or more often ____ About once per day ____ About once per exercise
____ About once or twice a year ____ Never
9. How often would a company commander need to use an M60A1/A3 tank's day sights in exercising his command during a field exercise?
____ Hourly or more often ____ About once per day ____ About once per exercise
____ About once or twice a year ____ Never
10. How often would a company commander need to use an M60A1 tank's night sights in exercising his command during a field exercise?
____ Hourly or more often ____ About once per day ____ About once per exercise
____ About once or twice a year ____ Never
11. How often would a company commander need to use an M60A3 tank's night sights in exercising his command during a field exercise?
____ Hourly or more often ____ About once per day ____ About once per exercise
____ About once or twice a year ____ Never
12. If a company commander is commanding from an M60A1/A3 tank, which crew position is it best for him to be in?

____ TC's station ____ Loader's station ____ Other (specify) _____

Why?

13. If an Armor company commander is commanding from an M113, which crew position is it best for him to operate from?

☐ Commander's hatch ☐ Troop compartment ☐ Other (specify) _____

Why?

14. How easy is it for a company commander to use the radio in an M60A1/A3 tank to monitor both company and battalion nets compared to the radio in a Jeep?

☐ Much easier in the tank ☐ Slightly easier in the tank
☐ About the same ☐ Slightly more difficult in the tank
☐ Much more difficult in the tank

Why?

15. How easy is it for a company commander to use the radio in an M60A1/A3 tank to monitor both company and battalion nets compared to the radio in an M113?

☐ Much easier in the tank ☐ Slightly easier in the tank
☐ About the same ☐ Slightly more difficult in the tank
☐ Much more difficult in the tank

Why?

16. Below is a list of factors that some consider to interfere with commanding from M60 tanks. If you feel any of the things below is a factor that affects command vehicle choice during exercises either against or in favor of an M60, put an "X" on the line next to that item.

- ___ space to lay out maps, CEOI, and other papers
- ___ radio controls, including the intercom
- ___ stability or roughness of ride
- ___ speed along roads
- ___ temperature inside during the summer and winter
- ___ lighting inside the vehicle
- ___ noise level
- ___ mobility
- ___ ease or difficulty of maintenance
- ___ position of the .50 cal
- ___ cost of operation and maintenance
- ___ design of the CVC helmet
- ___ time required to prepare to move out
- ___ cumbersome main gun
- ___ lack of access to certain areas while traveling
- ___ space in the commander's hatch
- ___ configuration of sights
- ___ mounting and dismounting ease
- ___ visibility at night
- ___ visibility during the day
- ___ allows the commander to rest during road marches
- ___ radio position
- ___ vehicle size

17. Number the items you marked in item 16 above as 1, 2, 3, etc. in terms of which interferes most with commanding from an M60, with 1 being the factor that interferes the most. Again, number only those items that you said interfered with command in item 16 above.

- ___ space to lay out maps, CEOI, and other papers
- ___ radio equipment, including the intercom
- ___ stability or roughness of ride
- ___ speed along roads
- ___ temperature inside during the summer and winter
- ___ lighting inside the vehicle
- ___ noise level
- ___ mobility
- ___ ease or difficulty of maintenance
- ___ position of the .50 cal
- ___ cost of operation and maintenance
- ___ design of the CVC helmet
- ___ time required to prepare to move out
- ___ cumbersome main gun
- ___ lack of access to certain areas while traveling
- ___ space in the commander's hatch
- ___ configuration of sights
- ___ mounting and dismounting ease
- ___ visibility at night
- ___ visibility during the day
- ___ allows the commander to rest during road marches
- ___ radio position
- ___ vehicle size

What would it take to improve the factors you ranked as 1-4?

1.

2.

3.

4.

18. How easy is it for a company commander to use the radio in an APC to monitor both company and battalion nets (compared to the radio in a Jeep)?

☐ Much easier in an APC ☐ Slightly easier in an APC ☐ About the same
☐ Slightly more difficult in an APC ☐ Much more difficult in an APC

Why?

19. Order the following vehicles and crew positions from 1 to 6 in terms of ease with which a company commander can communicate (with 1 being the easiest) to his crew directly and over the intercom.

☐ TC's position of an M60 tank
☐ Loader's position of an M60 tank
☐ Commander's hatch in an M113
☐ Troop compartment in an M113
☐ Jeep
☐ M577

20. Order the following vehicles and crew positions from 1 to 6 in terms of ease with which a company commander can communicate (with 1 being the easiest) directly to persons outside his vehicle during an offensive exercise.

☐ TC's position of an M60 tank
☐ Loader's position of an M60 tank
☐ Commander's hatch in an M113
☐ Troop compartment in an M113
☐ Jeep
☐ M577

Is there any difference in ease of communicating directly to persons outside the commander's vehicle between an offensive and a defensive setting?

☐ Yes ☐ No (If the answer is no, skip question #21 and go on to question #22.)

21. Order the following vehicles and crew positions from 1 to 6 in terms of ease with which a company commander can communicate (with 1 being the easiest) directly to persons outside his vehicle during a defensive exercise.

☐ TC's position of an M60 tank
☐ Loader's position of an M60 tank
☐ Commander's hatch in an M113
☐ Troop compartment in an M113
☐ Jeep
☐ M577

22. How many radios should a company commander's vehicle carry? _____

23. In your opinion, which vehicle provides the most stable ride on roads?

___ M60 tank ___ M113 ___ M577 ___ Jeep

Which provides the most stable ride across country?

___ M60 tank ___ M113 ___ M577 ___ Jeep

24. Order the following vehicle and crew positions from 1 to 6 in terms of ease with which a company commander can communicate via radio and monitor the necessary radio nets during an exercise in an offensive setting (with 1 being the easiest).

- ___ TC's position of an M60 tank
- ___ Loader's position of an M60 tank
- ___ Commander's hatch in an M113
- ___ Troop compartment in an M113
- ___ Jeep
- ___ M577

Is there any difference in ease of communicating via radio and in monitoring the necessary nets between an offensive and defensive setting?

___ Yes ___ No (If no, skip the next question.)

25. Order the following vehicle and crew positions from 1 to 6 in terms of ease with which a company commander can communicate via radio and monitor the necessary radio nets during an exercise in a defensive setting (with 1 being the easiest).

- ___ TC's position of an M60 tank
- ___ Loader's position of an M60 tank
- ___ Commander's hatch of an M113
- ___ Troop compartment of an M113
- ___ Jeep
- ___ M577

26. When you were first assigned to a unit, what command vehicle(s) did your company commander use during exercises, and about what percent of the time was each used?

☐ M60 tank ☐
☐ M113 ☐
☐ M577 ☐
☐ Jeep ☐
☐ Helicopter ☐
☐ Other ☐
☐ Don't remember

Do you feel that most commanders tend to choose the command vehicle for field exercises that they have seen their commanders use? ☐ Yes ☐ No

27. Do you feel that running here and there to manage and evaluate training of your men reduces the training value of field exercises for you as a battlefield commander?

☐ Yes, reduces ☐ No, increases ☐ Neither reduces nor increases

28. Do you feel that ordering all company commanders to direct field exercises from their tanks in the future would be good or bad?

☐ Good ☐ Bad ☐ Neither good nor bad ☐ Nothing would change

Why?

29. Which vehicle is the warmest in winter?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep

30. Which vehicle is the coolest in summer?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep

31. Which vehicle allows a commander to get the best rest on road marches during long exercises?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep

32. Which vehicle allows a commander to see the battlefield the best during day exercises?
___ M60 tank ___ M113 ___ M577 ___ Jeep
33. Which vehicle allows a commander to see the battlefield the best during night exercises?
___ M60 tank ___ M113 ___ M577 ___ Jeep
34. Which vehicle allows a company commander to return to battalion headquarters for meetings, briefings, etc. most easily during field exercises?
___ M60 tank ___ M113 ___ M577 ___ Jeep
35. Which vehicle has the best lighting inside for night operations?
___ M60 tank ___ M113 ___ M577 ___ Jeep
36. Which vehicle allows the commander to move around most easily in order to watch and manage training during day field exercises?
___ M60 tank ___ M113 ___ M577 ___ Jeep ___ No differences
37. Which vehicle allows the commander to move around most easily in order to watch and manage training during night field exercises?
___ M60 tank ___ M113 ___ M577 ___ Jeep ___ No differences
38. Which vehicle allows a company commander to read maps, CEOI, etc. the easiest, while stationary during the day?
___ M60 tank ___ M113 ___ M577 ___ Jeep ___ No differences
39. Which vehicle allows a company commander to read maps, CEOI, etc. the easiest, while moving during the day?
___ M60 tank ___ M113 ___ M577 ___ Jeep ___ No differences
40. Which vehicle allows a company commander to read maps, CEOI, etc. the easiest, while stationary at night?
___ M60 tank ___ M113 ___ M577 ___ Jeep ___ No differences

41. Which vehicle allows a company commander to read maps, CEOI, etc. the easiest, while moving at night?

☐ M60 tank ☐ M113 ☐ M57 ☐ Jeep ☐ No differences

42. Is training management and evaluation one of the main considerations in choosing a command vehicle during day field exercises?

☐ Yes ☐ No

43. Is training management and evaluation one of the main considerations in choosing a command vehicle during night field exercises?

☐ Yes ☐ No

44. Is speed of returning to battalion headquarters for meetings, etc. one of the main considerations in company commanders choosing a command vehicle during field exercises?

☐ Yes ☐ No

Would speed of returning to headquarters for meetings, etc. be one of the main considerations in command vehicle choice during combat?

☐ Yes ☐ No

45. Is it a common practice for company commanders to have a Jeep follow their armored vehicle during field exercises, to provide them with convenient transportation to the rear?

☐ Yes ☐ No

Would company commanders have a Jeep follow their armored vehicle during combat, to provide them with convenient transportation to the rear?

☐ Yes ☐ No

46. How many three- or four-day field exercises per year do you feel it would require to maintain an average company commander's proficiency in commanding from an M60 tank?

exercises per year

47. How many three- or four-day field exercises do you feel would be necessary for an average company commander to become proficient in commanding from an M60 tank?

exercises

48. Which vehicle allows the easiest communication between a company commander and his staff? (Including radio as well as meetings.)

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

49. In order to survive on the modern battlefield, a company commander must remain in his armored vehicle during combat.

☐ Agree ☐ Neither agree nor disagree ☐ Disagree

50. In any future war, company commanders must remain in their armored vehicles to survive, even on long road marches.

☐ Agree ☐ Neither agree nor disagree ☐ Disagree

51. In any future war, company commanders must remain in their armored vehicles to survive, even when traveling in rear areas.

☐ Agree ☐ Neither agree nor disagree ☐ Disagree

52. How often do you believe company commanders will involve their M60 tank in a battle?

☐ Always ☐ Almost always ☐ About half of the time ☐ Seldom
☐ Never

53. Which vehicle is the best command vehicle for offensive operations in the desert?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

Which vehicle is the best command vehicle for defensive operations in the desert?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

54. Which vehicle is the best command vehicle for offensive operations in mountainous terrain?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

Which vehicle is the best command vehicle for defensive operations in mountainous terrain?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

55. Is terrain one of the main considerations in choosing a command vehicle during field exercises?

☐ Yes ☐ No

56. Which vehicle is the best command vehicle for offensive operations in rain?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

Which vehicle is the best command vehicle for defensive operations in rain?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

57. Which vehicle is the best command vehicle for offensive operations in snow?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

Which vehicle is the best command vehicle for defensive operations in snow?

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep ☐ No differences

58. Confidence in the second in command has a considerable impact on how willing a company commander is to be forward in his fighting vehicle.

☐ Agree ☐ Neither agree nor disagree ☐ Disagree

59. Having to transport tanks or APCs by rail is a deterrent to using an armored vehicle for command purposes during field exercises.

☐ Agree ☐ Neither agree nor disagree ☐ Disagree

60. Rank the following vehicles from 1 to 4 with 1 as the best command vehicle for a company commander during field exercises when a company is in a defensive situation.

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep

Explain the rationale for your #1 selection.

61. Rank the following vehicles from 1 to 4 with 1 as the best command vehicle for a company commander during field exercises when a company is in an offensive situation.

☐ M60 tank ☐ M113 ☐ M577 ☐ Jeep

Explain the rationale for your #1 selection.

62. How do you feel about wearing webgear in the M60 tank commander's station during field exercises?

☐ dangerous
☐ inconvenient
☐ cumbersome at first, but easy to learn how to adapt
☐ I do not wear webgear in the tank commander's station
☐ there is no problem wearing webgear in the tank commander's station

Do you have any suggestions for improving the ease with which a commander can wear webgear in the tank commander's station?

63. Is it a good idea for a company commander to take a maintenance 113 for use as a command vehicle during field exercises if his tank is in good working condition?

☐ A good idea ☐ Neither a good nor bad idea ☐ A bad idea

Why?

Would the same reasoning hold during combat?

☐ Yes ☐ No

54. What technique do you use to handle your maps during exercises, if anything other than simply laying out the map and reading it?

☐ Making a map book ☐ Installing a map board in the command vehicle
☐ Folding the map a specific way ☐ Have the loader handle the map
☐ Other (describe it below)

65. How personally involved do you feel company commanders will become in battle commanding from an M60 tank?

☐ Very involved ☐ Moderately involved ☐ Involved only when absolutely necessary
☐ Not involved at all

To what extent will becoming involved in the battle hinder the company commander's ability to command his men?

☐ A great deal ☐ Somewhat ☐ None at all

66. How do you feel about the following statement: "Because of excessive restrictions on training due to safety, many company commanders may be learning command and control habits that will endanger their lives in combat."

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree
☐ Strongly disagree

67. Under what conditions in combat might a Jeep or M113 be preferable to a tank as a command vehicle?

68. How do you feel about the following statement: "A company commander should command from his tank during exercises to have a better appreciation for the limits of the tanks and the men in them."

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree
☐ Strongly disagree

69. How do you feel about the following statement: "A company commander does not need to be in his tank during field exercises terrain with his crew, because they can receive good training by themselves while attached to a platoon."

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree
☐ Strongly disagree

70. How do you feel about the following statement: "The M1 will be the best choice as a command vehicle for Armor company commanders."

☐ Strongly agree ☐ Agree ☐ Neither agree nor disagree ☐ Disagree
☐ Strongly disagree

71. Have you ever been involved in computer-assisted command, control, and communication exercises in a mockup or other simulation?

☐ Yes ☐ No

If yes, please answer the following:

Where was it done? _____

How helpful did you feel it was?

☐ Extremely helpful ☐ Helpful ☐ Neither helpful nor harmful
☐ Harmful ☐ Extremely harmful

Approximately how many hours have you spent in this kind of exercise?

_____ hours

What could have been done to make it better?

72. Other than factors already mentioned in this questionnaire, are there any other considerations that have an impact on which vehicle you would choose to command from during field exercises? (You can include statements about any and all command vehicles you wish.)

APPENDIX C VEHICLE USE FOR FIELD EXERCISES

PERCENT OF OFFICERS SPENDING 75% OR MORE OF TIME IN EACH VEHICLE DURING LAST ARTEP

	<u>No Single Vehicle</u>	<u>M60</u>	<u>M113</u>	<u>M557</u>	<u>M151</u>	<u>Other</u>	
CO Percent	50.0	0.0	25.0	0.0	25.0	0.0	(N = 4)
XO Percent	18.2	4.5	18.2	4.5	50.0	4.5	(N = 22)
Plt Ldr Percent	3.1	25.0	28.1	0.0	40.6	3.1	(N = 32)
Staff Percent	13.3	6.7	6.7	33.3	33.3	6.7	(N = 15)
Total Percent	12.3	13.7	20.5	8.2	41.1	4.1	(N = 73)

PERCENT OF OFFICERS SPENDING 75% OR MORE OF TIME IN EACH VEHICLE DURING LAST FTX

	<u>No Single Vehicle</u>	<u>M60</u>	<u>M113</u>	<u>M577</u>	<u>M151</u>	<u>Other</u>	
CO Percent	50.0	0.0	0.0	0.0	50.0	0.0	(N = 4)
XO Percent	18.5	7.4	14.8	0.0	59.3	0.0	(N = 27)
Plt Ldr Percent	5.0	25.0	20.0	5.0	45.0	0.0	(N = 20)
Staff Percent	21.7	4.3	4.3	39.1	21.7	8.7	(N = 23)
Total Percent	17.6	10.8	12.1	13.5	43.2	2.7	(N = 74)

PERCENT OF ARMOR OFFICERS WHO OBSERVED CO
USING VEHICLE 75% OR MORE OF EXERCISE TIME

Vehicle	<u>First Unit</u>	<u>Company</u>		<u>Battalion</u>	
		<u>ARTEP</u>	<u>FTX</u>	<u>ARTEP</u>	<u>FTX</u>
M60	6.4	10.8	4.0	11.3	6.5
M113	10.1	6.8	4.0	15.5	10.5
M151	50.6	31.1	61.0	28.2	34.2
Other	1.3	0.0	0.0	0.0	0.0

(Number Responding)	(79)	(74)	(75)	(71)	(76)
---------------------	------	------	------	------	------

APPENDIX D VEHICLE PREFERENCE FOR MAP READING

PERCENT OF OFFICERS PREFERRING EACH VEHICLE FOR READING MAPS

<u>Conditions</u>	<u>M60</u>	<u>M113</u>	<u>M577</u>	<u>M151</u>	<u>No Difference</u>
Day Stationary	1.2	32.1	27.2	28.4	11.1
Day Moving	4.9	30.5	17.1	43.9	3.7
Night Stationary	4.9	35.8	48.1	6.2	4.0
Night Moving	4.9	36.6	26.8	24.4	7.3
Inside Lighting	7.4	38.3	54.3	0.0	---

APPENDIX E COMMUNICATIONS

RELATIVE EASE OF MONITORING COMPANY AND BATTALION NETS FROM AN M60, M113, AND M151 (Pairwise comparisons)

	Ease of Monitoring (Percent in Each Category)		
	<u>Tank Easier</u>	<u>About The Same</u>	<u>Tank More Difficult</u>
M60A1/A3 vs M151 (N = 81)	24.7	21.0	54.3
M60A1/A3 vs M113 (N = 79)	19.0	35.4	45.6
	<u>M113 Easier</u>	<u>About The Same</u>	<u>M113 More Difficult</u>
M113 vs M151 (N = 78)	37.1	30.8	32.0

FACTORS MENTIONED FOR PREFERRING RADIOS IN M60 VS JEEP
FOR MONITORING BOTH COMPANY AND BATTALION NETS

<u>Those Preferring M60 (N = 20)</u>	<u>Number</u>	<u>% of Total Expressing A Preference</u>	<u>% of Those Preferring M60</u>
Reason for Preferring M60			
VRC-12	7	10.9	35.0
CVC Helmet	6	9.4	30.0
Remote Frequency Change	5	7.8	25.0
Commo	2	3.1	10.0
Loader Helps	2	3.1	10.0
Control	1	1.6	5.0
Intercom	1	1.6	5.0
Noise	1	1.6	5.0
Height of Antenna Platform	1	1.6	5.0
Marines Monitor Three Nets	1	1.6	5.0
No Reason Given	2	3.1	10.0

Those Preferring Jeep (N = 44)

Reason for Preferring Jeep

Commo/Commo Access	9	14.1	20.5
Vehicle Noise	8	12.5	18.2
Nets Difficult to Discriminate in CVC	8	12.5	18.2
Room	6	9.4	13.6
Frequency Select Problem in Tank	5	7.8	11.4
Command Without Vehicle Control Worries	4	6.2	9.1
Crew Noise in Tank	2	3.1	4.5
Intercom Interference	1	1.6	2.3
Jeep Easier with 2 Nets	1	1.6	2.3
Tank Monitors 2 Nets	1	1.6	2.3
No Reason Given	8	12.5	18.2

FACTORS MENTIONED FOR PREFERRING RADIOS IN M60 VS M113
FOR MONITORING BOTH COMPANY AND BATTALION NETS

<u>Those Preferring M60 (N = 15)</u>	<u>Number</u>	<u>% of Total Expressing A Preference</u>	<u>% of Those Preferring M60</u>
<u>Reasons for Preferring M60</u>			
Access to Commo	3	5.9	20.0
Remote Frequency Select	2	3.9	13.3
Intercom	2	3.9	13.3
Better Equipment	1	2.0	6.7
M113 Commo Simple	1	2.0	6.7
Troops in M113 Can Monitor Commo	1	2.0	6.7
No Reason Given	5	9.8	33.3
<u>Those Preferring M113 (N = 36)</u>			
<u>Reasons for Preferring M113</u>			
Commo Access	9	17.6	25.0
Room	7	13.7	19.4
Vehicle Noise	3	5.9	8.3
M113 Commo Simpler	2	3.9	5.6
Difficult to Monitor Nets in Tank	2	3.9	5.6
Switching Nets	2	3.9	5.6
Easier to Control Vehicle During Commo	2	3.9	5.6
Crew Noise	1	2.0	2.8
Auto Select Problem in Tank	1	2.0	2.8
Troops Can Help Monitor	1	2.0	2.8
Easier to Transmit on 2 Nets	1	2.0	2.8
No Reason Given	5	9.8	13.9

FACTORS MENTIONED FOR PREFERRING RADIOS IN M113 VS JEEP
FOR MONITORING BOTH COMPANY AND BATTALION NETS

<u>Those Preferring M113 (N = 29)</u>	<u>Number</u>	<u>% of Total Expressing A Preference</u>	<u>% of Those Preferring M113</u>
Reasons for Preferring M113			
CVC Helmet	4	7.4	13.8
Room	4	7.4	13.8
Commo Access	3	5.6	10.3
Remote Frequency Select	2	3.7	6.9
VRC-12	2	3.7	6.9
Crew Can Help	2	3.7	6.9
Vehicle Noise	1	1.9	3.4
Training NCO in M113	1	1.9	3.4
Commander Present	1	1.9	3.4
No Reason Given	9	16.7	31.0
Those Preferring Jeep (N = 25)			
Reasons for Preferring Jeep			
Vehicle Noise	11	20.4	44.0
Commo Access	4	7.4	16.0
CVC Problems	2	3.7	8.0
Net Discrimination Difficult in CVC	1	1.9	4.0
Ride	1	1.9	4.0
Room	1	1.9	4.0
M113 Cumbersome	1	1.9	4.0
No Reason Given	4	7.4	16.0

ARMOR OFFICERS RESPONDING THAT THE FOLLOWING VEHICLES
AND CREW POSITIONS WERE BEST FOR COMMUNICATIONS

	<u>M60 TC Position</u>	<u>M60 Loader Position</u>	<u>M113 TC Position</u>	<u>M113 Troop Compartment</u>	<u>Jeep</u>	<u>M577</u>
To Persons Within Vehicle:						
Number	18	1	5	8	42	12
Percent	20.9	1.2	5.8	9.3	48.8	14.0
To Persons Outside Vehicle:						
Number	8	8	3	9	56	4
Percent	9.1	9.1	3.4	10.2	63.6	4.5

PERCENT OF OFFICERS PREFERRING THE FOLLOWING
VEHICLES AND CREW POSITIONS

	<u>M60 TC Position</u>	<u>M60 Loader Position</u>	<u>M113 TC Position</u>	<u>M113 Troop Compartment</u>	<u>Jeep</u>	<u>M577</u>
For Radio Communications and Net Monitoring	10.6	5.9	7.1	18.8	42.4	15.3
	<u>M60</u>	<u>M113</u>	<u>Jeep</u>	<u>M577</u>	<u>No Difference</u>	
For Communications Between A Company Commander and His Staff	1.2	23.5	37.0	18.5	19.8	

APPENDIX F REASONS GIVEN FOR AND AGAINST BATTALION COMMANDERS ORDERING OFFICERS
IN THEIR COMMAND TO OPERATE FROM TANKS

REASONS FOR AND AGAINST ORDERING COs
TO USE TANKS IN FUTURE EXERCISES

Those Favoring Ordered Use of Tanks (N = 28)

Reasons Given	Number	% of Total	% of Those Favoring Order
Training Realism	15	27.3	53.6
Survivability	14	25.5	50.0
Control	1	1.8	3.6
Commo	1	1.8	3.6

Those Opposed to Ordered Use of Tanks (N = 27)

Reasons Given	Number	% of Total	% of Those Favoring Order
Reduces Flexibility	12	21.8	44.4
Reduces Mobility	7	12.7	25.9
Room	5	9.1	18.5
Commo	4	7.3	14.8
Wastes Fighting Vehicle	3	5.5	11.1
Information Overload	2	3.6	7.4
Noise	1	1.8	3.7
Limits Control	1	1.8	3.7
Reduces Ability to Evaluate	1	1.8	3.7
Need Better Vehicle	1	1.8	3.7
Comfort	1	1.8	3.7

APPENDIX G C³ PRODUCT AND PROCEDURES IMPROVEMENT QUESTIONNAIRE USED IN
PHASE II

C³ Product and Procedures Improvement Questionnaire

Name	Rank
1. [Name]	[Rank]
2. [Name]	[Rank]
3. [Name]	[Rank]
4. [Name]	[Rank]
5. [Name]	[Rank]
6. [Name]	[Rank]
7. [Name]	[Rank]
8. [Name]	[Rank]
9. [Name]	[Rank]
10. [Name]	[Rank]
11. [Name]	[Rank]
12. [Name]	[Rank]
13. [Name]	[Rank]
14. [Name]	[Rank]
15. [Name]	[Rank]
16. [Name]	[Rank]
17. [Name]	[Rank]
18. [Name]	[Rank]
19. [Name]	[Rank]
20. [Name]	[Rank]
21. [Name]	[Rank]
22. [Name]	[Rank]
23. [Name]	[Rank]
24. [Name]	[Rank]
25. [Name]	[Rank]
26. [Name]	[Rank]
27. [Name]	[Rank]
28. [Name]	[Rank]
29. [Name]	[Rank]
30. [Name]	[Rank]
31. [Name]	[Rank]
32. [Name]	[Rank]
33. [Name]	[Rank]
34. [Name]	[Rank]
35. [Name]	[Rank]
36. [Name]	[Rank]
37. [Name]	[Rank]
38. [Name]	[Rank]
39. [Name]	[Rank]
40. [Name]	[Rank]
41. [Name]	[Rank]
42. [Name]	[Rank]
43. [Name]	[Rank]
44. [Name]	[Rank]
45. [Name]	[Rank]
46. [Name]	[Rank]
47. [Name]	[Rank]
48. [Name]	[Rank]
49. [Name]	[Rank]
50. [Name]	[Rank]
51. [Name]	[Rank]
52. [Name]	[Rank]
53. [Name]	[Rank]
54. [Name]	[Rank]
55. [Name]	[Rank]
56. [Name]	[Rank]
57. [Name]	[Rank]
58. [Name]	[Rank]
59. [Name]	[Rank]
60. [Name]	[Rank]
61. [Name]	[Rank]
62. [Name]	[Rank]
63. [Name]	[Rank]
64. [Name]	[Rank]
65. [Name]	[Rank]
66. [Name]	[Rank]
67. [Name]	[Rank]
68. [Name]	[Rank]
69. [Name]	[Rank]
70. [Name]	[Rank]
71. [Name]	[Rank]
72. [Name]	[Rank]
73. [Name]	[Rank]
74. [Name]	[Rank]
75. [Name]	[Rank]
76. [Name]	[Rank]
77. [Name]	[Rank]
78. [Name]	[Rank]
79. [Name]	[Rank]
80. [Name]	[Rank]
81. [Name]	[Rank]
82. [Name]	[Rank]
83. [Name]	[Rank]
84. [Name]	[Rank]
85. [Name]	[Rank]
86. [Name]	[Rank]
87. [Name]	[Rank]
88. [Name]	[Rank]
89. [Name]	[Rank]
90. [Name]	[Rank]
91. [Name]	[Rank]
92. [Name]	[Rank]
93. [Name]	[Rank]
94. [Name]	[Rank]
95. [Name]	[Rank]
96. [Name]	[Rank]
97. [Name]	[Rank]
98. [Name]	[Rank]
99. [Name]	[Rank]
100. [Name]	[Rank]

Previous Unit _____ Branch: Armor _____ Cavalry _____

Position in Previous Unit CO XO Plt Ldr S2 S3

Other (please name) _____

Based on a recent survey of command vehicle choice and C³ performance, several factors have been isolated as potential areas for product improvements in equipment or changes in procedure.

How much do you think each of the following modifications to the TC's station of a tank would help an Armor company commander in his command and control functions?

1a. A swing down ladder on the side of the tank to aid mounting and dismounting. The ladder could be latched in place when not in use.

_____ Help a lot _____ Help a little _____ Not worth the trouble.

Hinder a little Hinder a lot

lb. Small handles or hand and foot grips welded onto the tank glacis to aid mounting and dismounting.

Help a lot _____ Help a little _____ Not worth the trouble _____

Hinder a little Hinder a lot

1c. Which of the proposed changes, 1a and 1b above, would you install?

1a	1b	Neither	Both
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12
13	13	13	13
14	14	14	14
15	15	15	15
16	16	16	16
17	17	17	17
18	18	18	18
19	19	19	19
20	20	20	20
21	21	21	21
22	22	22	22
23	23	23	23
24	24	24	24
25	25	25	25
26	26	26	26
27	27	27	27
28	28	28	28
29	29	29	29
30	30	30	30
31	31	31	31
32	32	32	32
33	33	33	33
34	34	34	34
35	35	35	35
36	36	36	36
37	37	37	37
38	38	38	38
39	39	39	39
40	40	40	40
41	41	41	41
42	42	42	42
43	43	43	43
44	44	44	44
45	45	45	45
46	46	46	46
47	47	47	47
48	48	48	48
49	49	49	49
50	50	50	50
51	51	51	51
52	52	52	52
53	53	53	53
54	54	54	54
55	55	55	55
56	56	56	56
57	57	57	57
58	58	58	58
59	59	59	59
60	60	60	60
61	61	61	61
62	62	62	62
63	63	63	63
64	64	64	64
65	65	65	65
66	66	66	66
67	67	67	67
68	68	68	68
69	69	69	69
70	70	70	70
71	71	71	71
72	72	72	72
73	73	73	73
74	74	74	74
75	75	75	75
76	76	76	76
77	77	77	77
78	78	78	78
79	79	79	79
80	80	80	80
81	81	81	81
82	82	82	82
83	83	83	83
84	84	84	84
85	85	85	85
86	86	86	86
87	87	87	87
88	88	88	88
89	89	89	89
90	90	90	90
91	91	91	91
92	92	92	92
93	93	93	93
94	94	94	94
95	95	95	95
96	96	96	96
97	97	97	97
98	98	98	98
99	99	99	99
100	100	100	100

Why?

1d. Do you have any other ideas to aid company commanders in mounting and dismounting the tank?

2a. Additional lighting in the turret ceiling above the TC's position.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

2b. Additional lighting in the turret wall next to the TC's position.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

2c. Would you prefer a wide beam or a high-intensity narrow beam light?

_____ Wide beam _____ Narrow beam

2d. Which of the proposed changes, 2a and 2b above, would you install?

_____ 1a _____ 1b _____ Neither _____ Both

Why?

2e. Do you have any other ideas to improve lighting inside tanks?

3a. A series of toggle switches, with one for each of several radio nets (battalion, company, platoon, intercom) that would allow the CO to monitor and transmit on any one net or any combination of nets at a given time. Each toggle switch would turn a given net on or off.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

3b. A series of toggle switches as described above, plus an extra switch so the CO can monitor or transmit on any other frequency he chooses.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

3c. A series of volume controls next to the toggle switches as described above, to allow the CO to monitor one primary net at a given volume and one or more other nets at a lower volume.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

3d. A visual indicator above each toggle switch, such as a light or a meter, that would indicate to the CO when a message is coming in over each individual net, intended to help in discriminating among nets.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

3e. Placing the TC's radio transmission switch on the TC's override or some other position rather than on the CVC helmet.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

3f. If you were to move the TC's radio transmission switch to somewhere other than the TC's override, where would you move it and why?

3g. Which of the proposed changes in 3a through 3e above would you install?

____ 3a ____ 3b ____ 3c ____ 3d ____ 3e ____ All ____ None

Why?

3h. Do you have any other ideas to improve the radio and intercom controls to make commanding from a tank easier?

4a. A platform with hydraulics to allow the TC to move up and down between hatch and sights; up and down movement would be controlled by a switch at the commander's position.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

4b. If 4a above was installed, where would be the best place to put the control switch?

_____ Above the TC's head _____ On the turret wall
_____ On the TC's platform (a foot switch)
_____ Other (describe below)

4c. Do you have any other ideas to help TCs and company commanders move up and down from hatch to sights?

5a. A computerized display to provide CEOI information.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

5b. If 5a above was installed, where would be the best place to put the display?

_____ In the TC's sight _____ On the turret wall
_____ Above the TC's head _____ Above the TC's sights
_____ Hand held _____ Other (describe below)

5c. A small pocket card containing CEOI information rather than having it in a book.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

5d. Do you have any other ideas to help TCs and company commanders use CEOI information more easily?

6a. A small swing-up shelf in front of the commander's station to lay maps, papers, etc. on.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

6b. Please list any comments, ideas, or suggestions you might have on providing a small swing-up shelf in front of the TC's station.

7a. An electronic heading reference system display at the TC station to tell which direction the tank is moving.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

7b. Where would be the best place to provide such a display?

_____ In the TC's sight _____ On the turret wall
_____ Above the TC's head _____ Above the TC's sights
_____ Other (describe below)

7c. Please list any comments, ideas, or suggestions you might have on providing a heading reference system display at the TC station.

8a. An electronic position locating system display in six-digit coordinates to tell the tank's position.

_____ Help a lot _____ Help a little _____ Not worth the trouble
 _____ Hinder a little _____ Hinder a lot

8b. Where would be the best place to provide such a display?

_____ In the TC's sight _____ On the turret wall
_____ Above the TC's head _____ Above the TC's sights
_____ Other (describe below)

8c. Please list any comments, ideas, or suggestions you might have on providing a position locating system display at the TC station.

9a. Small maps with a magnification device for reading them; the magnifier's display could be set up to accept acetate overlays.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

9b. A thumb indexed map book.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

9c. An electronic map display.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

9d. A map folding aid and map holder.

_____ Help a lot _____ Help a little _____ Not worth the trouble
_____ Hinder a little _____ Hinder a lot

9e. Which of the proposed changes in 9a through 9d above would you install?

_____ 9a _____ 9b _____ 9c _____ 9d _____ All _____ None

Why?

9f. Do you have any other ideas to improve map reading and navigation in a tank other than those already listed?

10. How would you redesign the TC's station to provide more space for C³ functions?

11. Of the following innovations, select the one or ones you would probably incorporate in a new commander's station. Number the innovations you would select as 1, 2, 3, ..., etc., with number 1 being the highest priority innovation. Number only those innovations you would want to include.

- _____ Handles or a ladder for mounting and dismounting
- _____ Additional lighting in the TC's position
- _____ A series of toggle switches as described above to allow monitoring of selected radio nets
- _____ TC's radio transmission switch moved from CVC helmet to another location
- _____ Hydraulic stand for the TC
- _____ CEOI access display
- _____ Swing-up shelf in front of the TC station
- _____ Heading reference system display
- _____ Position locating system display
- _____ Electronic map display

12. Of the following modifications, select the one or ones you think are most reasonable to include in the TC stations of M60A3 tanks. Number the modifications you would select as 1, 2, 3, ..., etc., with number 1 being the highest priority modification. Number only those modifications you would want to include.

- ☐ Handles or a ladder for mounting and dismounting
- ☐ Additonal lighting in the TC's position
- ☐ A series of toggle switches as described above to allow monitoring of selected radio nets
- ☐ TC's radio transmission switch moved from CVC helmet to another location
- ☐ Hydraulic stand for the TC
- ☐ CEOI access display
- ☐ Swing-up shelf in front of the TC station
- ☐ Heading reference system display
- ☐ Position locating system display
- ☐ Electronic map display

13. What suggestions would you make to improve a company commander's ability to manage and evaluate training from his tank during field exercises?

14. What administrative steps could be taken to reduce the number of times a company commander is required to return to battalion headquarters during field exercises?

15. Could you currently find the time to practice commanding from a tank for a 3-4 day field exercise every three months?

_____ Yes _____ No

If so, when?

If not, why?

If not, what specifically could be done to (a) allow you the opportunity for such practice and (b) assure that you received practice commanding from a tank? (Please be specific; don't just say "cut out all the baloney", etc.)

a.

b.

16. What could be done to make it acceptable for tanks to travel in areas where tanks currently are not allowed?

17. Are there currently any safety restrictions on training that may cause company commanders to learn command and control habits that would endanger their lives in combat?

_____ Yes _____ No

If so, which restrictions could reasonably be lifted to allow more realism in training and greater training benefit from field exercises?

18. How would you specifically redesign the TC's position or webgear to make wearing webgear safer/more convenient while commanding?

19. Do you have any comments on any of the items in this questionnaire? If so, please list the question number and your comment below. You may continue comments on the back of this sheet if you wish.

REASONS FOR INSTALLING A SERIES
OF TOGGLE SWITCHES FOR COMMO
BUT NO OTHER COMMO MODIFICATIONS
(N=9)

	NUMBER OF SOLDIERS MAKING SUGGESTION
CURRENT SYSTEM INADEQUATE/INACCESSIBLE	3
SPEED COs RESPONSE	1
NEED TO MONITOR MULTIPLE NETS	1
AID SWITCHING NETS ON THE MOVE	1
NO REASON GIVEN	3

REASONS FOR INSTALLING A SERIES OF
TOGGLE SWITCHES PLUS OTHER
PROPOSED MODIFICATIONS
(EXTRA SETTABLE SWITCH, VOLUME CONTROLS, VISUAL
INDICATOR, MOVE TC)
(N=64)

SPEED/CONVENIENCE OF SWITCHING NETS	19
FACILITATE SWITCHING/MONITORING MULTIPLE NETS	7
CURRENT SYSTEM INACCESSIBLE	8
WOULD AID CONTROL AND COMMO TO DIFFERENT LEVELS	6
AID DISTINGUISHING INCOMING NETS	5
VOLUME CONTROLS WOULD BE AN AID	2
VRC-12 UNRELIABLE	1
VISUAL INDICATORS WOULD BE AN AID	1
BN COULD MONITOR COs INSTRUCTIONS TO CRITICAL PLATOON(S)	1
NO REASON GIVEN	26

REASONS FOR INSTALLING PROPOSED
MODIFICATIONS WITHOUT SERIES OF
TOGGLE SWITCHES
(N=21)

	NUMBER OF SOLDIERS MAKING SUGGESTION
INDICATOR LIGHTS WOULD HELP, TOGGLE SWITCHES UNNECESSARY	5
POSITION OF TC TRANSMISSION SWITCH CRITICAL	4
CURRENT SYSTEM ALLOWS MONITORING MULTIPLE NETS	3
NEED TO KEEP COMMO SIMPLE	2
VARIABLE VOLUME AND INDICATORS MAY HELP WHEN HEAVY TRAFFIC	1
NO REASON GIVEN	11

REASONS FOR INSTALLING ALL PROPOSED
COMMO MODIFICATIONS
(N=33)

	NUMBER OF SOLDIERS MAKING SUGGESTION
SPEED/CONVENIENCE OF SWITCHING NETS	10
ALLOW COMMO ON SEVERAL DIFFERENT NETS SIMULTANEOUSLY	4
EXISTING SYSTEM POOR/UNRELIABLE	3
ALLOW EASIER NET DISCRIMINATION	3
POOR ACCESS TO RADIO CURRENTLY	3
AID CONTROL AND MANAGEMENT	3
NO REASON GIVEN	9

REASONS FOR INCORPORATING NONE
OF PROPOSED COMMO MODIFICATIONS
(N=23)

CURRENT SYSTEM ACCEPTABLE	7
DIFFICULT TO MONITOR MORE THAN 2 NETS	2
NOT COST EFFECTIVE	3
TAKE TOO MUCH SPACE	1
MAINTENANCE PROBLEMS	1
NEED 2 TRANSMITTERS AND 3 RECEIVERS INSTEAD	1
TOO MUCH RELIANCE ON RADIOS AS IS	1
ONLY NEED TO MODIFY REMOTE BOX TO INDICATE INCOMING TRAFFIC	1
TC TRANSMISSION SWITCH ON OVERRIDE WOULD CAUSE PROBLEMS	1
NO REASON GIVEN	11

APPENDIX I IDEAS TO IMPROVE RADIO AND INTERCOM CONTROLS

	NUMBER OF SOLDIERS MAKING SUGGESTION
INCREASE NUMBER OF CHANNELS CO CAN TRANSMIT ON/MONITOR	11
IMPROVE RADIO/FREQUENCY SELECTOR CONTROLS	9
IMPROVE RADIO RELIABILITY/POWER	8
INSTALL THROAT MIKES	6
INSTALL INDICATORS FOR INCOMING CALLS	4
REDUCE RADIO SIZE	4
INSTALL ROTARY SWITCH FOR FREQUENCY SELECT	3
INSTALL TOGGLE SWITCHES FOR LOADER/CREW TO HELP MONITOR	2
CO ONLY NEEDS ONE CHANNEL	2
USE PUSH BUTTONS INSTEAD OF TOGGLES	2
EASIER ACCESS TO CREW'S TRANSMISSION SWITCHES	2
DIGITAL FREQUENCY SELECTION	1
INCREASE SECURITY	1
MOVE CONTROL BOX HIGHER ON TURRET WALL	1
DEVELOP LIVE INTERCOM-SWITCH FOR RADIO	1
INSTALL VOICE ACTIVATED INTERCOM	1
INSTALL MASTER POWER SWITCH FOR ALL M60 RADIOS	1
SHOULDER SWITCH FOR RADIO TRANSMISSION	1
ISSUE WALKIE-TALKIES FOR USE WHEN DISMOUNTED	1
AUTOMATIC FREQUENCY SELECTOR	1
THROAT MIKE FOR INTERCOM, HAND-HELD MIKE FOR RADIO	1
INSTALL PROPOSED TOGGLE SWITCHES AND INDICATORS	1
DEVELOP HELMET TRANSMITTER AND DO AWAY WITH CVC CORD	1
PUT RADIO ON LOADER'S SIDE	1
MODIFY BOOM MIKE	1
DEVELOP LARGER FREQUENCY INDICATORS	1
INPUT ONE NET TO EACH EARPHONE	1
INSTALL CONTROL BOX LIKE TO REMOTE OR AN-VRC 12	1
INSTALL TOGGLE SWITCHES AND FOOT TRANSMISSION SWITCHES	1
PUT CONTROLS ON CVC CORD	1
DEVELOP EXTERNAL SPEAKER CAPABILITY	1
KEEP COMMO OUT OF SLIP RING	1
POWER BURSTS TO BREAK JAMMING	1
INTERCOM LIKE GERMANS	1
REMOVE UNNECESSARY EQUIPMENT	1
SHIELD RADIO FROM NUCLEAR EFFECTS BETTER	1
MORE WOULD BE CONFUSING	1

NO IDEAS

95

APPENDIX J SUGGESTED POSITIONS FOR MOVING THE TC'S RADIO TRANSMISSION SWITCH

POSITION TO MOVE TC'S TRANSMIT SWITCH

	NUMBER OF SOLDIERS MAKING SUGGESTION
IN CUPOLA (ON TRAVERSING HANDLE OR .50 CAL SAFETY)	16
FOOT SWITCH(ES) ON TURRET FLOOR AND/OR TURRET RING	8
ON CORD CLIPPED TO SHIRT AND AT HAND LENGTH	5
TURRET CEILING OR UNDER HATCH	4
ON TC'S BELT OR CHEST	3
THROAT MIKE	3
ON CORD BETWEEN CONNECTOR AND CVC	3
IN MULTIPLE PLACES (UNSPECIFIED)	2
ON TURRET POWER SWITCH	2
SOMEWHERE, BUT NOT ON OVERRIDE	2
TO A HAND HOLD	2
ON TURRET WALL NEXT TO OVERRIDE	2
RANGE FINDER HOUSING	1
TC OVERRIDE <u>AND</u> CVC	1
ON INTERCOM BOX	1
ON CHEST BOX	1
ON MOVABLE CONTROL MODULE BOX	1
NEAR RADIO NET TOGGLE SWITCHES	1
ON OUTSIDE OF CUPOLA	1
ON MICROPHONE	1
TC OVERRIDE PLUS REMOTE, FLEXIBLE SWITCH	1
NEXT-TO SIGHTS	1
ON CVC AND ON .50 CAL HANDLE	1
DON'T MOVE	26
NO RESPONSE/OVERRIDE FINE	77

APPENDIX K IDEAS TO HELP COs USE CEOI MORE EFFECTIVELY

IDEAS TO HELP COs USE CEOI MORE EFFECTIVELY

	NUMBER OF SOLDIERS MAKING RESPONSE
BACK-LIGHTED DISPLAY TO WRITE CEOI INFO ON WITH GREASE PENCIL	6
DAILY CEOI INFO ON ONE CARD	6
REMOVE PAGES FROM CEOI	5
EACH TC/CO CONSTRUCT OWN CEOI EXTRACT	3
WRITE ON PLASTIC LAMINATE ON TURRET/CUPOLA WALL	3
STANDARDIZE CEOI BY POSITION	3
USE A SIMPLER SYSTEM	3
CASE ON PERSON/HOLDER ON SLEEVE	2
MAKE CEOI CARDS WATERPROOF	2
CO MANUALLY TRANSFER INFORMATION	2
INSTALL A CLIP OR BRACKET TO HOLD IT	2
PROVIDE CEOI TO ALL TCs	2
TRAIN MORE EFFECTIVELY ON HOW TO USE CEOI	1
DEVISE EASY AND EFFICIENT WAY TO DESTROY THEM	1
DEVELOP SECURE DIGITAL MESSAGE DEVICE	1
USE COAT POCKET	1
USE MICROFICHE AND READER	1
USE AN ACETATE BOARD	1
TRAIN GUNNERS OR DRIVERS	1
NEED READILY AVAILABLE INFO FOR SITREPS	1
MAKE IT SMALLER	1
DON'T MAKE IT TOO SMALL	1
NO IDEAS	120

APPENDIX L IDEAS FOR PROVIDING A POSITION LOCATING SYSTEM

IDEAS FOR PROVIDING POSITION LOCATING SYSTEM

	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
WOULD BE HELPFUL (ESPECIALLY IN DESERT, ROUGH TERRAIN, ETC.)	11
SIMPLY NEED TO TRAIN MORE	7
WOULD SAVE TIME AND ELIMINATE ERRORS	6
CONCERN ABOUT COST AND MAINTENANCE	6
PLACE ON LOADER'S SIDE OF TURRET	3
PROVIDE READOUT IN DRIVER'S STATION	2
BETTER THAN HEADING REFERENCE SYSTEM	2
GOOD, DEPENDING ON PROGRAMMING REQUIRED BY CREW	1
TIE IN WITH CEOI TO GIVE POSITION ENCODED BY DAILY CEOI	1
DESIGN IT WITH LIGHT DISCIPLINE IN MIND	1
PUT IT ABOVE AND TO RIGHT OF RADIO PRESELECT SWITCHES AT TC STATION	1
DISPLAY SHOULD INCLUDE POSITION OF CO'S ELEMENTS	1
DISPLAY IN TC THERMAL CHANNEL	1
PUT IT ON THE RANGEFINDER	1
USE AN LED DISPLAY	1
OK IF USED ONLY AS A BACKUP	1
HEADING REFERENCE SYSTEM WOULD BE BETTER	1
PLACE IT ON TURRET CEILING TO THE LEFT	1
INCLUDE A DEVICE TO ENCODE/DECODE SIX DIGIT COORDINATES	1
INCORPORATE IT INTO WASTED SPACE IN AMMO AREA	1
MANY TCs NEED IT	1
COULD BECOME A CRUTCH	1
SPEND MONEY ON BETTER TANKS FIRST	1
NO IDEAS	109

APPENDIX M IDEAS FOR PROVIDING A HEADING REFERENCE SYSTEM

IDEAS FOR PROVIDING TC HEADING REFERENCE SYSTEM

	NUMBER OF SOLDIERS MAKING SUGGESTION
PUT IN DRIVER'S STATION ALSO	7
MECHANICAL COMPASS FOR TC AND DRIVER WOULD DO	5
DIGITAL HEADING GIVING DEGREES ONLY	3
RED LED DISPLAY	3
ALSO PUT IN GUNNER'S STATION	2
INSTALL GYRO-COMPASS TO HELP TRAVEL A SPECIFIC AZIMUTH	2
COMBINE WITH POSITION LOCATING SYSTEM	2
PROVIDE TO CO, XO, PLT. LDR. AND PLT. SGT.	1
NEED A TEST FUNCTION	1
DISPLAY HEADING RELATIVE TO ALL DIRECTIONS	1
POSITION WHERE VISIBLE BOTH HEAD-OUT AND BUTTONED-UP	1
INSTALL IN DESERT OPERATIONS ONLY	1
CONSIDER MERKAVA SYSTEM	1
DESIGN WITH LIGHT DISCIPLINE IN MIND	1
DISPLAY DIRECTION RELATIVE TO MAP AZIMUTH	1
INSTALL ONLY ONE PER PLATOON	1
USE A COMPASS AND TURN ON YOUR STAB.	1
PUT ON TURRET WALL	1
PUT ON TURRET WALL AND ABOVE TC'S SIGHT	1
INCORPORATE SAME IDEA AS IN THE STAB. SYSTEM	1
PUT IN SIGHT DISPLAY FOR INDIRECT FIRE	1
SHOULD BE BASED ON HULL ORIENTATION	1
ALLOW SWITCHING DISPLAY FROM DEGREES/MILS	1
NO IDEAS	123

APPENDIX N REASONS FOR INSTALLING VARIOUS MAP READING AIDS AND DEVICES

REASONS FOR INSTALLING ONLY A MAGNIFICATION DEVICE FOR READING SMALL MAPS (N=5)

	NUMBER OF SOLDIERS GIVING REASON
COMPACT	2
POTENTIALLY PORTABLE	1
CONCERNED ABOUT TRANSFERING OVERLAYS FROM LARGE MAPS TO A SMALLER SCALE	1
TECHNOLOGY CURRENTLY AVAILABLE	1
WOULDN'T HAVE TO KEEP FOOLING WITH MAP CASE	1
NO REASON GIVEN	3

REASONS FOR USING ONLY A THUMB-INDEXED MAP BOOK (N=20)

SIMPLE/CONVENIENT METHOD	7
WOULD HELP IN LARGE SCALE MOVEMENTS	3
MAP BOOKS NOW LOCALLY PRODUCED, SHOULD MASS PRODUCE AND SAVE TROUBLE	2
PROVEN EFFECTIVE IN PAST	1
COMPACT	1
CAN USE DISMOUNTED IF NECESSARY	1
NO REASON GIVEN	8

REASONS FOR INSTALLING ONLY AN ELECTRONIC MAP DISPLAY (N=7)

COULD AUGMENT DRIVER IN TELLING DIRECTION OF MOVEMENT	1
REST WOULD HAVE TOO MUCH TROUBLE IN THE LONG RUN	1
COULD WORK WITH ELECTRONIC POSITION LOCATING SYSTEM	1
MAP BOOK, MAGNIFICATION DEVICE COULD BE MADE BY TC'S	1
GOOD, ESPECIALLY IF YOU CAN TRANSMIT YOUR POSITION TO HQ	1
WOULD BE UNIFORM FOR ALL TANKS	1

NO REASON GIVEN

REASONS FOR INSTALLING ONLY A MAP FOLDING AID AND MAP HOLDER (N=17)

SIMPLE, ADDRESSES THE REAL PROBLEM AT LITTLE COST	3
NEED TO HAVE MAPS ORGANIZED BECAUSE OF SPACE AVAILABLE	3
TOO EASY TO DAMAGE MAPS WITHOUT A HOLDER	1
EASY TO LOSE MAPS IN A MOVING TANK	1
DIFFICULT TO PUT OVERLAYS ON MAP BOOK	1
IT WOULD HELP	1
NO REASON GIVEN	7

REASONS FOR USING SOME COMBINATION OF
DEVICES TO AID MAP READING
(N=70)

NUMBER
OF SOLDIERS
GIVING
REASON

<u>MAGNIFICATION DEVICE AND THUMB INDEXED MAP BOOK</u>	
FEAR OF FAILURE IN ELECTRONIC DEVICES	1
FRG MAPS NECESSARY ARE TOO MUCH TO HANDLE	1
MAP BOOK THAT CAN BE MAGNIFIED WOULD SAVE TIME	
LOOKING FOR MAPS	1
CONVENIENT AND INEXPENSIVE	1
GOOD IDEA	1
 <u>MAGNIFICATION DEVICE AND ELECTRONIC MAP DISPLAY</u>	
WILL WORK WELL WITH PLS	1
SAVE SPACE - SHOULD HAVE MAP BOOK FOR ALL OTHER TANKS	1
GIVE CDR MORE TIME TO MONITOR SITUATION	1
NEED OVERLAP OF MAPS, BUT WOULD ESPECIALLY HELP IN BAD WEATHER	1
 <u>MAGNIFICATION DEVICE, MAP BOOK, AND MAP HOLDER</u>	
COMPACT, BUT DON'T SACRIFICE ACCURACY	2
REALISTIC	1
DURABLE	1
COULD STILL OPERATE IF POWER OUTAGE	1
FASTER	1
BETTER ON THE MOVE	1
BETTER AT NIGHT	1
 <u>MAGNIFICATION DEVICE AND MAP HOLDER</u>	
ELECTRONICS COULD GO OUT AND EVERYONE ALREADY HAS MAP BOOKS	1
 <u>MAP BOOK AND ELECTRONIC MAP DISPLAY</u>	
MAP BOOK COULD BE A BACKUP TO DISPLAY	2
WOULD AID IN QUICKLY-MOVING OR CROSS-ATTACHED SCENARIOS	1
KEEP MAPS FROM BEING LOST/BLOWING AWAY	1
POTENTIAL FOR PUTTING INFORMATION ON THE DISPLAY	1
COULD BE DONE	1
 <u>MAP BOOK, ELECTRONIC MAP DISPLAY, AND MAP HOLDER</u>	
WILL WORK WELL WITH PLS	1

REASONS FOR USING SOME COMBINATION OF
DEVICES TO AID MAP READING
(CONTINUED)

	<u>NUMBER OF SOLDIERS GIVING REASON</u>
<u>MAP BOOK AND MAP HOLDER</u>	
ESPECIALLY IMPORTANT IN FAST, LARGE-SCALE OPERATIONS	9
FOLDING MAPS A PROBLEM	8
MORE RELIABLE THAN OTHER ALTERNATIVES, SIMPLE	6
PROVIDES QUICK AND EASY ACCESS, CONVENIENT	5
PRACTICAL	4
INEXPENSIVE	3
MAPS NEED HOLDER TO KEEP FROM BLOWING AWAY OR FALLING OFF	2
COMPACT	2
COULD BE USED BY PERSONNEL AT LOWEST LEVEL	1
SHOULD PLASTICIZE MAPS IN BOOK	1
BOOK ESPECIALLY IMPORTANT IN EUROPE	1
BOOK COULD BE USED DISMOUNTED IN AN EMERGENCY	1
MAP READING A BIG PROBLEM	1
FEAR OF TC FOCUSING TOO MUCH ON ELECTRONICS	1
COULD BE TRANSFERRED BETWEEN TANKS	1
REGULARLY-SIZED MAPS CONTAIN MORE INFORMATION	1
DIFFICULT TO BRIEF WITH SMALL MAPS	1
DAMAGING MAPS A PROBLEM	1
<u>ELECTRONIC MAP DISPLAY AND MAP HOLDER</u>	
EASE STORAGE PROBLEM	2
GOOD FOR DEEP INTERDICTION	1
WON'T LOSE MAPS	1
GOOD, IF ELECTRONIC DISPLAY IS RELIABLE	1
MAKE BOTH CO CDR AND TC JOBS EASIER	1
 NO REASONS GIVEN (ALL CATEGORIES ABOVE)	 7

REASONS FOR INSTALLING ALL PROPOSED
MAP READING DEVICES
(N=14)

NUMBER
OF SOLDIERS
GIVING
REASON

WOULD HELP OVER LONG DISTANCES	1
ANY HELP IN GRAPHICS AND MAPS WOULD BE GOOD	1
ALL GOOD IDEAS	1
NO REASONS GIVEN	9

REASONS FOR INSTALLING NONE OF THE
PROPOSED MAP READING DEVICES
(N=21)

TOO COMPLEX/DIFFICULT TO USE AND HARD TO MAINTAIN	8
WILL NOT IMPROVE C ³ ENOUGH TO MATTER/UNNECESSARY	6
TOO EXPENSIVE	6
OVERLAYS DIFFICULT TO USE/HARD TO BRIEF USING SUGGESTIONS	3
EVERY GOOD TC ALREADY HAS A MAP HOLDER/BOOK	2
FOLDING DEVICE MAY BE OF SOME HELP	1
STILL NEED MAPS	1
PROBLEMS WHEN OPERATIONS OVERLAP TWO PAGES	1
NO REASONS GIVEN	9

APPENDIX O IDEAS TO IMPROVE MAP READING AND NAVIGATION

	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
NEED MORE TRAINING IN READING MAPS	8
CONCERNED ABOUT RELIABILITY OF ELECTRONIC DEVICES	4
HEADING REFERENCE/POSITION LOCATING SYSTEM WILL HELP	3
NEED MORE FUEL AND MANEUVER RIGHTS TO TRAIN	2
CONCERNED ABOUT COST	2
GIVE DRIVERS HEADING REFERENCE SYSTEM	1
NEED CAPABILITY TO TRANSMIT GRAPHICS	1
NEED CLAMPS FOR MAPS WHILE UNBUTTONED	1
USE A GYROSCOPE	1
NIGHT MAP READING WITH RED LIGHT INADEQUATE	1
NEED INTERIOR SIDE BOARDS FOR MOUNTING MAPS, ETC.	1
MAP BOOKS WOULD HELP TCs BUT NOT COs	1
NEED PLACE TO STORE MAPS	1
NEED FLEXIBLE RED LIGHT FOR MAP READING	1
NEED LAMINATED MAPS	1
NEED TO BE ABLE TO REMOVE MAP FROM PROTECTIVE COVER	1
GADGETS WILL REQUIRE TOO MUCH SPACE	1
CONCERNED ELECTRONICS MAY BECOME A CRUTCH	1
NO IDEAS	126

APPENDIX P WRITTEN RESPONSES RELEVANT TO PROPOSED WORKSPACE AND HUMAN
FACTORS ITEMS

IDEAS FOR IMPROVING LIGHTING

	NUMBER OF SOLDIERS MAKING SUGGESTION
FLEXIBLE WAND LIGHT WITH RED/WHITE SELECTOR	7
USE RED FILTER ON LIGHT	5
INSTALL LIGHT BY COAX	3
PENLIGHT ON CORD WITH HOOK FOR HANGING	3
USE FLASHLIGHT WITH RED LENS CAPABILITY	2
PUT LIGHT ON CVC	2
PUT LIGHT ON ODDMENT TRAY	2
USE BLUE/GREEN LIGHTS	2
ADD LIGHT BLOCKS	2
ADD MAP LIGHT	2
PENLIGHT ON A SWIVEL AT EACH STATION	1
LIGHT BY LOADER FOR THE M240	1
INSTALL SMALL AVIATOR'S HAND LIGHT (AVAILABLE)	1
DEVELOP ONE-WAY VISION BLOCKS	1
USE FLUORESCENT PAINT IN TANK	1
ADD LIGHT OVER VRC-12	1
LIGHT BEHIND GUNNER'S HEAD	1
LIGHT FOR GUNNER	1
LIGHT FOR DRIVER	1
PUT SWITCH ON HATCH	1
CURRENT WHITE LIGHT INADEQUATE FOR MAPS, CEOI	1
MUST BE SHIELDED ADEQUATELY	1
NO RESPONSE	124

REASONS FOR INSTALLING ADDITIONAL LIGHTING IN THE TURRET CEILING

	NUMBER OF SOLDIERS MAKING SUGGESTION
AID IN MAP READING	8
NEED OVERHEAD RATHER THAN SIDE LIGHT	1
NEED FLEX ARM ON LIGHT	1
NO REASON GIVEN	11

REASONS FOR INSTALLING ADDITIONAL LIGHTING IN THE TURRET WALL NEXT TO TC

AID IN MAP READING	12
SHIELDED MORE EASILY THAN OVERHEAD LIGHT	9
ALLOWS TC TO SEE WITHOUT HOLDING FLASHLIGHT	5
OUT OF THE WAY/PREVENT DAMAGE TO LIGHT	3
BETTER TO USE THAN OVERHEAD LIGHT	2
INSUFFICIENT LIGHT IN TC POSITION NOW	1
OVERHEAD IMPRACTICAL WHEN HEAD-OUT	1
WILL ASSIST TC IN NIGHT FIRING	1
EASIER THAN MOVING TOWARD BREECH BLOCK	1
AID IN CONTINUOUS OPERATIONS	1
WILL HELP BY ILLUMINATING CONTROLS	1
EASY ACCESS	1
WILL HELP IN SETTING RADIO	1
MORE ROOM TO INSTALL IT THERE	1
NO REASON GIVEN	32

REASONS FOR NOT INSTALLING ADDITIONAL LIGHTING IN THE TURRET WALL OR CEILING

	NUMBER OF SOLDIERS MAKING SUGGESTION
NOT COST EFFECTIVE/UNNECESSARY	8
LIGHT DISCIPLINE WOULD BE AN INCREASED PROBLEM	6
TC CAN USE A FLASHLIGHT	2
DON'T NEED A FIXED LIGHT, MUST BE FLEXIBLE	1
WOULD REQUIRE DEPOT-LEVEL WORK TO INSTALL	1
NO REASON GIVEN	20

REASONS FOR INSTALLING ADDITIONAL LIGHTING IN BOTH TURRET WALL AND CEILING

AID IN MAP READING, ETC.	7
CURRENT LIGHTING INADEQUATE	6
RED LIGHT IN CUPOLA WOULD HELP IF DOESN'T SHINE OUT	2
ALLOWS TC TO SEE WITHOUT FLASHLIGHT	1
LIGHT ON FLEXIBLE CORD COULD PROVIDE BOTH	1
NO REASON GIVEN	13

APPENDIX Q IDEAS FOR PROVIDING A SMALL SWING-UP SHELF IN FRONT OF THE
TX's STATION

IDEAS FOR INSTALLING A SMALL
SWING-UP SHELF IN FRONT OF THE TC'S STATION

	NUMBER OF SOLDIERS MAKING SUGGESTION
DESIGN IT WITH CLIPS OR COVER TO HOLD DOWN PAPERS, ETC.	9
WEATHERPROOF COVER ON IT (ACETATE, PLEXIGLASS, ETC.)	8
INCLUDE LIGHTING ON IT	3
PUT SHELF OUTSIDE CUPOLA, COULD FOLD FOR TRAVELING	3
NEED A TRAY, NOT A SHELF	2
RAISED EDGES TO KEEP THINGS FROM FALLING/ROLLING OFF	2
PUT BETWEEN TC AND LOADER	2
POCKETS ON IT TO HOLD PAPERS	2
PUT ABOVE GUNNER'S HEAD	2
DESIGN TO BE TILTED OR LEVEL	2
REMOVE CUPOLA AND MOUNT ON TURRET WALL	2
MOUNT IT ON TURRET WALL	2
PUT SOMETHING ALONG TURRET WALL RATHER THAN A SHELF	1
PULL DOWN AND FORWARD-STOW BEHIND TC SIGHT	1
INSTALL A RACK FOR MAPS	1
DESIGN TO BE CLIPPED EITHER INSIDE OR OUTSIDE	1
PUT ON TOP OF BALLISTIC SHIELD	1
MAKE LARGE ENOUGH TO HOLD 1/50,000 MAP SHEET	1
NEED PLACE TO HANG MAPS INSTEAD	1
DESIGN IT TO SWING OUT ACROSS TC'S LAP	1
PUT ON M85 ACCESS PLATES	1
DESIGN IT TO BE OUT OF GUNNER'S WAY	1
DESIGN NOT TO INTERFERE WITH .50 CAL	1
SHERIDANS AT FORT IRWIN HAVE SOMETHING	1
PUT ONLY ON CO'S TANK	1
FOLD MAP AND KEEP IT OUT OF THE WIND	1
MOUNT ON TOP OF TURRET TRAVERSE GEAR UNIT	1
SHELF UNDER .50 CAL AMMO TRAY WOULD BE BETTER	1
PUT ON TURRET ROOF	1
CONCERNED ABOUT SAFETY	1
MAY NOT NEED TO SWING UP	1

NO IDEAS

112

APPENDIX R WRITTEN RESPONSES TO ITEMS INVOLVING DEVICES TO AID MOUNTING
AND DISMOUNTING

IDEAS PROVIDED TO
AID MOUNTING & DISMOUNTING

	NUMBER OF SOLDIERS MAKING SUGGESTION
USE NON-SKID PAINT ON MOUNTING AREAS	4
MORE PT	3
MORE PRACTICE/TRAINING	3
CUTOUTS ON SIDE OF VEHICLE	3
ADD ROUGH SURFACE OR SCREENING TO FRONT SLOPE	2
ADD STEP RAIL ON TURRET	2
ADD HOLDS AROUND CUPOLA	2
ADD INDENTATIONS IN PLATING	1
ADD HAND AND FOOT GRIPS TO REAR OF VEHICLE	1
ATTACH FRONT TOW HOOKS	1
ADD HANDHOLD ABOVE TOW HOOK	1
ADD GROOVE ON FRONT SLOPE	1
PUT 2 X 4 BETWEEN HEADLIGHTS	1
ADD HANDLE OR STEP BY FIRE EXTINGUISHER	1
ELIMINATE M60 CUPOLA	1
ENLARGE HATCH	1
ELIMINATE WEARING LBE	1
NO RESPONSE	128

REASONS FOR INSTALLING A SWING-DOWN LADDER

NUMBER
OF SOLDIERS
MAKING
SUGGESTION

SPEED OF MOUNTING/DISMOUNTING	1
PREVENT INJURIES	1
NO REASON GIVEN	5

REASONS FOR INSTALLING HAND AND FOOT GRIPS ON TANK GLACIS

SAFETY WHEN WET, MUDDY, OR ICY	24
MORE PRACTICAL THAN LADDER	11
COST EFFECTIVE AID	4
HELP WHEN CARRYING A LOAD	3
SPEED MOUNTING/DISMOUNTING	3
GOOD AS LONG AS DOESN'T COLLECT ICE AND MUD	1
GOOD FOR OLDER TCs	1
GLACIS A PROBLEM SPOT MOUNTING/DISMOUNTING	1
WOULD HELP SHORT PEOPLE	1
WOULD HELP IN NBC GEAR	1
STANDARDIZE MOUNTING POSITION FOR SAFETY	1
BETTER/SAFER THAN 2X4	1
CAN TIE EQUIPMENT ON IT	1
NO EXTRA EQUIPMENT REQUIRED	1
NO REASON GIVEN	38

REASONS FOR INSTALLING BOTH

SPEED MOUNTING/DISMOUNTING	1
NO REASON GIVEN	3

REASONS FOR INSTALLING NEITHER SWING-DOWN LADDER NOR HAND AND FOOT GRIPS

UNNECESSARY/NOT COST EFFECTIVE	15
PRESENT CONFIGURATION ALLOWS EASY MOUNTING/DISMOUNTING	5
INABILITY TO MOUNT/DISMOUNT DEMONSTRATES INCOMPETENCE	3
USE A 2X4	1
THE ENEMY CAN USE THEM ALSO	1
POTENTIAL HAZARD	1
WOULD REQUIRE MORE MAINTENANCE	1
NO REASON GIVEN	37

APPENDIX S

IDEAS TO HELP TCs MOVE UP AND DOWN FROM HATCH TO SIGHTS

	NUMBER OF SOLDIERS MAKING SUGGESTION
NONE-AFRAID OF MECHANICAL/HYDRAULIC/SAFETY PROBLEMS	20
BE PHYSICALLY FIT	7
GET RID OF CUPOLA	6
TRAINING	5
STEPS ON TURRET WALL	5
UNNECESSARY CONCEPT/HYDRAULICS TOO SLOW	5
HAND HOLDS ON TURRET CEILING/WALL	3
IMPROVE SEAT AND STAND	2
CHANGE PLATFORM TO ALLOW CROUCHING DOWN TO SIGHTS	2
MOVE HYDRAULICS AND GUN RECOIL SHIELDS	1
MOVE SIGHTS TO TC	1
MECHANICAL BUTTON TO DROP PLATFORM	1
CONSTRUCT A GRATE LADDER IN THE TURRET	1
UPSIDE DOWN PERISCOPE	1
USE PERISCOPE	1
SLANT TC'S SEAT	1
PUT STEPS ON SEAT STAND	1
LIMIT TC FUNCTIONS TO COMMAND AND CONTROL	1
TC SHOULD ALWAYS BE HEAD-OUT	1
REDESIGN TANK	1
No IDEAS	101

APPENDIX T SUGGESTIONS FOR REDESIGNING THE TC STATION OF AN M60 TANK

SUGGESTIONS FOR REDESIGNING THE TC STATION TO PROVIDE MORE SPACE FOR C³

	NUMBER OF SOLDIERS MAKING SUGGESTION
REMOVE CUPOLA	12
ELIMINATE .50 CAL OR PUT OUTSIDE ON RING OR POST	10
STOWAGE SPACES FOR PENCILS, ETC. (POCKETS, POUCHES)	7
OK AS IS	7
INSTALL MAP SHELF/HOLDER	6
SMALLER, MORE RELIABLE RADIOS	5
WIDER CUPOLA/HATCH	5
INSTALL MORE RADIOS/NET CAPABILITIES	4
REMOVE MAIN GUN AND PUT IN PLATFORM	3
USE .50 CAL AMMO WELL FOR STORAGE	2
MOVE OVERRIDE UP	2
MAKE RADIO CONTROLS EASIER TO SEE AND REACH	2
MOVE RADIOS INTO ODDMENT TRAY	2
DEVELOP A BETTER REMOTE	2
REMOVE AUTOBAHN SEAT	2
MOVE RADIOS	2
GO TO LASER RANGEFINDER IN M60A1	1
ELIMINATE RANGEFINDER	1
MOVE RANGEFINDER AND PERISCOPE EYEPieces CLOSER	1
MOVE TC'S STATION BACK - PUT RADIOS AND SIGHTS IN FRONT OF TC	1
USE M60A3 SIGHTS ON M60A1	1
MOVE COMMO BOX	1
INSTALL TOGGLE SWITCH COMMO	1
AM RADIO WITH SECURE CAPABILITY FOR COs	1
AM RADIO IN ODDMENT TRAY	1
USE LOADER TO MONITOR COMMO	1
REMOVE AMMO RACKS IN LOADER'S AREA AND PUT RADIOS THERE	1
PLACE RADIOS ON FLOOR, HAVE REMOTE UNITS FOR SETTING AND USE RADIO AREA FOR STORAGE	1
MOVE RADIOS WITHIN REACH OF LOADER OR GUNNER	1
REMOTE BOX FOR SWITCHING NETS	1
MAKE JACK BOX MORE ACCESSIBLE	1
INSTALL BACKUP FOR TC'S JACK BOX	1
MOVE RADIO CONTROL BOXES TO ALLOW MAPS ON TURRET WALL	1
ATTACHMENT FOR FIXED ANTENNA	1
FOOT SWITCH (ASSUME FOR COMMO)	1
FREQUENCY DISPLAY ON RADIO	1
MAKE TC'S STAND ROTATE INSTEAD OF FOLD UP	1
PROVIDE SEAT FOR OPERATING WHILE SEATED	1
INSTALL JUMPSEAT ON TC STAND THAT FOLDS DOWN TO MAKE SEAT BACK	1
REDESIGN SEAT	1
PROVIDE GREATER EASE OF MOVEMENT FROM TC SEAT	1

SUGGESTIONS FOR REDESIGNING THE TC STATION
TO PROVIDE MORE SPACE FOR C³

(CONTINUED)	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
MORE SPACE FOR MAPS	1
NEED MOBILE AND FIXED MAP	1
COMPASS	1
MAP BOARD AND WRITING STAND WELDED TO LEFT OF CUPOLA	1
DESIGN MORE COMPACT .50 CAL	1
MOVE M85 EQUIPMENT TOWARDS GUNNER AND AWAY FROM CUPOLA	1
USE M-2	1
USE .50 CAL AMMO STORAGE SPACE FOR C ³ GADGETS	1
MOVE MG ON M60 SERIES TO LOADER'S POSITION	1
PROVIDE POWER CUPOLA	1
GIVE TC CADILLAC CONTROLS FOR TURRET AND CUPOLA	1
INSTALL TOW MISSILE LAUNCHERS INSTEAD OF MAIN GUN	1
INSTALL HEADS-UP DISPLAY LIKE AIRCRAFT	1
INSTALL BETTER VISION BLOCKS TO EXPAND VIEW	1
ADD LIGHT	1
ADOPT LEOPARD'S TC STATION	1
ELECTRONIC C ³ DEVICES ON TURRET WALL AND OVER SIGHTS	1
REDUCE OR ELIMINATE THE 105mm GUNSHIELD	1
REMOVE TC'S OVERRIDE AND FIRING SIGHTS	1
USE DETACHABLE OVERRIDE GRIP SO TC DOESN'T LOSE HIS ORIENTATION	1
MOVE CO INTO M3	1
NO SUGGESTIONS	73

APPENDIX U OFFICERS' SUGGESTIONS TO AID WEARING WEBGEAR IN THE TC STATION

SUGGESTIONS FOR REDESIGNING THE TC'S POSITION TO ALLOW WEARING WEBGEAR WHILE COMMANDING

	NUMBER OF SOLDIERS MAKING <u>SUGGESTION</u>
DON'T WEAR WEBGEAR - STOW IT OR ELIMINATE IT	95
DEVELOP COVERALLS/OVERALLS INCORPORATING GEAR	25
ATTACH LESS GEAR (VARIOUS CONFIGURATIONS SUGGESTED)	21
DEVELOP AVIATOR VEST OR TANKER'S JACKET	10
ENLARGE HATCH	3
DO AWAY WITH CUPOLA/USE POP-UP HATCH LIKE ISRAELIS	3
NO PROBLEM	3
REDESIGN MASK/INSTALL OVERPRESSURE SYSTEM	3
MOVE ALL KNOBS, BUTTONS, AND HANDLES OUT OF THE WAY	2
REDESIGN WEBGEAR OR REPLACE WITH EXTRACTION STRAPS	2
DO SOMETHING WITH JUMP SEAT HANDLE	1
REDESIGN HOLSTER	1
ELIMINATE STEEL POT - GO BACK TO BERET AND CVC	1
REVERSE LATCH ADJUSTER SO IT'S FLAT ON THE OUTSIDE	1
RELOCATE OR REDESIGN THE CANTEEN	1
NEED 360° THERMAL VIEWER WITH TARGET DESIGNATE	1
DEVELOP SOMETHING SMALLER FOR ARMOR CREWMEN	1
ONLY WEAR FLACK JACKET	1
FEWER SHARP EDGES OR CATCHES	1
DELETE AMMO POUCHES	1
DEVELOP BULLET-PROOF PLEXIGLASS DOME AND STEEL CVC	1
NO SUGGESTIONS	24